# ECAR 2001 Summer Assessment of Transmission System Performance (01-TSPP-3)

# DRAFT


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# INTRODUCTION

The ECAR Transmission System Performance Working Group (TSPWG), under the direction of the ECAR Transmission System Performance Panel (TSPP), semiannually assesses the ECAR bulk transmission system. The purpose of these assessments is to provide insight into the expected performance of the ECAR bulk transmission system under a wide range of system conditions for the upcoming peak load season.

This report presents an assessment of the performance of the ECAR bulk transmission system for the 2001 Summer period. It is based on analyses of extensive studies conducted by the TSPWG for various operating conditions. This report also contains results from studies conducted by the individual ECAR-member companies, and includes information regarding studies conducted by inter-regional study groups involving ECAR (such as MEN, MET, and VEM), which complement the ECAR study results contained in this report. This study uses ECAR Document No.1 as a guide to measure the ability of the transmission system to avoid uncontrolled power interruptions for use as a gauge in assessing overall system performance.

In order to stress the ECAR bulk transmission system, inter-regional and trans-regional power transfers were simulated. Contingencies were superimposed on these power transfers to determine the ability of the ECAR network to perform adequately under the expected seasonal peak load conditions. Linear power flow studies were used to examine these scenarios. Based on these simulations, assessments of the bulk transmission networks were performed. The specific generation outaged and the sources of replacement power used to model these transfers were not intended to reflect typical or expected generation availability or maintenance schedules. The tests were selected to stress the ECAR bulk transmission system and are not to be construed as being normal or expected operating conditions. In addition to the linear power flow analysis, AC analysis was also used to examine the voltage performance of those portions of the ECAR transmission network where potential voltage limitations have been identified through past operating experience or other ECAR assessments. The study results from these linear and AC simulations are contained in the main body of this report.

The Appendix contains information supporting the study results documented in this report. Key transmission facilities identified in this assessment, along with their TLR history, are listed in Appendix A. Facilities expected to be added,

removed, modified, or remain out of service during this study period, are listed in Appendix B. A tabulation of loads, losses, and interchange modeled in the ECAR base case are documented in Appendices C, D, and E. Transcriptions of the simulated flow patterns on the ECAR bulk transmission network and within ECAR-member systems, along with EHV facility ratings, are documented in Appendix F. A listing of the various generation dispatch scenarios used in this study are contained in Appendix G. Operating procedures cited in this report, which were developed by the ECAR members and are designed to relieve overloading problems that may result from interconnected system operation, are documented in Appendix H. A listing of the contingency outages simulated as part of this study are contained in Appendix I. Finally, Appendices J and K contain listings of definitions and abbreviations used throughout this report.

***The transfer capabilities in this report are not the Available Transfer Capabilities (ATC) or the Total Transfer Capabilities (TTC) required under FERC Orders 888 and 889 for posting on the OASIS nodes. While all of these values are based on next-contingency analysis, numerous differences in the study scopes and assumptions make valid comparisons impossible. These include different study periods, and use of Transmission Reliability Margin (TRM) and Capacity Benefit Margin (CBM) which may vary with the time horizon. In addition, as the transfer capabilities documented in this report are based on only one set of forecasted conditions for the period under study, they should not be considered absolute or optimal. They represent just one possible method of measuring and comparing the relative strength of the system from one season or study period to the next.***

## Geographic Location of Study Areas (Figure 1)

For the purposes of this study, the ECAR Region has been sub-divided into three study areas that coincide with the three security coordinator areas presently operating within ECAR. These three study areas are as follows:

- The Michigan (MECS) study area, composed of CONS and DECO/ITC.
- The Northeast (NE) study area, composed of AP, DLCO, and FE/ATSI.
- The South West (SW) study area, composed of AEP, BREC, CIN, DPL, EKPC, ENWC, ENWI, HE, IPL, LGEE, NIPS, OVEC, and SIGE.

A map showing the geographic relationship between these three study areas and the ECAR Region as a whole is presented as Figure 1 in this report.

## References

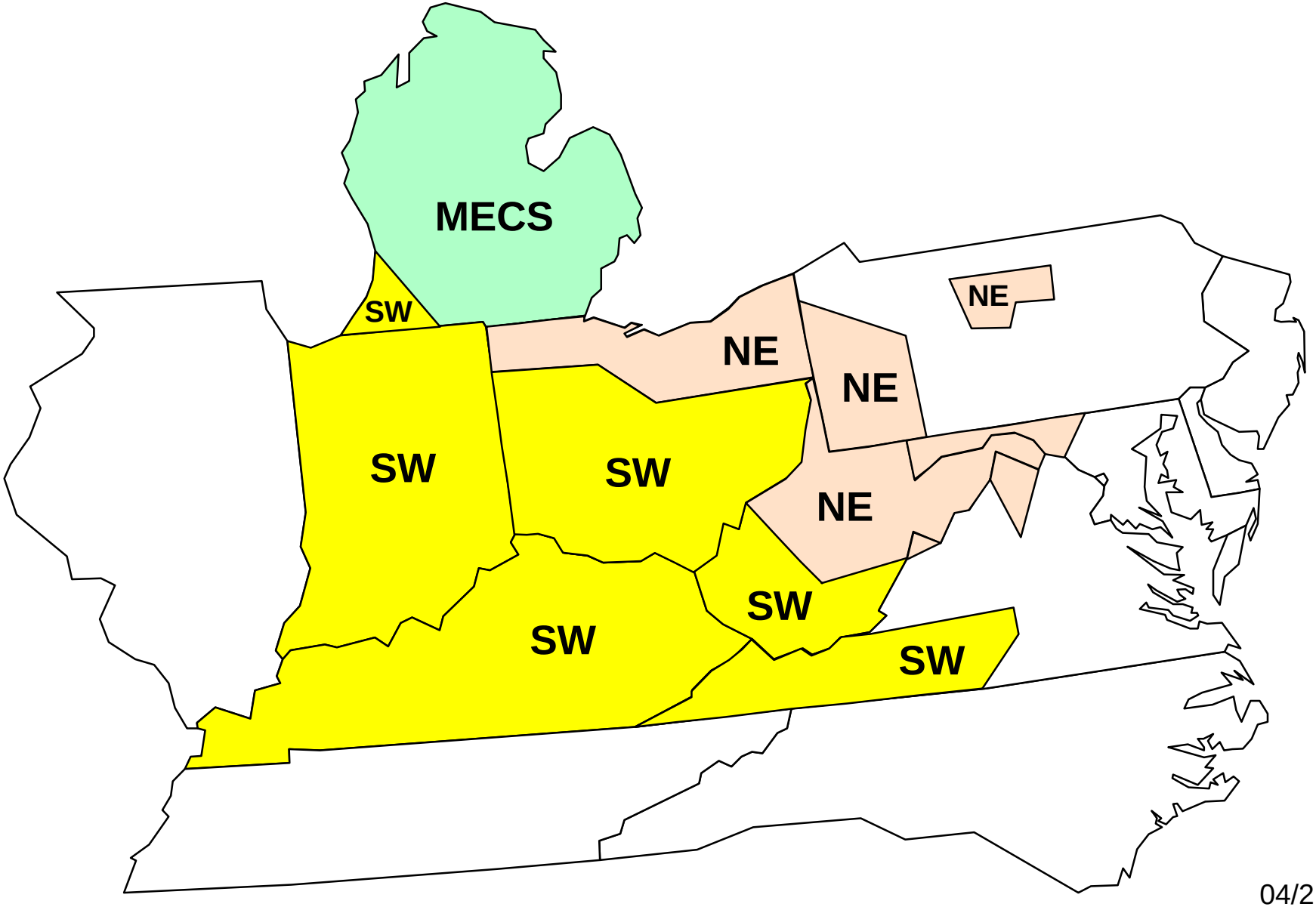
This ECAR transmission assessment report is augmented by the following regional and inter-regional reports and studies:

