UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION
105 FERC ¶ 61,372
(December 24, 2003)

Ohio Edison Company, Toledo Edison Company, Cleveland Electric Illuminating Company, and Pennsylvania Power Company, Docket No. PA04-14-000

H. Peter Burg
Chairman and Chief Executive Officer
Anthony J. Alexander
President and Chief Operating Officer
FirstEnergy Corporation
76 South Main Street
Akron, Ohio 44308-1812

Dear Messrs. Burg and Alexander:

1. The public utility affiliates of FirstEnergy Corporation, Ohio Edison Company, Toledo Edison Company, Cleveland Electric Illuminating Company and Pennsylvania Power Company, (jointly, FirstEnergy) are directed to retain an independent expert to prepare a study of the adequacy of transmission and generation facilities in Northeastern Ohio, particularly the so-called Cleveland Bowl, relative to loads, regardless of whether these facilities are owned by FirstEnergy (as described in more detail in Attachment A below).

BACKGROUND

2. On August 14, 2003, significant portions of the Midwest and Northeast United States, and Ontario, Canada, experienced an electric power blackout that, in some areas of the United States, lasted for up to two days, and that in some areas of Canada lasted longer. In the wake of that blackout, a joint United States-Canada Task Force undertook a study of the causes of that blackout and possible solutions to avoid future such blackouts. In November 2003, that Task Force issued an interim report,[1] describing its investigation and findings and identifying the causes of the blackout.

[1] United States-Canada Power System Outage Task Force, Interim Report: Causes of the August 14th Blackout in the United States and Canada (Nov. 2003)(Interim Blackout Report).

3. The Interim Blackout Report identified three basic categories of precipitating events or causes of the August 14th blackout: (1) what the Task Force described as "[i]nadequate situational awareness" on the part of FirstEnergy; (2) FirstEnergy's failure "to manage adequately tree growth in its transmission right-of-way;" and (3) what the Task Force described as the "[f]ailure of the interconnected grid's reliability organizations to provide effective diagnostic support."[2]

DISCUSSION

4. FirstEnergy, as relevant here, operates a control area in Northeastern Ohio,[3] with the Midwest Independent System Operator Corporation (Midwest ISO) serving as FirstEnergy's reliability coordinator.[4] As noted above, two of the three categories of precipitating events or causes of the August 14th blackout went to the actions of FirstEnergy.

5. And the Interim Blackout Report indicates that, in the period of time immediately preceding the August 14th blackout, Northeastern Ohio had significant reactive power[5] needs on that warm August day (with its high air conditioning load)

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[2] Id. at 23; see also id. at 21-65.

[3] As explained in the Interim Blackout Report, a control area is a geographic area within which a single entity, such as FirstEnergy, balances generation and load in real time in order to maintain reliable operations. Id. at 8.

[4] As explained in the Interim Blackout Report, a reliability coordinator, like the Midwest ISO, provides reliability oversight over a geographic area – which includes such things as preparing reliability assessments and coordinating emergency operations among the control areas within their auspices. Id. at 10.

[5] The Interim Blackout Report describes reactive power output in this way:

> A generator typically produces some mixture of "active" and "reactive" power, and the balance between them can be adjusted at short notice to meet changing conditions. Active power, measured in watts, is the form of electricity that powers equipment. Reactive power, characteristic of AC systems, is measured in volt-amperes reactive (VAr), and is the energy supplied to create or be stored in electric or magnetic fields in and around electrical equipment. Reactive power is particularly important for equipment that relies on magnetic fields for the production of induced electric currents (e.g., motors, transformers, pumps, and air conditioning). Transmission lines both consume and produce reactive

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and FirstEnergy was importing a substantial amount of reactive power – i.e., consuming what the Task Force described as "high levels of reactive power," with two of FirstEnergy's reactive power production "anchors" (the Davis Besse and Eastlake 4 units) "shut down" – setting the stage for the August 14th blackout.[6]

6. FirstEnergy has expressed concerns with the availability of reactive power [7] and the Task Force noted FirstEnergy's increased imports of reactive power immediately before the August 14th blackout.

7. In these circumstances, the availability of reactive power and more generally, the availability of sufficient generation and transmission facilities in Northeastern Ohio, are matters deserving further study, and accordingly, pursuant to Section 304(a)[8] of the Federal Power Act, FirstEnergy is directed to retain independent experts (consistent with the criteria laid out in Attachment B to this order) to prepare a study of the adequacy of transmission and generation facilities in Northeastern Ohio, particularly the so-called Cleveland Bowl, relative to loads, regardless of whether

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> power. At light loads they are net producers, and at heavy loads, they are heavy consumers. Reactive power consumption by these facilities or devices tends to depress transmission voltage, while its production (by generators) or injection (from storage devices such as capacitors) tends to support voltage. Reactive power can be transmitted only over relatively short distances, and thus must be supplied as needed from nearby generators or capacitor banks. If reactive power cannot be supplied promptly and in sufficient quantity, voltages decay and in extreme cases a "voltage collapse" may result.
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> Id. at 6.

