Hearing Before the United States Senate
Committee on Governmental Affairs
Subcommittee on Oversight of Government Management, the Federal Workforce, and the District of Columbia
November 20, 2003

Prepared Testimony of

Michehl R. Gent
President and Chief Executive Officer
North American Electric Reliability Council

Good morning, Mr. Chairman and members of the Committee. My name is Michehl Gent and I am President and Chief Executive Officer of the North American Electric Reliability Council (NERC). Thank you for inviting me to provide NERC's perspective on the interim report of the U.S.-Canada Power System Outage Task Force on the causes of the blackout on August 14, 2003.

NERC is a not-for-profit organization formed after the Northeast blackout in 1965 to promote the reliability of the bulk electric systems that serve North America. NERC's mission is to ensure that the bulk electric system in North America is reliable, adequate, and secure. NERC works with all segments of the electric industry as well as electricity consumers and regulators to set and encourage compliance with rules for the planning and operation of reliable electric systems. NERC comprises ten Regional Reliability Councils that account for virtually all the electricity supplied in the United States, Canada, and a portion of Baja California Norte, Mexico.

NERC has been an integral part of the joint fact-finding investigation that led to the interim report on the August 14 blackout that the U.S.-Canada Power System Outage Task Force issued yesterday. NERC fully supports the findings and conclusions in the interim report. With respect to what happened on August 14, the key findings and conclusions are detailed on page 23

of the interim report, as follows: "inadequate situational awareness at First Energy Corporation," "First Energy failed to manage adequately tree growth in its transmission rights-of-way," and "failure of the interconnected grid's reliability organizations to provide effective diagnostic support."

Immediately after the onset of the blackout on August 14, 2003, NERC began assembling a team of the best technical experts in North America to investigate exactly what happened and why. Every human and data resource we have requested of the industry has been provided, and experts covering every aspect of the problem have been volunteered from across the United States and Canada. In the week following the blackout, NERC and representatives of DOE and the Federal Energy Regulatory Commission ("FERC") established a joint fact-finding investigation. All members of the team, regardless of their affiliation, have worked side by side to help correlate and understand the massive amounts of data that we have received. We have had hundreds of volunteers from organizations all across North America involved in the investigation so far.

To lead the NERC effort, we established a strong steering group of the industry's best, executive-level experts from systems not directly involved in the cascading grid failure. The steering group scope and members are described in Attachment A.

On October 15, NERC sent a letter to the CEOs of all reliability coordinators and control areas in North America directing them to verify within 60 days that their organizations are measuring up to reliability requirements in six key areas: Voltage and reactive management, reliability communications, failures of system monitoring and control functions, emergency action plans, training for emergencies, and vegetation management. The intent of this action was

to minimize the likelihood of another blackout in the near future while the investigation is ongoing and a full set of recommendations is being developed. Responses are due on December 15. The full text of that letter is in Attachment B.

Chapter 6 of the interim report compares the August 14 blackout to other major disturbances on the interconnected bulk electric system. That comparison reveals that some of the causes of the August 14 blackout (inadequate vegetation management, failure to ensure operation within secure limits, failure to identify emergency conditions and communicate that status to neighboring systems, inadequate operator training, and inadequate regional-scale visibility over the power system) were repeats from the earlier outages, but it also revealed some causes not seen before (inadequate interregional visibility over the power system, dysfunction of a control area's SCADA/EMS system, and a lack of adequate backup to that system). The electricity industry has made great strides in responding to the recommendations from those earlier investigations, in the form of better communication capabilities, operator certification program, better tools for dealing with congestion on the grid, but clearly more needs to be done. For one thing, we are now using the bulk electric system harder than we have in the past and in ways for which it wasn't designed. Actions and practices that sufficed when the system had plenty of margin for error simply are inadequate when the system is being pushed more to its limits as electricity markets are increasingly characterized by larger transactions over greater distances. For another, the reliability responsibility for a given area that used to be concentrated within a single, vertically integrated organization is, in many parts of the country, now divided among several different entities.