- ECAR 2001 Summer Facility Outage Notification Table (01-TSPP-2)
- ECAR 2001 Summer Assessment of Load and Capacity (01-GRP-33)
- MAAC-ECAR-NPCC (MEN) 2001 Summer Transmission Assessment
- MAIN 2001 Summer Transmission Assessment Study, Including MAIN-ECAR-TVA (MET), MAIN-MAPP-SPP (MMS), and MAIN-SERC West (MSw) Inter-regional Appraisals (Referred to in this report as the MET 2001 Summer Transmission Assessment)
- VACAR-AEP-Southern-TVA (VAST) 2001 Summer Operating Study
- VACAR-ECAR-MAAC (VEM) 2001 Summer Transmission Assessment
- Ontario-Michigan Transfer Capability Summer 2000

**Figure 1**

ECAR 2001 Summer Assessment of Transmission System Performance

Geographic Location of Study Areas

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# CONCLUSION AND OBSERVATIONS

## ECAR Regional Assessment

The bulk transmission systems in ECAR are expected to perform reliably under a wide range of conditions. However, there will be a greater need for the Security Coordinators and Transmission Operators to communicate and coordinate their actions to preserve the continued reliability of the ECAR systems. It is anticipated that the ECAR transmission systems could become constrained as a result of unit unavailability and/or economic transactions that have historically resulted in large unanticipated power flows within and through the ECAR systems. If these conditions occur again this summer, local operating procedures, as well as the NERC Transmission Loading Relief procedure, will need to be invoked in order to maintain transmission system security. As long as transmission limitations are identified and available operating procedures are implemented when required, the ECAR bulk transmission systems are anticipated to perform reliably. During times of heavy regional and inter-regional transfers, it will be essential that Security Coordinators and Transmission Operators have timely and adequate information on the sources and sinks of scheduled transfers in order to identify appropriate corrective actions. This report is designed to serve as a tool for the Security Coordinators and Transmission Operators, by providing them with an indication of where transmission problems are anticipated for the upcoming peak load season.

The most significant differences from 2000 Summer which are expected to impact ECAR transmission system performance during 2001 Summer, and which also serve to explain the changes in transfer capability between last summer and this summer, include: (1) the return-to-service of AEP's Cook Unit 1; (2) the mode of operation of the new Phase Angle Regulators (PAR) on the Michigan - Ontario interface; (3) the addition of approximately 4,600 MW of merchant and utility generation in ECAR; (4) the addition of the new Orange 765-138 kV (AEP) station on the Kammer - Marysville 765 kV (AEP) circuit; (5) the addition of the new Foster - Bath 345 kV (CIN-DPL) circuit; and (6) the 1,100 MW increase in ECAR load forecasted for 2001 Summer as compared to 2000 Summer.

The transfer capability levels documented in this report are primarily presented using the new concept of Total Import Capability. This is in addition to the traditional NITC/NTTC and FCITC/FCTTC quantities which are also presented in this report. Total Import Capability is basically the sum of the FCITC between

two areas of interest, plus the net of the power transfers modeled in the base case for the importing area, but from all directions, not just those associated with the exporting area. This provides for a better indication of the total amount of power that can be imported into an area of interest. The detailed definitions can be found Appendix J.

## Summary of ECAR Study Area Imports

The ability of the transmission system to support ECAR study area imports from adjacent Regions varies significantly. In this 2001 Summer assessment, under the projected peak load conditions modeled in the ECAR primary (E100) base case, Total Import Capabilities ranged from 2,950 MW into Kentucky, to 6,250 MW into the Northeast (NE) study area. Under transfer-bias conditions, Total Import Capabilities ranged from zero to 5,350 MW. Of the twenty-four ECAR study area import scenarios examined in this 2001 Summer assessment, thirteen had a higher transfer capability as compared to 2000 Summer, two had a lower transfer capability, and nine were either unchanged or not analyzed in the 2000 Summer assessment. The specific ECAR import transfer capability levels varied as a function of transfer direction, other transfer activity, and the specific limiting and outaged facilities that were considered during the study. Based on an analysis of both thermal and voltage limitations, the most limiting facilities found in this assessment, included:

- Dumont 765-345 kV (AEP) Transformer
- Muskingum River - Ohio Central 345 kV (AEP) Circuit
- Queenston Flow West (QFW) (HONI) Interface
- Michigan - Ontario (L4D / L51D / B3N / J5D) Interface
- Norris - La Follette 161 kV (TVA) Circuit
- Twin Branch - Argenta 345 kV (AEP-CONS) Circuit
- Cumberland - Davidson 500 kV (TVA) Circuit
- South Canton 765-345 kV (AEP) Transformer
- Gallagher 230-138 kV (CIN) Transformer

- Grahamville - South Paducah - Livingston 161 kV (LGEE) Path

## Summary of MAAC Imports

The ability of the transmission system to support MAAC imports from or through ECAR will be somewhat more restrictive this year. In this 2001 Summer assessment, under the projected peak load conditions modeled in the ECAR primary (E100) base case, Total Import Capabilities were around 1,500 MW. Under transfer-bias conditions, Total Import Capabilities were also around 1,500 MW. Of the three MAAC import scenarios examined in this 2001 Summer assessment, none had a higher transfer capability as compared to 2000 Summer, one had a lower transfer capability, and two were either unchanged or not analyzed in the 2000 Summer assessment. The specific MAAC import transfer capability levels varied as a function of transfer direction, other transfer activity, and the specific limiting and outaged facilities that were considered during the study. Based on an analysis of both thermal and voltage limitations, the most limiting facility found in this assessment, was:

- Hatfield - Black Oak 500 kV (AP) Circuit -- Voltage Limit

## Summary of VACAR Imports

The ability of the transmission system to support VACAR imports from or through ECAR will be somewhat more restrictive this year. In this 2001 Summer assessment, under the projected peak load conditions modeled in the ECAR primary (E100) base case, Total Import Capabilities were around 2,500 MW. Under transfer-bias conditions, Total Import Capabilities ranged from zero to 800 MW. Of the four VACAR import scenarios examined in this 2001 Summer assessment, one had a higher transfer capability as compared to 2000 Summer, one had a lower transfer capability, and two were either unchanged or not analyzed in the 2000 Summer assessment. The specific VACAR import transfer capability levels varied as a function of transfer direction, other transfer activity, and the specific limiting and outaged facilities that were considered during the study. Based on an analysis of both thermal and voltage limitations, the most limiting facilities found in this assessment, included:

- Hatfield - Black Oak 500 kV (AP) Circuit -- Voltage Limit

- Cumberland - Davidson 500 kV (TVA) Circuit

## Summary of TVA Imports

The ability of the transmission system to support TVA imports from or through ECAR varies significantly. In this 2001 Summer assessment, under the projected peak load conditions modeled in the ECAR primary (E100) base case, Total Import Capabilities ranged from 2,550 MW to over 3,350 MW. Under transfer-bias conditions, Total Import Capabilities ranged from 3,000 MW to 4,700 MW (1,200 MW to 3,000 MW if the 2,000 MW transfer-bias to Southern from the E104 study base case is not included in the calculation of Total Import Capability for TVA). Of the seven TVA import scenarios examined in this 2001 Summer assessment, two had a higher transfer capability as compared to 2000 Summer, three had a lower transfer capability, and two were not analyzed in the 2000 Summer assessment. The specific TVA import transfer capability levels varied as a function of transfer direction, other transfer activity, and the specific limiting and outaged facilities that were considered during the study. Based on an analysis of both thermal and voltage limitations, the most limiting facilities found in this assessment, included:

- Clinch River - Spring Creek - North Bristol 138 kV (AEP) Path
- Kanawha River - Matt Funk 345 kV (AEP) Circuit -- Voltage Limit

## Summary of MAIN Imports

The ability of the transmission system to support MAIN imports from or through ECAR varies significantly. In this 2001 Summer assessment, under the projected peak load conditions modeled in the ECAR primary (E100) base case, Total Import Capabilities ranged from 3,550 MW to 4,700 MW. Under transfer-bias conditions, Total Import Capabilities ranged from zero 5,550 MW. Of the sixteen MAIN import scenarios examined in this 2001 Summer assessment, six had a higher transfer capability as compared to 2000 Summer, three had a lower transfer capability, and seven were either unchanged or not analyzed in the 2000 Summer assessment. The specific MAIN import transfer capability levels varied as a function of transfer direction, other transfer activity, and the specific limiting and outaged facilities that were considered during the study. Based on an analysis of both thermal and voltage limitations, the most limiting facilities found in this assessment, included:

- Breed - Casey 345 kV (AEP-AMRN) Circuit

- Sidney 345-138 kV (IP) Transformer
- Queenston Flow West (QFW) (HONI) Interface
- Dumont 765-345 kV (AEP) Transformer
- East Danville - Danville 138 kV (AEP) Circuit
- Summer Shade - Summer Shade Tap 161 kV (TVA-EKPC) Circuit

## Summary of Significant Observations

In addition to the specific observations documented above, this section of the report summarizes the most significant observations from this ECAR transmission assessment, from studies conducted by the individual ECAR-member companies, either individually or jointly with other companies, and from past operating experiences.