[6] Id. at 15-16, 18-19, 22.

[7] E.g., Press Release, FirstEnergy Corporation, FirstEnergy Believes Interim Report Fails To Adequately Address Root Causes (Nov. 19, 2003)(found at http://www.firstenergycorp.com).

[8] 16 U.S.C. § 825c(a) (2000)(requiring public utilities to file with the Commission such special reports as the Commission may by order prescribe; the Commission may prescribe the manner and form in which such reports shall be made, and the Commission may require that such reports shall include, among other things, full information as to generation, transmission, distribution delivery, use, and sale of electric energy).

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these facilities are owned by FirstEnergy, and to submit the results of this study to the Commission within 120 days of the date of this letter order (as described in more detail in Attachment A below).[9]

By direction of the Commission.

Linda Mitry,
Acting Secretary.

Attachment A: Study of the Capability of the Power System in Northeastern Ohio; Scope, Modeling, Planning, Deliverables, Timeline

Scope of Study:

The assessment will entail steady state power flow analysis, including P-V and V-Q analysis for Northeastern Ohio generally, and the Cleveland–Akron area in particular, to assess the adequacy of the power system during the period January 1, 2004 through December 31, 2008 and identify the need for, and nature of, remedial measures required to satisfy NERC Planning Standards 1A & 1D and relevant ECAR Planning Standards.

In particular the study will cover the following:

1. minimum acceptable 345 kV and 138 kV pre-contingency voltages

[9]In evaluating independent experts that have bid to conduct the study and their responses to the Request for Proposals (RFP) discussed in Attachment A below, FirstEnergy is encouraged to consult with the Commission and its staff, the Public Utilities Commission of Ohio and its staff, and others (e.g., North American Electric Reliability Council (NERC), etc.), before making a selection. Moreover, during the course of the study, FirstEnergy and the independent expert are likewise encouraged to consult with the Commission and its staff, the Public Utilities Commission of Ohio and its staff, and others (e.g., North American Electric Reliability Council (NERC), etc.), as to the conduct of the study.

Once FirstEnergy has selected such an independent expert, FirstEnergy should advise the Commission as to which expert has been selected and justify its selection under the criteria identified in Attachment B below.

2. reactive power margin requirements

3. adequacy of existing and committed facilities including reactive power resources to meet summer peak loads, import requirements and transfer levels

4. maximum import capability into the Cleveland-Akron area with forecast south-to-north and west-to-east transactions external to FirstEnergy footprint.

5. adequacy of operating and reactive power reserves to respond to generation and transmission contingencies in compliance with Category C.3. of NERC Planning Standards Table 1A

6. need and timing of additional operating & reactive resources over the period

7. appropriate mix of static and dynamic reactive resources

8. reliability must run units in the area

9. need and timing of any special protection system(s) (including the use of under voltage load shedding) required to ensure system security under credible evolving n-1 system states.

The study will also evaluate system performance for a range of sensitivity conditions as follows:

a. unavailability of critical generating units in the study area

b. unavailability of critical transmission lines or transformers

c. unavailability of capacitor banks

d. variations in load levels consistent with upper load forecast uncertainty

e. variations in load power factors

f. variations in load representation

g. variations in south-north and west-east transfer levels

The study shall take note of the studies performed by the American Electric Power Company and shared with FirstEnergy in 2002 and 2003, that indicated probable voltage collapse conditions for various generation/transmission and