One important step Congress can and should take to strengthen the reliability of the bulk power system in general would be to pass legislation to make the reliability rules mandatory and enforceable. For several years, NERC and a broad coalition of industry, government, and customer groups have been supporting legislation that would authorize creation of an industry-led self-regulatory organization, subject to oversight by FERC within the United States, to set and enforce reliability rules for the bulk electric system. NERC has developed a world-class set of planning and operating standards, though I expect we will find it necessary to improve those standards, based on the events of August 14. However, as long as compliance with these standards remains voluntary, we will fall short of providing the greatest possible assurance of reliability that could be achieved through mandatory verification of compliance and the ability to impose penalties and sanctions for non-compliance. On Tuesday, the House of Representatives passed H.R. 6, a comprehensive energy bill that includes the needed reliability legislation. H.R. 6 is now before the Senate for action.

As for the August 14 outage, much remains to be done. As the entity responsible for reliability standards for the bulk electric system, NERC must understand and communicate to its members what happened on August 14 and why it happened. The interim report is a major step in accomplishing that task. NERC must also determine whether any of its standards were violated and whether its standards and procedures require modifications to take into account the ways in which the bulk electric system is being used. Finally, NERC must assure that measures necessary to avoid a recurrence of the August 14 outage are taken.

NERC will continue to work with the U.S.-Canada Task Force as the investigation continues and recommendations are developed. We expect to learn many additional lessons from this event that will enable us to improve the overall reliability of the grid.

Thank you.

Attachment A

NORTH AMERICAN ELECTRIC RELIABILITY COUNCIL

Princeton Forrestal Village, 116-390 Village Boulevard, Princeton, New Jersey 08540-5731

August 14, 2003 Blackout Investigation
NERC Steering Group

SCOPE

August 27, 2003

Scope

The NERC Steering Group steers the formulation and implementation of the NERC blackout investigation plan, reviews the milestone progress and results, and recommends improvements. The Steering Group provides a perspective of industry experts in power system planning, design, and operation.

Members

The members of the NERC Steering Group are:

Paul F. Barber, Facilitator
Barber Energy

W. Terry Boston
Executive Vice President
Transmission/Power Supply Group
Tennessee Valley Authority

Mark Fidrych
Power Operations Specialist
Western Area Power Administration

Sam R. Jones
Chief Operating Officer
Electric Reliability Council of Texas

Yakout Mansour
Senior Vice President
System Operations & Asset Management
British Columbia Transmission Corporation

William (Bill) K. Newman
Senior Vice President
Transmission Planning and Operations
Southern Company Services, Inc.

Terry M. Winter
President and Chief Executive Officer
California ISO

M. Dale McMaster
Executive Vice President–Operations and Reliability
Alberta Electric System Operator

Biographies

Paul F. Barber, Ph.D.
Barber Energy
Dr. Barber provides transmission and engineering services to the electric power industry in areas of governance, strategic planning, electric grid management, and power system reliability. He previously served as the Chair of the NERC Market Interface Committee and as the Vice Chair (Transmission Customers) of the Northeast Power Coordinating Council (NPCC). Dr. Barber joined Boston-based Citizens Power & Light, providing transmission and engineering technical expertise and support to all business lines of Citizens Power & Light and its successors. Dr. Barber served on the NERC Board of Trustees as well as the Boards of the Mid-Atlantic Area Council, Western Systems Coordinating Council (WSCC), and the three Regional Transmission Associations in the Western Interconnection. Prior to 1994, Dr. Barber served a 28-year career as an officer in the U.S. Army Corps of Engineers rising to the rank of Colonel. Dr. Barber received his BS degree from the U.S. Military Academy and MS degrees in electrical engineering and civil engineering from the University of Illinois. He completed a Ph.D. degree in electric power engineering from Rensselaer Polytechnic Institute in 1988. He has been registered in the State of Illinois as a professional engineer since 1974.