- The return-to-service of AEP's Cook Unit 1 (1000 MW connected at 345 kV) is expected to reduce loadings on the Dumont and Cook 765-345 kV (AEP) transformers, increasing transfer capability to the north and west.
- The Michigan - Ontario interface and the Queenston Flow West (QFW) interface in Ontario have been susceptible to large parallel flows and Transmission Loading Relief (TLR) curtailments during past summers. The scheduled installation (by mid-August) of the remaining (L4D) Phase Angle Regulating (PAR) transformer on the Michigan - Ontario interface, and subsequent utilization of all four PARs on this interface, will mitigate these conditions by normally operating these PARs to reduce unscheduled flows from Ontario into Michigan. This operating mode, however, increases loadings on other critical ECAR facilities, such as the Dumont 765-345 kV (AEP) and Cook 765-345 kV (AEP) transformers, by redirecting flows that would otherwise flow around the north end of Lake Erie into Michigan. This can reduce transfer capability to the north and west. The Lake Erie Security Process Working Group has developed an overall operating strategy for coordinated operation of all control devices in the area, including the new PARs on the Michigan - Ontario interface.
- Several transmission additions, modifications, and abnormal conditions within ECAR are expected for this summer. The most significant include the addition

of the new Orange 765-138 kV (AEP) station on the Kammer - Marysville 765 kV (AEP) circuit, and the addition of the new Foster - Bath 345 kV (CIN-DPL) circuit. Details on all facility changes and the impact they will have on ECAR bulk transmission system performance can be found under the Individual Company Assessments section of this report, and in Appendix B.

- The installation of over 4,500 MW of new merchant and utility generation is expected to be in place for 2001 Summer within the ECAR Region. For comparison, over 3,000 MW were installed for 2000 Summer. Of this amount, 1,930 MW are scheduled to be installed in AEP, 540 MW in DECO, 480 MW in DPL, 445 MW in CONS, 425 MW in FE, 295 MW in LGEE, 183 MW in CIN, 88 MW in AP, 75 MW in IPL, and 58 MW in BREC. Higher facility loadings may result from these installations. Details can be found in Table B-1, under Appendix B.

- Central Ohio continues to be susceptible to voltage drops for the loss of the Marysville 765-345 kV (AEP) transformer concurrent with certain generation outages at the Conesville (AEP) generating plant. These concerns are heightened for outages of the Cook (AEP) generating units, by heavy transfers to the north and west, and by the mode of operation of the Phase Angle Regulators (PAR) on the Michigan - Ontario interface. Voltage performance in 2001 Summer, however, is expected to significantly improve from 2000 Summer due to the scheduled addition of the new Orange 765-138 kV (AEP) station on the Kammer - Marysville 765 kV (AEP) circuit. Details can be found under the Voltage Analysis section (refer to Figure 4.2).

- The Reliability Coordination Plan (RCP) methodology will continue to be used by Allegheny Power to determine limitations on the AP transmission system, which in conjunction with the NERC TLR procedure, will be used to freeze or curtail west-to-east transfers to ensure that adequate system reliability is maintained in portions of ECAR, MAAC, and VACAR. More limiting voltage constraints are expected this summer due to higher loads in Allegheny Power.

- AEP will continue to use the Southern Transmission Emergency Procedures (STEP) to maximize the loadability of the critical Kanawha River - Matt Funk 345 kV (AEP) circuit and reduce the reliability risks of potential widespread power interruptions in the southeastern portion of ECAR. More limiting voltage constraints are expected this summer due to higher loads in the area.

- The Kentucky transmission system has experienced numerous overload and voltage problems during shoulder peak periods with high north-to-south transfers. TLRs have been called in an attempt to control the north-to-south flows through Kentucky, and relieve overloading on area facilities such as the Blue Lick 345-161 kV (LGEE) transformer, the Paddy's Run - Summershade 161 kV (LGEE-TVA) circuit, the New Hardinsburg 138-161 kV (BREC) transformer, and the New Hardinsburg - Paradise 161 kV (BREC-TVA) circuit. However, due to the low response factors, sufficient relief has sometimes not been obtained via the TLR process and the affected companies have been forced to redispatch generation and open 161 kV transmission interconnection facilities to eliminate the problems. In addition, LGEE has experienced depressed voltages in the central Kentucky area and had to dispatch combustion turbines at the Brown CT site to provide reactive and voltage support (refer to Figure 4.8 in the Voltage Analysis section of this report). Problems due to north to south flow are anticipated this summer and similar responses will be required unless the TLR process is modified to recognize and respond to the problem.

- In addition to the voltage concerns noted above, the voltage performance of other portions of the ECAR transmission network, where potential voltage limitations have been identified through past operating experience or other ECAR assessments, is also documented in this report. Details can be found in the Voltage Analysis section of this report.

## Summary of Transfer Capabilities (Table 1)

Table 1 summarizes the study results from this assessment (detailed study results are documented in Table 2). Fifty-four transfer scenarios, representing the most significant and meaningful combinations of approximately twenty-two transfer patterns and eight base case conditions, were analyzed. The eight base cases were comprised of the primary base case, developed from the NERC/MMWG 2001 Summer base case, and seven study base cases which were developed to model conditions which would further stress the ECAR bulk transmission network.

The first three study base cases (E101a / E101b / E101c) reflected the same 4,000 MW east-to-west transfer bias, but different operating settings for the four Phase Angle Regulators (PAR) on the Michigan - Ontario interface. The E101a study base case reflected minimum-fixed-angle PAR settings which resulted in a 2,430 MW flow from Ontario to Michigan, the E101b study base case reflected

zero-fixed-angle PAR settings which resulted in a 1,890 MW flow from Ontario to Michigan, and the E101c study base case reflected maximum-fixed-angle PAR settings which resulted in a 1,220 MW (most restrictive) flow from Ontario to Michigan. The fourth study base case (E102) reflected a 4,000 MW west-to-east transfer bias. The next two study base cases (E103a / E103b) reflected a 4,000 MW south-to-north transfer bias, except that in first (E103a) base case, Cook Unit 1 (AEP) was outaged as part of the transfer bias, while in the second (E103b) base case, Davis-Besse Unit 1 (FE) was outaged as part of the transfer bias. The final study base case (E104) reflected a 4,000 MW north-to-south transfer bias. The total ECAR bus load for 2001 Summer modeled in all eight base cases was 100,783 MW, which is 1.1% higher than the 99,675 MW of ECAR bus load modeled in the 2000 Summer base cases.

The transfer capabilities summarized in Table 1 are the Total Import Capability values for the 2001 Summer assessment (shown to the left of the slash), with those from the 2000 Summer assessment (shown to the right of the slash) also included for comparison. The transfer pattern and base case combinations that were not considered significant for this analysis, appear in the table as blank entries. Although a number of transfers were considered in this seasonal assessment in an effort to stress the ECAR transmission network, it is impossible to anticipate all operating possibilities, and thus, this report should only be used as a guide for conditions expected during the upcoming peak load season.