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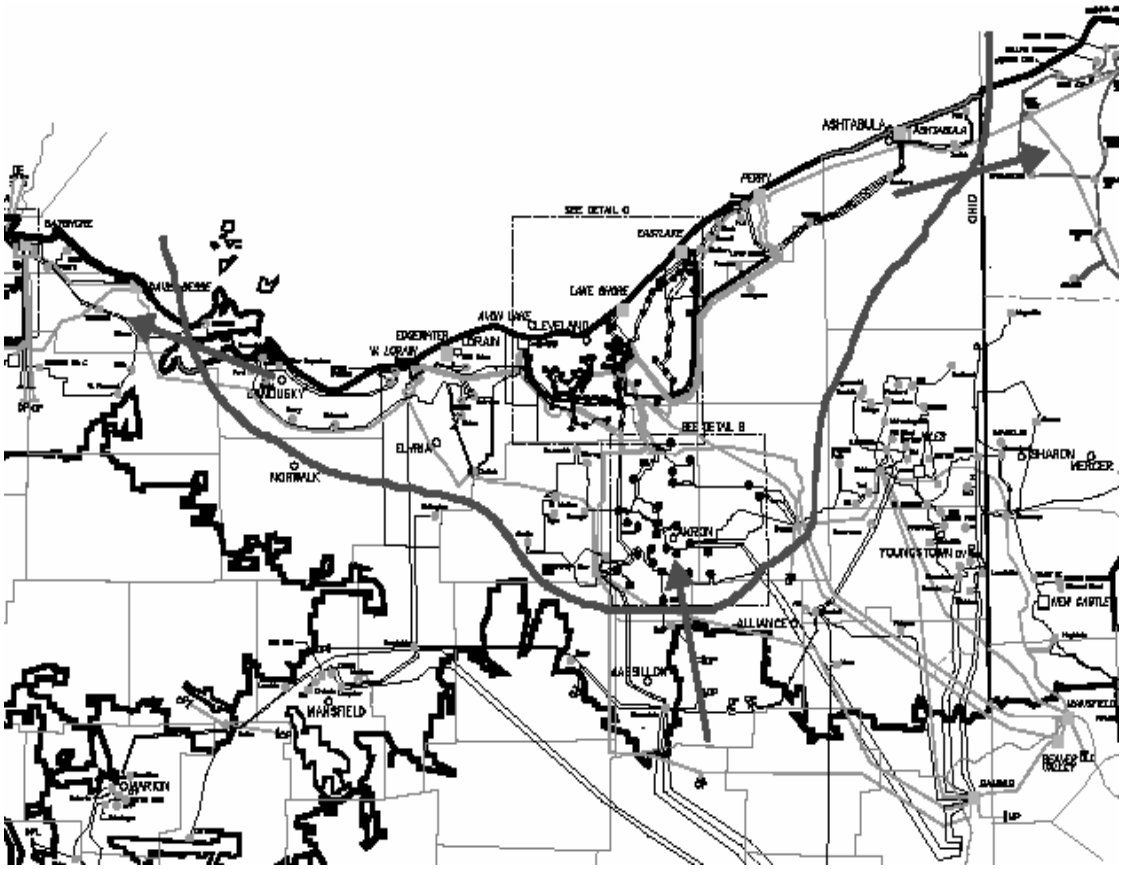
transmission/transmission double contingencies, and the vulnerability of the Star-South Canton line.

Modeling Requirements:

The interconnected system representing August 14, 2003 conditions has been assembled by the NERC modeling team. The modeling of the FirstEnergy system shall be further improved, if necessary, by the consultant with assistance from FirstEnergy and benchmarked to the actual conditions observed on August 14, 2003.

The study area is generally as defined in the attached diagram.



The following requirements must be met for the study area:

a. MW and MVAr demands are to be based on recorded demand and allocated at the appropriate locations at the 69 kV and sub 69 kV networks along with the 69 kV or sub 69 kV shunt compensation available that day. The latter must be explicitly modeled.

b. All 138/69/22 kV transformers are to be modeled with the appropriate automatic under-load tap changers. All steady-state load flows shall be run with these automatic under-load tap changers controlling the appropriate load supply buses to the desired voltage levels.

c. All 138 kV shunt capacitors that were available and deployed on August 14.

d. All MW and MVAr demands internal and external to the Cleveland-Akron area shall be represented as constant P and Q load model for the base case.

e. All generators in the FirstEnergy system, including merchant plants, shall be dispatched based on August 14 conditions and controlled to their respective scheduled voltages. The Q_{max} for the generators shall be based on the data used by FirstEnergy on August 14, 2003 modified where applicable based on actual capability determined from the recent NERC survey.

f. All generator step-up transformers are to be modeled explicitly with actual tap settings on August 14, 2003.

g. Lines are to be modeled using normal operating limits and the emergency ratings as specified on August 14, 2003.

The benchmarking test for acceptance shall be based on the following:

345 kV bus voltages at Harding, Chamberlain, Star, Hanna, Sammis, East Lake, Perry, Ashtabula, Juniper and Beaver must be within +/- 1 kV of the recorded voltages.

The line flows on the 345kV lines into Harding, Chamberlain, Juniper and Star must be within 5% of the recorded MVA flows.