W. Terry Boston
Executive Vice President, Transmission/Power Supply Group
Tennessee Valley Authority
Terry Boston is Executive Vice President of the Tennessee Valley Authority's Transmission/Power Supply Group. Mr. Boston is the senior officer responsible for the planning, building, operation, and maintenance of TVA's transmission and power supply network. He joined TVA as a power supply engineer in 1972, and was named head of the Power Supply Group in 1980. Over the next 16 years, he directed three TVA divisions in succession: Transmission, Regional Operations, and Electric System Reliability. Mr. Boston has served for six years on the NERC Engineering Committee and Transmission Task Force, and is on the NERC Stakeholders Committee. He is vice president of CIGRE, the International Council on Large Electric Systems, and vice president of CERTS (the Consortium for Electric Reliability Technology Solutions). Boston holds a B.S. in engineering from Tennessee Technological University and an M.S. in engineering administration from the University of Tennessee.

Mark Fidrych
Power Operations Specialist
Western Area Power Administration
Mark E. Fidrych has served as the Manager of Western Area Power Administration's Rocky Mountain Desert Southwest Reliability Center. Mr. Fidrych began his career with WAPA in 1979, working in maintenance and marketing, with the majority of his career having been in power system operations. He directed activities in the computer systems and power scheduling divisions before becoming the Operations Manager in 1990. A 1972 graduate of the University of Rhode Island, Mr. Fidrych received a bachelor's degree in electrical engineering. In 1980, he received a master's degree in public administration from the University of Colorado. Mr. Fidrych is the present Chair of the NERC Operating Committee. He has also served as the Chair of the NERC Security Coordinator and the Operating Reliability Subcommittees.

Sam R. Jones
Chief Operating Officer
Electric Reliability Council of Texas
Sam R. Jones became the first Director of the Electric Reliability Council of Texas (ERCOT) on December 1, 1996. In March 2000, he was appointed as the Executive Vice President and Chief Operating Officer of ERCOT. Prior to joining ERCOT, Mr. Jones was employed by the City of Austin, Texas, Electric Utility for over 35 years. With the City of Austin, he held engineering and management positions in the areas of distribution, transmission, substation, generation and system operations. He was responsible for the development of Austin's first energy control center. He retired from the City of Austin as Director of Generation and Energy Control. He has been active in inter-utility reliability work for over 19 years. He is a two-time past chair of the ERCOT Operating Subcommittee, and a current Vice-Chair of the NERC Operating Committee, and a past chair (or member) of numerous NERC and ERCOT subcommittees and task forces. Mr. Jones has a degree in Electrical Engineering from the University of Texas at Austin and is a Registered Professional Engineer in Texas.

Yakout Mansour
Senior Vice President, System Operations & Asset Management
British Columbia Transmission Corporation
Yakout Mansour is Senior Vice President of System Operations & Asset Management of the British Columbia Transmission Corporation. Previously, he served as the Vice President of the Grid Operations and Inter-Utility Affairs division of BC Hydro, responsible for BC Hydro's transmission, distribution and generation dispatch operations as well as the development of policies and practices related to inter-utility transmission access. Mr. Mansour currently serves as BC Hydro's principal representative and board member on the RTO West filing utilities structure and has been the Canadian representative in the RTO consultation process. Mr. Mansour is a registered Professional Engineer in the Provinces of British Columbia and Alberta with over 30 years experience in power system planning, system and market operation, design and research. He is a Fellow of IEEE, has authored and co-authored over 100 papers and special publications of IEEE and other international professional institutions, has provided training and consulting services around the world, and holds U.S. and Canadian patents.