The study results also reflect selected non-ECAR outages and limitations. These non-ECAR facilities were added in an attempt to provide consistency with other regional reports and to capture elements that may be more restrictive to transfers of interest to ECAR. However, additional limiting elements not reported in this study may exist in other Regions for various transfers from, to, or through ECAR. Refer to the MEN, MET, and VEM transmission assessments for additional insight into these transmission limitations in adjacent Regions.

## Bubble Diagram of Transfer Capabilities (Figure 2)

The primary study results from this assessment are also summarized in the form of three bubble diagrams. Figure 2.1 presents the study results for ECAR exports, Figure 2.2 presents the results associated with ECAR imports, and Figure 2.3 presents the results for the trans-regional transfers considered in this assessment under primary (E100) base case conditions. The study results are presented as Total Import Capabilities, as defined in Appendix J.

## Summary of Operating Procedures

Operating procedures have been developed by ECAR-member systems to relieve overloading problems that may result from interconnected system operation. Those operating procedures, which are available to allow for improvement of transfer capabilities in specific areas of the ECAR bulk transmission network, are described in Appendix H. One of these procedures, the Ridgeway - Dan River 138 kV (AEP-DUKE) operating procedure, was implemented in the primary base case, which served as the starting point for this seasonal transmission assessment, due to expected high loadings on the Ridgeway - Dan River 138 kV (AEP-DUKE) circuit during peak load conditions.

## Transmission Loading Relief (TLR) Procedure

The NERC Transmission Loading Relief (TLR) Procedure is a step-by-step procedure developed by the NERC Security Coordinator Subcommittee to maintain network security by avoiding or relieving transmission overloads. The TLR identifies the actual transactions (by priority and use) which cause Operating Security Limit violations. The TLR considers the actual paths over which transactions are flowing, not their contract paths, to determine which transactions to freeze or curtail.

Due to the significance of this operating procedure, Table A-1 (in Appendix A) contains the TLR history of all ECAR and selected non-ECAR transmission facilities which had a TLR Level 2 or above declared during the most recent eight seasonal quarters. Table A-1 also lists all transfer limiting facilities identified in the 2001 and 2000 Summer transmission assessments. By presenting these two pieces of information together, comparison can be made between limiting facilities encountered in actual operation and those identified in the seasonal assessments.

Based on the information presented in Table A-1, the following ECAR facilities had at least one TLR Level 2 or above (total number of TLRs is shown on the right) declared during 2000 Summer, and were also identified as limiting facilities in this 2001 Summer assessment under the transfer capability analysis documented in Table 2.

- Kanawha - Matt Funk 345 kV (AEP) Circuit (Voltage Limit) (35)
- New Hardinsburg 161-138 kV (BREC) Transformer (10)

- Gallagher 230-138 kV (CIN) Transformer (9)
- Wylie Ridge #1 or #2 500-345 kV (AP) Transformer (7)
- Bedington - Doubs 500 kV (AP) Circuit (Voltage Limit) (5)
- Black Oak - Bedington 500 kV (AP) Circuit (4)
- Ghent - West Lexington - Brown 345 kV (LGEE) (4)
- Cloverport - Newtonville 138 kV (LGEE-SIGE) Circuit (4)
- Pruntytown - Mount Storm 500 kV (AP-VP) Circuit (2)
- Gallagher - Paddys West 138 kV (CIN-LGEE) Circuit (2)
- Cook 765-345 kV (AEP) Transformer (1)
- Dumont 765-345 kV (AEP) Transformer (1)
- Doubs #1 or #2 or #3 or #4 500-230 kV (AP) Transformer (1)
- South Canton - Star 345 kV (AEP-FE) Circuit (1)

The following ECAR facilities had at least one TLR (Level 2 or above) declared during 2000 Summer, but were not identified as limiting facilities in this 2001 Summer transmission assessment under the transfer capability analysis documented in Table 2. However, they were identified as facilities which might exceed their thermal emergency ratings under the base case contingency overload analysis documented in Table 3.

- Blue Lick 345-161 kV or Blue Lick - Bullitt Co. 161 kV (LGEE-EKPC) (53)

The following ECAR facilities had at least one TLR (Level 2 or above) declared during 2000 Summer, but were not identified as limiting facilities in this 2001 Summer transmission assessment under neither the transfer capability analysis documented in Table 2 or the base case contingency overload analysis documented in Table 3. These facilities have clearly documented explanations in Table A-1 as to why they did not appear as limiting facilities in this 2001 Summer assessment.

- Paddys Run - Summershade 161 kV (LGEE-TVA) Circuit (37)

- Trimble County - Centerfield 138 kV (LGEE)  (11)
- Speed - Northside 138 kV (CIN-LGEE) Circuit  (3)
- Coleman - National Aluminum 161 kV (BREC) Circuit  (2)
- Foster - Sugarcreek 345 kV (CIN-DPL) Circuit  (1)
- McCracken - Marshall 161 kV (BREC-TVA) Circuit  (1)
- Henderson County 138-161 kV (SIGE-BREC) Transformer  (1)
- Oakland City - Toyota 138 kV (CIN-SIGE) Circuit  (1)

Date: 04/18/01

**Table 1**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Summary of Study Results from Transfer Capability Analysis**