Modeling for future years shall be based on the August 14 Base System, with appropriate changes provided by FirstEnergy, including but not limited to the following:

Increase the FirstEnergy's system load to the respective projected levels including FirstEnergy's upper load forecast uncertainties by scaling up the P and Q load and maintaining the same power factor, unless FirstEnergy data suggest that the power factor should be more pessimistic compared to that on August 14, 2003

All firm power transactions

Planned and committed facilities as contained in Commission filings.

Planning Criteria:

The assessments shall be based on the following criteria:

a. NERC Planning Standard 1A Categories A, B, C and D and NERC Planning Standard 1D

b. ECAR Document No. 1, "Reliability Criteria for Evaluation and Simulated Testing of the ECAR Bulk Power Supply Systems," revised July 27, 1998.

c. FirstEnergy's 2003 Form 715 on Bus Voltage Criteria (Normal voltage can range from 0.90 pu to 1.05 pu of nominal during on-peak and off-peak conditions. The minimum contingency voltage is 0.90 pu. The maximum pre-to-post contingency voltage change is 0.05 pu for 345 kV transmission substations and 0.10 pu for the remaining transmission substations. The maximum allowable peak-to-off is the same as that for the pre-to-post contingency voltage change.)

d. Voltage Criteria used by the Cleveland Electric Illuminating Company and the Toledo Edison Company in 1996, based on Direct Testimony of Stanley F. Szwed in proceeding #9603050347, as follows:

> The transmission system MVAr capacity be sufficient to allow the simultaneous outage of any two (2) generators without exceeding applicable voltage limits, loading equipment above emergency ratings, or interrupting or curtailing customer load.
>
> For both the 345 kV and 138 kV systems, normal system conditions allow for operation between -5% to +5% of nominal (131 kV to 145 kV @ 138 kV or 328 kV to 362 kV @ 345 kV). For emergency conditions, the 138 kV voltage levels are allowed to deviate as much as -8% of their scheduled levels.
>
> Centerior planning standards require normal system transmission voltages to maintain 95% of nominal, or 131 kV on the 138 kV transmission network and 328 kV on the 345 kV transmission network. As a result, Centerior requires transmission voltages to maintain 95% of nominal or higher following the outage of its two largest internal generating units provided that all other internal Cleveland Control Area generation has been brought on-line and all available internal reactive sources are in-service.

> Following good utility practice, Centerior considers the next most severe single contingency following the loss of the two largest internal generating units. The next contingency may involve either the next largest internal generating unit or most critical interconnection circuit. With the system within normal operating ranges, the next most critical contingency must not result in generating plant busses below 92% of nominal or other transmission load busses below 90% of nominal in order to prevent loss of additional generation or loss of customer load. Also, transmission circuit emergency thermal ratings should not be exceeded.

Deliverables:

The deliverables shall include a report with detailed documentation of assumptions, methodologies and results, including copies of power flow base-cases used. The findings and conclusions shall cover:

a. minimum acceptable voltages at critical buses

b. reactive power margin requirements

c. adequacy of operating and reactive power resources/reserves for summers of 2004-2008

d. maximum import capability into the Cleveland-Akron area

e. need and timing of new generation capacity, reactive resources, transmission facilities and special protection systems (including the use of under-voltage load shedding) required over the period 2004-2008

f. reliability must run units in the Cleveland-Akron Area.

g. indication of what actions may be beneficial to prevent system cascading for extreme events, such as a lightning storm taking out the Harding-Chamberlain, Hanna-Juniper, and Star-South Canton 345 kV lines before readjustment is possible.

Timeline:

FirstEnergy will issue the RFP for this study within 10 days of the date of issuance of this letter order, and will issue a contract for the work on or before January 30, 2004.

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FirstEnergy will submit to the Commission the identity of the contractor selected and FirstEnergy's justification (based on the criteria contained in Attachment B below) for the contractor's selection. FirstEnergy will pay all costs of the study.

The study and report are to be completed within 120 days of the date of issuance of this letter order, and the report is to be submitted to the Commission at that time. A copy of the report is to be submitted to the Public Utilities Commission of Ohio, NERC, the East Central Area Reliability Coordination Agreement, and the Midwest ISO, as well.

Attachment B: Study of the Capability of the Power System in Northeastern Ohio; Contractor Qualifications

The contractor selected to carry out the study must meet the following requirements:

Demonstrated knowledge and experience in carrying out EHV system planning studies in general and reactive power-voltage studies in particular

Good familiarity with NERC and ECAR planning criteria and performance standards

Proven experience with carrying out P-V, V-Q analyses to determine minimum acceptable voltages and reactive power margin requirements

Extensive knowledge of modeling large interconnected power systems and the performance of power system equipment including loads

Minimum of 10 years experience working for a large utility in the area of power system planning or operations