Dale McMaster, P.Eng.
Executive Vice-President, Operations and Reliability
Alberta Electric System Operator (AESO)
Dale McMaster is Executive Vice-President, Operations and Reliability for the Alberta Electric System Operator (AESO). The AESO integrates the functions of the Power Pool of Alberta, the Transmission Administrator of Alberta, and provincial load settlement. Mr. McMaster's knowledge of system planning and his overall industry experience integrates the AESO's operational and planning areas. As President and System Controller, Mr. McMaster played a key role during the integration of the former Power Pool and the Transmission Administration. Mr. McMaster joined the former Power Pool of Alberta in 1996 as Chief Operations Officer, with responsibility for the system control function, the ongoing development of the Alberta electric energy market, and strategic planning. He is an electrical engineer with more than 25 years of experience in power systems in Canada and abroad. Mr. McMaster received his degree in electrical engineering from the University of Saskatchewan and held a variety of senior management positions at SaskPower, SNC-Lavalin, and Acres International. He is a member of the Association of Professional Engineers, and the Canadian Electricity Association.

William K. Newman
Senior Vice President, Transmission Planning & Operations
Southern Company
William K. Newman began his career with Georgia Power Company in 1966 and progressed through positions of increasing responsibility at Georgia Power for 18 years. In 1984, he assumed the position of General Manager, Power Operations, at Mississippi Power Company, was promoted to Director of Power Delivery in 1988 and named Vice President, Power Generation and Delivery, in 1989. His responsibilities at Mississippi Power Company included the areas of fuels, environmental, generating plants, transmission, and system operations. He transferred to Southern Company Services in 1992 as Vice President, Operating and Planning Services and was named Senior Vice President, Transmission Planning and Operations in 1995. He is responsible for planning and operation of the Southern electric system's network transmission grid in order to provide economic, reliable service to all users. Mr. Newman has served in numerous academic and professional organizations and is currently Chairman, Southeastern Electric Reliability Council. He is a Registered Professional Engineer in the states of Georgia and Mississippi.

Terry M. Winter,
President and Chief Executive Officer
California ISO
Terry M. Winter is President and Chief Executive Officer of the California Independent System Operator (ISO), a position he has held since March 1, 1999. Mr. Winter was formerly Chief Operating Officer of the California ISO, having accepted the position in August 1997. He assisted in developing operations from the ground up and oversaw the integration of the transmission systems of Southern California Edison, Pacific Gas & Electric, and San Diego Gas & Electric when the California ISO assumed control of the state's open market transmission grid on March 31, 1998. Mr. Winter was formerly the Division Manager of San Diego Gas & Electric's power operations. His 21-year career with SDG&E focused on power operations, transmission engineering and project management. Prior to his tenure with SDG&E he worked on electrical transmission and distribution engineering for Arizona's Salt River Project for 10 years. Mr. Winter holds professional engineering licenses in both California and Arizona. Mr. Winter graduated from the University of Idaho with a Bachelor of Science degree in Electrical Engineering.

Attachment B

MICHEHL R. GENT
President and CEO

NORTH AMERICAN ELECTRIC RELIABILITY COUNCIL

Princeton Forrestal Village, 116-390 Village Boulevard, Princeton, New Jersey 08540-5731

October 15, 2003

Name
Address

Dear Name:

Near-Term Actions to Assure Reliable Operations

On October 10, 2003, the NERC Board of Trustees, with the endorsement of its Stakeholders Committee, directed that the following letter be sent to the CEOs of all NERC control areas and reliability coordinators.

NERC is assisting the U.S.-Canada Joint Task Force's investigation of the August 14, 2003, blackout that affected parts of the Midwest and Northeast United States, and Ontario, Canada. Although considerable progress has been made in the investigation to determine what happened, an understanding of the causes of the outage is still being developed through analysis by teams of experts.

The reliability of the North American bulk electric systems, including the avoidance of future cascading outages, is of paramount importance to NERC and its stakeholders. Pending the outcome of the final report on the outage, NERC emphasizes to all entities responsible for the reliable operation of bulk electric systems the importance of assuring those systems are operated within their design criteria and within conditions known to be reliable through analytic study. If the power system enters an unanalyzed state, system operators must have the authority and the capability to take emergency actions to return the power system to a safe condition.