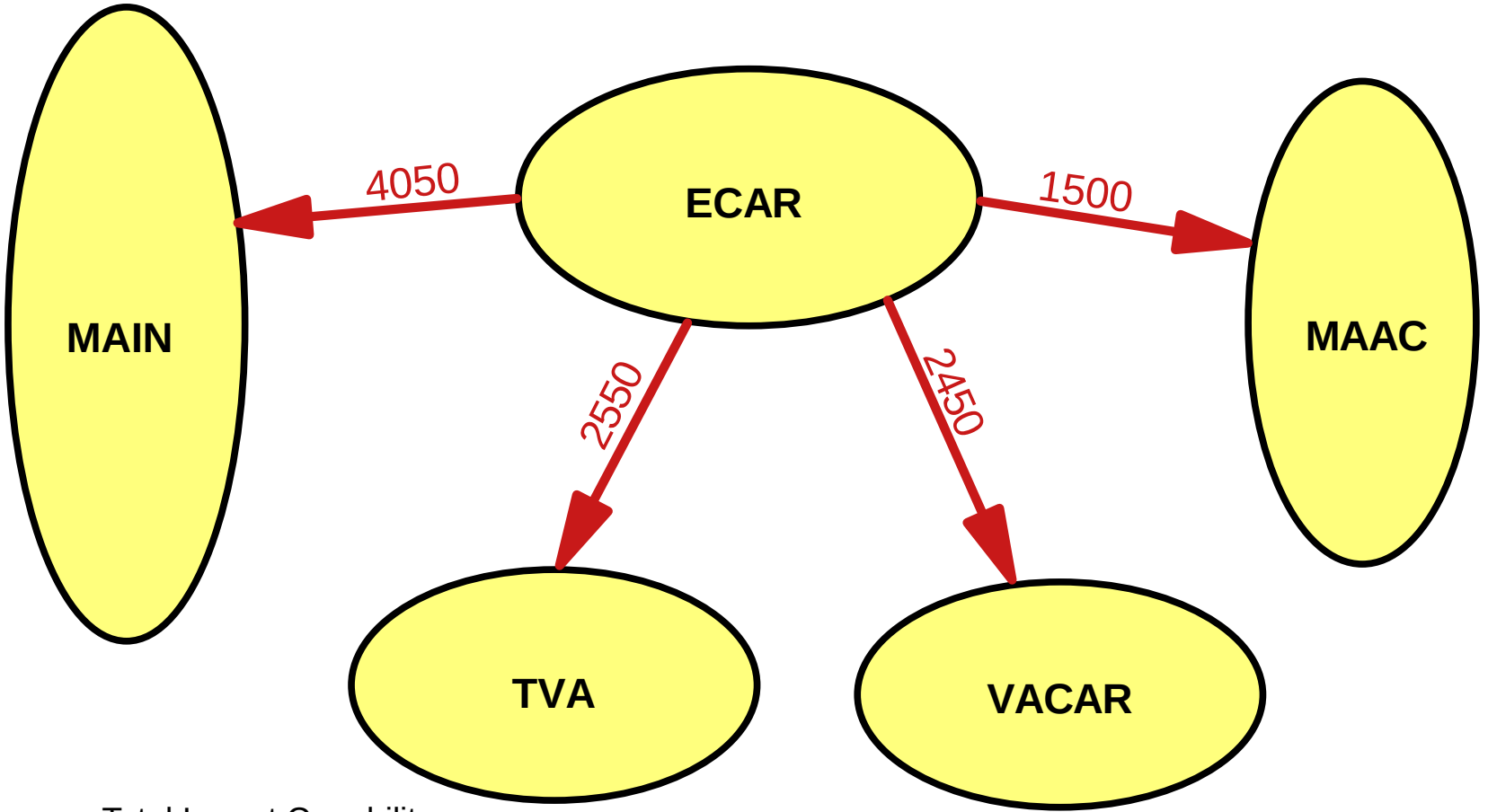
| TYPE OF TRANSFER | STUDY AREA | Transfer Scenarios by Study Area<br>MECS = 12<br>NE = 12<br>SW = 30<br>Total = 54<br>TRANSFER DIRECTION | E100<br>Base Case With<br>No Transfer Bias<br>OH to MECS PARs<br>Fixed @ 600 MW<br>Total Import Capability<br>( 2001S / 2000S ) | E101a<br>Base Case With<br>East to West<br>4000 MW Bias<br>OH to MECS PARs<br>Fixed @ Min Angle<br>Total Import Capability<br>( 2001S / 2000S ) | E101b<br>Base Case With<br>East to West<br>4000 MW Bias<br>OH to MECS PARs<br>Fixed @ Zero Angle<br>Total Import Capability<br>( 2001S / 2000S ) | E101c<br>Base Case With<br>East to West<br>4000 MW Bias<br>OH to MECS PARs<br>Fixed @ Max Angle<br>Total Import Capability<br>( 2001S / 2000S ) | E102<br>Base Case With<br>West to East<br>4000 MW Bias<br>OH to MECS PARs<br>Fixed @ 600 MW<br>Total Import Capability<br>( 2001S / 2000S ) | E103a<br>Base Case With<br>South to North<br>4000 MW Bias<br>OH to MECS PARs<br>Fixed @ 600 MW<br>Total Import Capability<br>( 2001S / 2000S ) | E103b<br>Base Case With<br>South to North<br>4000 MW Bias<br>OH to MECS PARs<br>Fixed @ 600 MW<br>Total Import Capability<br>( 2001S / 2000S ) | E104<br>Base Case With<br>North to South<br>4000 MW Bias<br>OH to MECS PARs<br>Fixed @ Min Angle<br>Total Import Capability<br>( 2001S / 2000S ) |
|---|---|---|---|---|---|---|---|---|---|---|
| ECAR EXPORTS | MECS | ECAR to IMO | **Winter Only** | | | | | | | |
| | NE | ECAR to MAAC | **1500 / 2100** | | | | | | | |
| | NE | ECAR to VACAR | **2450 / 3400** | | | | | | | |
| | SW | ECAR to TVA | **2550 / 1400** | | | | | | | **3200 / 3650** |
| | SW | ECAR to MAIN | **4050 / 4000** | | | | | **5400 / 4750** | **5550 / 4750** | |
| ECAR IMPORTS | MECS | MAAC to MECS | **3200 / -----** | | | | | **1650 / 1600** | **2650 / 1600** | |
| | MECS | VACAR to MECS | **3200 / -----** | **(*) 0 / 2650** | **3450 / 2550** | **3200 / 1900** | | | | |
| | MECS | TVA to MECS | **3100 / -----** | | | | | | | |
| | MECS | MAIN to MECS | **4200 / -----** | | | | **1050 / (*) 0** | **1400 / 1300** | **2750 / 1300** | |
| | NE | TVA to NE | **4950 / -----** | **5050 / 4450** | | | **5350 / 3700** | | | |
| | NE | MAIN to NE | **6250 / -----** | | | | **2700 / 1450** | | | |
| | SW | MAIN to Kentucky | **2950 / -----** | | | | **1400 / 650** | | | **(*) 0 / (*) 0** |
| | SW | MAAC to Indiana | **+ 3800 / -----** | **+ 3800 / 0** | | | | **(*) 0 / (*) 0** | **(*) 0 / (*) 0** | |
| TRANS-REGIONAL | MECS | TVA to IMO | **Winter Only** | | | | | | | |
| | MECS | MAIN to IMO | **Winter Only** | | | | | | | |
| | NE | MAIN to MAAC | **1550 / -----** | | | | **1450 / 1400** | | | |
| | NE | MAIN to VACAR | **2500 / -----** | | | | **800 / 750** | | | **(*) 0 / (*) 0** |
| | SW | MAAC to TVA | **2600 / -----** | | | | | | | **3250 / 4200** |
| | SW | MAIN to TVA | **+ 3350 / -----** | | | | **3000 / 2600** | | | **4700 / 5200** |
| | SW | MAAC to MAIN | **4600 / -----** | **(*) 0 / 3650** | **3600 / 3650** | **3550 / 1200** | | **(*) 0 / (*) 0** | **2800 / (*) 0** | |
| | SW | VACAR to MAIN | **4700 / -----** | **3700 / 3650** | **3650 / 3650** | **3550 / 1500** | | | | |
| | SW | TVA to MAIN | **3550 / -----** | | | | | **1400 / 2700** | **1500 / 2700** | |

**(*) Overloaded facilities were found under transfer-bias conditions without any additional transfers.**

**Figure 2.1**

ECAR 2001 Summer Assessment of Transmission System Performance

ECAR Exports Under Primary (E100) Base Case



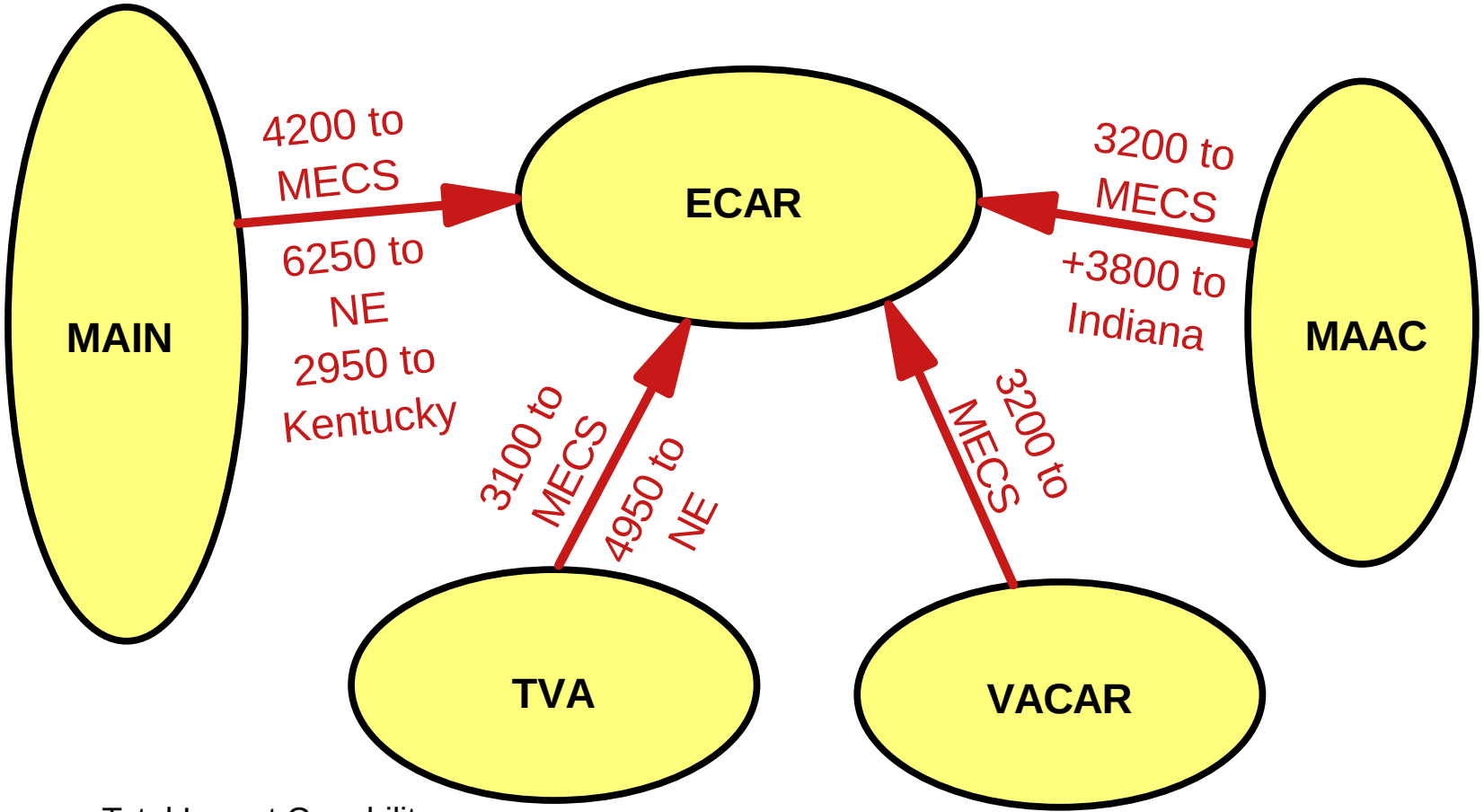

Values are Total Import Capability levels as defined in Appendix J

04/21/00

**Figure 2.2**

ECAR 2001 Summer Assessment of Transmission System Performance

ECAR Imports Under Primary (E100) Base Case




Values are Total Import Capability levels as defined in Appendix J

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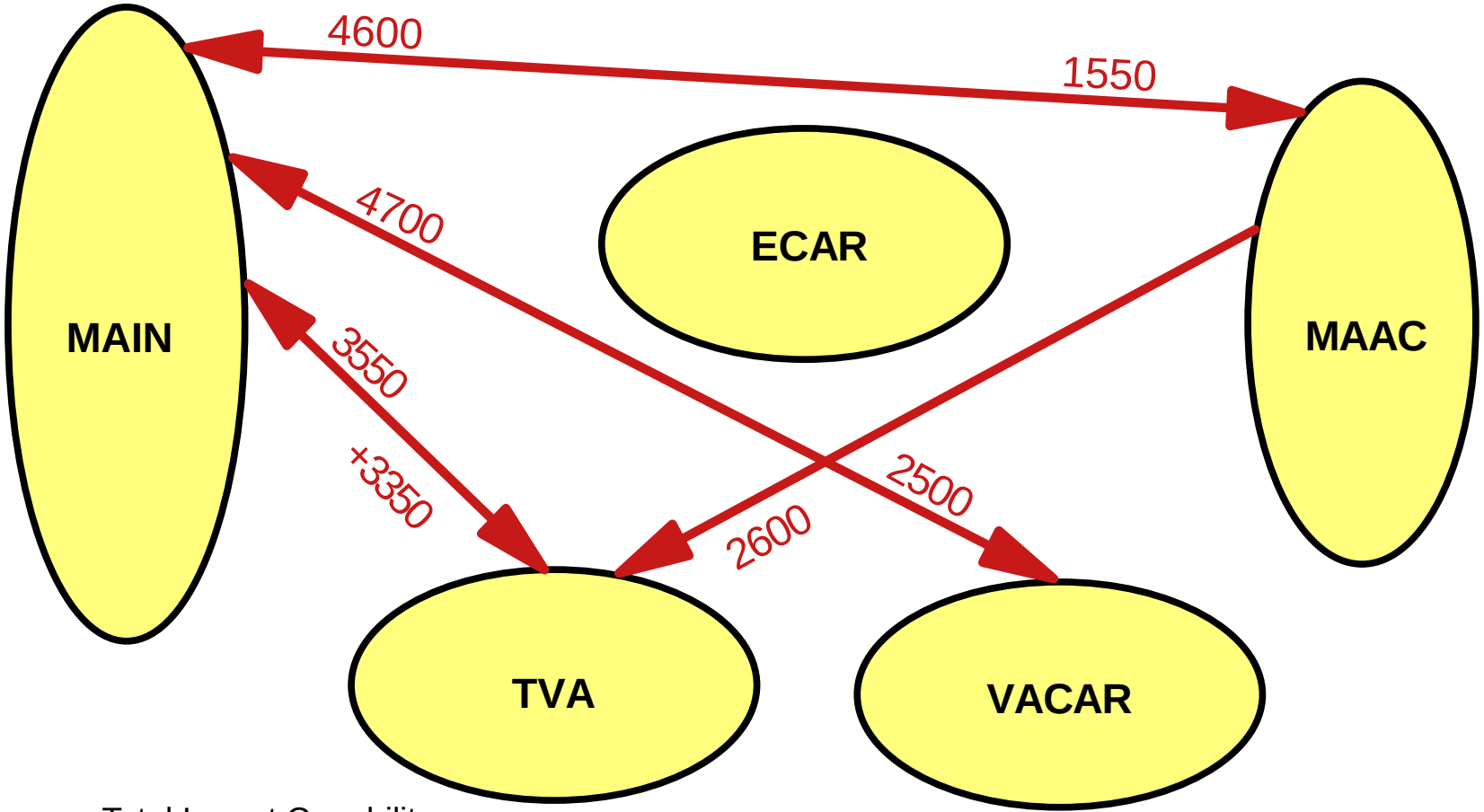
**Figure 2.3**

ECAR 2001 Summer Assessment of Transmission System Performance

Trans-Regional Transfers Under Primary (E100) Base Case




Values are Total Import Capability levels as defined in Appendix J

04/21/00

# STUDY RESULTS -- Michigan (MECS) Study Area

## Introduction

The MECS study area of ECAR is one control area that includes Consumers Energy, Detroit Edison, and several municipals and cooperatives. It is also one of three security coordinators within ECAR. Consumers Energy and Detroit Edison have projected peak demands of 8,166 MW and 11,399 MW, respectively, as modeled in the ECAR primary base case (E100). Edison Sault became part of the WEC control area in the MAIN reliability region beginning January 2001. Edison Sault with a peak demand of 130 MW was modeled in the MECS control area for this assessment and included a 20 MW transfer from WEC. The municipals and cooperatives have a reduced representation modeling 809 MW of load. Therefore, the total summer peak demand modeled for the MECS study area is 20,504 MW. This is 635 MW higher than the 19,879 MW modeled in the 2000 Summer study. In addition, about 1,000 MW of generation is scheduled to be added for the 2001 Summer period (refer to Appendix B). With 20,196 MW of dispatched generation and an import of 308 MW supporting this demand, there is approximately 1,730 MW of non-dispatched generation available (before forced and scheduled unit outages).

## General Observations

System additions that are presently under construction for 2001 Summer include a new looped 230 kV line into the DIG merchant plant, a new 345-120 kV autotransformer at the Bismarck station, a new station called Blackfoot that breaks up the 3-ended Belle River - Madrid - Pontiac 345 kV line, a looped 345 kV line into the Oneida station, and a looped 345 kV line into Roosevelt with a radial line to the Zeeland merchant plant. Also, the Phase Angle Regulating (PAR) transformer on the L4D interconnection between Detroit Edison and Hydro One is scheduled to be in service by mid-August. PAR transformers were installed last year on the B3N and L51D interconnections, along with a new 345-230 kV autotransformer on the L51D interconnection.