NERC requests that each entity in North America that operates a control area and each NERC reliability coordinator review the following list of reliability practices to ensure their organizations are within NERC and regional reliability council standards and established good utility practices. NERC further requests that within 60 days, each entity report in writing to their respective regional reliability council, with a copy to NERC, that such a review has been completed and the status of any necessary corrective actions. This brief list of near-term actions is not in any way intended to diminish the need to comply with all NERC and regional reliability council standards and good utility practices.

1. **Voltage and Reactive Management:** Ensure sufficient voltage support for reliable operations.

- Establish a daily voltage/reactive management plan, assuring an adequate static and dynamic reactive supply under a credible range of system dispatch patterns.
- During anticipated heavy load days, or conditions of system stress such as caused by heavy wide-area transfers, ensure all possible VAR supplies are verified and available, and VAR supplies are applied early in the day ahead of load pickup.
- Reserve sufficient dynamic reactive supply (e.g. online generation and other dynamic VAR resources) to meet regional operating criteria and system needs.
- In accordance with NERC and regional practices maintain voltage schedules of all bulk electric transmission facilities above 95% of nominal values and in conformance with regional criteria.
- Report any low voltage limit violations at critical high voltage transmission facilities to the reliability coordinator.
- Ensure all interconnected generators that have, or are required to have, automatic voltage regulation (AVR) are operating under AVR.
- Coordinate potential differences of voltage criteria and schedules between systems and ensure these differences are factored into daily operations.

2. **Reliability Communications:** Review, and as necessary strengthen, communication protocols between control area operators, reliability coordinators, and ISOs.
   - Share the status of key facilities with other appropriate control area operators, reliability coordinators, and ISOs.
   - Control area operators, reliability coordinators, and ISOs should conduct periodic conference calls to discuss expected system conditions and notify all neighboring systems of any unusual conditions. Conduct additional calls as needed for system critical days.

3. **Failures of System Monitoring and Control Functions:** Review and as necessary, establish a formal means to immediately notify control room personnel when SCADA or EMS functions, that are critical to reliability, have failed and when they are restored.
   - Establish an automated method to alert power system operators and technical support personnel when power system status indications are not current, or that alarms are not being received or annunciated.
   - Determine what backup capabilities can be utilized when primary alarm systems are unavailable. If a backup to failed alarms is not immediately available, then monitoring and control should be transferred in accordance with approved backup plans.
   - Identify and implement procedures to move to 'conservative system operations' when operators are unsure about next contingency outcomes (i.e., unstudied conditions, loss of SCADA or EMS visibility, unexplained or unknown power system conditions).
   - Ensure all critical computer and communication systems have a backup power supply, and the backup supply is periodically tested.
   - Ensure that system operators have a clear understanding of the impact to their energy management system control functions whenever their transaction tagging and scheduling systems fail. Identify and implement appropriate contingency procedures for loss of real-time ACE and AGC control.

4. **Emergency Action Plans:** Ensure that emergency action plans and procedures are in place to safeguard the system under emergency conditions by defining actions operators may take to arrest disturbances and prevent cascading.
   - Actions might include but should not be limited to acting immediately to reduce transmission loading, ordering redispatch, requiring maximum reactive output from interconnected resources, and shedding load without first implementing normal operating procedures.
   - Ensure operators know, not only that they have the authority to shed load under emergencies, but that, in addition, they are expected to exercise that authority to prevent cascading.

5. **Training for Emergencies:** Ensure that all operating staff are trained and certified, if required, and practice emergency drills that include criteria for declaring an emergency, prioritized action plans, staffing and responsibilities, and communications.

6. **Vegetation Management:** Ensure high voltage transmission line rights of way are free of vegetation and other obstructions that could contact an energized conductor within the normal and emergency ratings of each line.

Sincerely,