Even with these system improvements, study results indicate that the MECS study area may experience difficult operating conditions during the 2001 Summer season. Potential overloads were observed under single contingency conditions for total simultaneous imports into MECS above 3,100 MW. MECS imports will

continue to be generally limited by the Dumont and Cook 765-345 kV (AEP) transformers. The restart of AEP's Cook Unit 1 (connected at 345 kV) has improved the import capability into MECS, as compared to the 2000 Summer Study, by relieving the loadings on these transformers.

There are lower limits for MECS imports if there are heavy interregional transfers or critical unit outages. The Michigan - Ontario Phase Angle Regulating (PAR) transformers can be operated to improve transfer capability. Internal limits in MECS appear only under heavy interregional transfers and with multiple units inside of MECS being out of service. Also, with the PARs at their minimum angle, elements inside of Ontario and on the Michigan - Ontario interface may limit MECS imports.

Of the twelve transfer scenarios examined as part of the MECS study area assessment, six had a higher transfer capability as compared to 2000 Summer, one had a lower transfer capability, and five were either unchanged or not analyzed as part of the 2000 Summer assessment. In addition to the return-to-service of Cook Unit 1, the operation of the PARs, and the facility modifications noted above, other factors contributing to the change in transfer capability, include the approximately 1,100 MW increase in ECAR load modeled for 2001 Summer, and the addition of over 4,600 MW of merchant and utility generation in ECAR.

Additional information relating to MECS import limits may be found in the MEN, MET, and VEM, 2001 Summer Transmission Assessments, and the Ontario-Michigan Transfer Capability Review for Summer 2000.

## MECS Imports

The MECS study area is summer peaking. Imports into MECS and transmission loadings during the summer season are significantly higher than during the winter period. Transfers into the MECS study area from MAAC, VACAR, TVA, or MAIN were analyzed using the ECAR primary (E100) peak load base case. As shown in Tables 1 & 2, the MECS Total Import Capability ranges from 3,100 MW to 4,200 MW. Transfers from MAAC or VACAR were limited to 3,200 MW by the Dumont 765-345 kV (AEP) transformer for an outage of the Cook 765-345 kV (AEP) transformer. Transfers from TVA were limited to 3,100 MW by the Norris - La Follette 161 kV (TVA) circuit for an outage of the Volunteer - Phipps Bend 500 kV (TVA) circuit. Transfers from MAIN were limited to 4,200 MW by

the Twin Branch - Argenta 345 kV (AEP-CONS) circuit for an outage of the Cook - Palisades 345 kV (AEP-CONS) double-circuit tower.

**East-to-West Transfer Bias:** MECS imports from VACAR were analyzed under the three E101 study base cases, which reflect a 4,000 MW east-to-west transfer bias. Transfer capability was determined with different modes of operation for the PARs on the Michigan - Ontario interface. This study showed a range of Total Import Capability of -600 MW to 3,450 MW. The E101a study base case reflects a maximum flow of 2,430 MW from Ontario to Michigan. Although the Total Import Capability as limited by the Dumont 765-345 kV transformer increases to 4,400 MW, the Queenston Flow West (QFW) and Michigan - Ontario interfaces become more limiting. This is a condition that MECS does not anticipate operating in, as this scenario models the holding of fixed minimum angles on the PARs, when in reality it is anticipated that if the system conditions were those modeled in this case, the PARs would most likely be used to retard flow not contracted through Ontario. The E101b study base case reflects zero-fixed-angle PAR settings, which resulted in 1,890 MW flow from Ontario to Michigan. For this condition the Total Import Capability was limited to 3,450 MW by the pre-contingency rating of the Lambton - Saint Clair (L4D) 345 kV (DECO-HONI) line. To achieve this limit, operating procedures were modeled to relieve potential overloads on the Michigan - Ontario interface. Again, the PAR on the L4D circuit could be operated to resolve this limit. The E101c study base case reflects the most restrictive flow from Ontario to Michigan of 1,220 MW. The Total Import Capability was limited to 3,200 MW by the Dumont 765-345 kV (AEP) transformer for an outage of the Cook 765-345 kV (AEP) transformer.

**West-to-East Transfer Bias:** MECS imports from MAIN were analyzed under the E102 study base case, which models a 4,000 MW west-to-east transfer bias. The Total Import Capability was limited to 1,050 MW by the Cumberland - Davidson 500 kV (TVA) circuit for an outage of the Cumberland - Johnsonville 500 kV (TVA) circuit. This is a decrease of 3,150 MW from the E100 base case.

**South-to-North Transfer Bias:** MECS imports from MAAC or MAIN were analyzed under the E103 study base cases, which model a 4,000 MW south-to-north transfer bias. The E103a study base case modeled Cook Unit 1 out of service. As compared to the E100 study base case, the Total Import Capability from MAAC decreased by 1,550 MW, and the Total Import Capability from MAIN decreased by 2,800 MW. The Dumont 765-345 kV (AEP) transformer for an outage of the Cook 765-345 kV (AEP) transformer limited both transfers. The E103b study base case modeled Davis-Besse Unit 1 out of service. As compared

to the E100 study base case, the Total Import Capability from MAAC decreased by 550 MW, and the Total Import Capability from MAIN decreased by 1,450 MW. The Muskingum River - Ohio Central 345 kV (AEP) circuit limited both transfers at its pre-contingency summer rating.

**Comparison to 2000 Summer:** MECS Total Import Capability increased between 900 MW and 1,450 MW as compared to 2000 Summer. This improvement can largely be attributed to the return to service of Cook Unit 1 (AEP). With Cook Unit 1 out of service, as was modeled in the E103a study base case, MECS Total Import Capability did not increase more than 100 MW. TVA being modeled as exporting 500 MW more power in 2001 Summer as compared to 2000 Summer, also contributed to the increase in MECS Total Import Capability.

# STUDY RESULTS -- Northeast (NE) Study Area

## Introduction

The NE study area includes the AP, DLCO, and FE control areas. This grouping was chosen to generally define the northeastern portion of ECAR. It is also one of the three security coordinators within ECAR. The MECS and SW study areas, the MAAC Region, and the VACAR Sub-Region of SERC bound the NE study area. The NE study area has a projected peak demand for 2001 Summer of 24,092 MW, with approximately 21,880 MW of dispatched internal generation and a net import of approximately 2,210 MW. Non-dispatched generation of approximately 1,060 MW is projected to be available. These values reflect the over 500 MW of merchant generation that is scheduled to be added for the 2001 Summer period (refer to Appendix B). There are no major generation or transmission facilities planned for an extended outage, and no significant facility additions or retirements affecting regional reliability.

## General Observations

The results of these studies indicate that the NE study area is expected to perform adequately during the 2001 Summer season. Transfer capabilities to MAAC and VACAR are limited by either voltage constraints in Allegheny Power or thermal constraints in TVA, while transfer capabilities to the NE study area are limited by thermal constraints in AEP and TVA. In general, the voltage constraints are more limiting than last year, while the thermal constraints are less limiting than last year. Specifically, of the twelve transfer scenarios examined as part of the NE study area assessment, four scenarios had higher transfer capability from 2000 Summer, two scenarios had lower transfer capability, and six were either unchanged or not analyzed as part of the 2000 Summer assessment.

FE is in the process of adding five 85 MW combustion turbines at its Beaver 345 kV station west of Lorain. They are scheduled to be in service by June 1, but they were not modeled in any of the ECAR study base cases. However, a sensitivity analysis was performed. As expected, the addition of these generating units had little effect on most of the transfer capabilities. Specifically, under primary base case (E100) conditions, these generating units did marginally improve MECS import capability from MAAC, VACAR, and MAIN, between 100 MW and 200 MW.

The four significant operating procedures defined for the NE study area are the Reliability Coordination Plan (AP-PJM-VP), and the Elrama - Mitchell 138 kV (DLCO-AP), Springdale - Cheswick 138 kV (AP-DLCO), and Hoytdale - Maple - Krendale - Butler 138 kV (FE-AP) operating procedures. All four operating procedures are summarized in Appendix H. Additional information on the thermal and voltage constraints of significance to the NE study area can also be found in the MEN, MET, and VEM 2001 Summer Transmission Assessments.

## NE Imports

Transfers into the NE study area from TVA or MAIN were analyzed using the ECAR primary (E100) peak load base case. As shown in Tables 1 & 2, the Total Import Capability into the NE study area ranges from 4,950 MW to 6,250 MW. Transfers from TVA were limited to 4,950 MW by the Norris - La Follette 161 kV (TVA) circuit for an outage of the Volunteer - Phipps Bend 500 kV (TVA) circuit. Transfers from MAIN were limited to 6,250 MW by the South Canton 765-345 kV (AEP) transformer at its pre-contingency summer rating.

**East-to-West Transfer Bias:** Total Import Capability into the NE study area from TVA was analyzed under the E101a study base case, which reflects a 4,000 MW east-to-west transfer bias and a maximum flow of 2,430 MW from Ontario to Michigan. Transfer capability was again limited by the Norris - La Follette 161 kV (TVA) circuit for an outage of the Volunteer - Phipps Bend 500 kV (TVA) circuit, but at the slightly higher total import level of 5,050 MW.

**West-to-East Transfer Bias:** Total Import Capability into the NE study area from TVA or MAIN was analyzed under the E102 study base case, which models a 4,000 MW west-to-east transfer bias. Total Import Capability into the NE study area from TVA was limited to 5,350 MW by the South Canton 765-345 kV (AEP) transformer at its pre-contingency summer rating. This is an increase of 400 MW from the E100 base case. Conversely, Total Import Capability into the NE study area from MAIN was limited to 2,700 MW by the Cumberland - Davidson 500 kV (TVA) circuit for an outage of the Cumberland - Johnsonville 500 kV (TVA) circuit. This is a decrease of 3,550 MW from the E100 base case.

**Comparison to 2000 Summer:** Total Import Capability into the NE study area increased between 600 MW and 1,650 MW as compared to 2000 Summer. This improvement can be attributed to the June 2001 addition of the new Foster - Bath 345 kV (CIN-DPL) circuit, which relieves loadings on the previously-limiting

Foster - Sugarcreek 345 kV (CIN-DPL) circuit, and on TVA being modeled as exporting 500 MW more power in 2001 Summer as compared to 2000 Summer.

## MAAC Imports

Transfers into MAAC from ECAR or MAIN were analyzed using the ECAR primary (E100) peak load base case. As shown in Tables 1 & 2, the MAAC Total Import Capability only ranges from 1,500 MW to 1,550 MW. Transfers from ECAR were limited to 1,500 MW, and transfers from MAIN were limited to 1,550 MW, in both cases by the voltage-limited Hatfield - Black Oak 500 kV (AP) circuit for an outage of the Pruntytown - Mount Storm 500 kV (AP) circuit.

**West-to-East Transfer Bias:** MAAC imports from MAIN were analyzed under the E102 study base case, which models a 4,000 MW west-to-east transfer bias. MAAC Total Import Capability from MAIN was limited to 1,450 MW by the voltage-limited Hatfield - Black Oak 500 kV (AP) circuit for an outage of the Pruntytown - Mount Storm 500 kV (AP) circuit. This is a decrease of 100 MW from the E100 base case.

**Comparison to 2000 Summer:** MAAC Total Import Capability from ECAR decreased by 600 MW, and from MAIN it was essentially unchanged, as compared to 2000 Summer. The decrease can be attributed to more limiting voltage constraints in Allegheny Power due to higher real and reactive loads being modeled for 2001 Summer.

## VACAR Imports

Transfers into VACAR from ECAR or MAIN were analyzed using the ECAR primary (E100) peak load base case. As shown in Tables 1 & 2, the VACAR Total Import Capability only ranges from 2,450 MW to 2,500 MW. Transfers from ECAR were limited to 2,450 MW, and transfers from MAIN were limited to 2,500 MW, in both cases by the voltage-limited Hatfield - Black Oak 500 kV (AP) circuit for an outage of the Pruntytown - Mount Storm 500 kV (AP) circuit.

**West-to-East Transfer Bias:** VACAR imports from MAIN were analyzed under the E102 study base case, which models a 4,000 MW west-to-east transfer bias. VACAR Total Import Capability from MAIN was limited to 800 MW by the voltage-limited Hatfield - Black Oak 500 kV (AP) circuit for an outage of the

Pruntytown - Mount Storm 500 kV (AP) circuit. This is a decrease of 1,700 MW from the E100 base case.

**North-to-South Transfer Bias:** VACAR imports from MAIN were analyzed under the E104 study base case, which models a 4,000 MW north-to-south transfer bias. With this transfer bias, the Cumberland - Davidson 500 kV (TVA) circuit overloads for an outage of the Cumberland - Johnsonville 500 kV (TVA) circuit. For comparison purposes, this results in a VACAR Total Import Capability from MAIN of -350 MW. This is a decrease of 2,850 MW from the E100 base case.

**Comparison to 2000 Summer:** VACAR Total Import Capability from ECAR decreased by 950 MW, and from MAIN it ranged between being essentially unchanged to increasing 1,150 MW. The decrease can be attributed to more limiting voltage constraints in Allegheny Power due to higher real and reactive loads being modeled for 2001 Summer, while the increases can be attributed on TVA being modeled as exporting 500 MW more power in 2001 Summer as compared to 2000 Summer.

# STUDY RESULTS -- South West (SW) Study Area

## Introduction

The SW study area of ECAR is composed of thirteen control areas. These include AEP, BREC, CIN, DPL, EKPC, ENWC, ENWI, HE, IPL, LGEE, NIPS, OVEC, and SIGE. It is also one of three security coordinators within ECAR. The SW study area has a projected 2001 Summer demand of approximately 58,690 MW, with approximately 60,990 MW of dispatched generation supporting this demand and 2,300 MW of exports. With the addition of 3,020 MW of merchant and utility generation scheduled to be added for the 2001 Summer period (refer to Appendix B), a total of 6,310 MW of non-dispatched generation is available for exports. The SW study area was further divided into the Kentucky and Indiana import study areas. These import study areas were defined in order to better concentrate generation deficiencies and further stress the internal ECAR network.

## General Observations

The results of this study indicate that the SW study area of ECAR is expected to perform adequately during the 2001 Summer season. However, during times of heavy inter-regional transfers, it will be important for the ECAR companies to closely monitor their areas in order to maintain the reliability of the bulk system. During times of peak loading conditions, it may be necessary to implement certain operating procedures to reduce loadings on various transmission facilities. Refer to Appendix H of this report for details on these operating procedures.

There are four significant generation and transmission changes taking place in the SW study area since the 2000 Summer operating period. The first is the addition of 3,020 MW of merchant and utility generation. Of this amount, 1,930 MW are being added in AEP, 480 MW in DPL, 295 MW in LGEE, 183 MW in CIN, 75 MW in IPL, and 58 MW in BREC. The second is the return to service of Cook Unit 1 (AEP) which will relieve loadings on the Dumont and Cook 765-345 kV (AEP) transformers. The third is the addition of the new Orange 765-138 kV (AEP) station on the Marysville - Kammer 765 kV (AEP) circuit, which will improve the voltage performance in the Columbus Metropolitan area. The fourth is the addition of the Foster - Bath 345 kV (CIN-DPL) circuit, which will relieve contingency overloads on the Foster - Sugarcreek 345 kV (CIN-DPL) circuit.

In addition to the generation and transmission changes noted above, transmission system performance in the SW study area will also be impacted by the mode of operation of the Phase Angle Regulators (PAR) on the Michigan - Ontario interface. By redirecting flows that would otherwise flow around the north end of Lake Erie, a greater percentage of flows to the west will now flow through transmission facilities located south of Lake Erie. The net effect of these changes is that of the thirty transfer scenarios examined as part of the SW study area assessment, twelve scenarios had higher transfer capability from 2000 Summer, seven scenarios had lower transfer capability, and eleven were either unchanged or not analyzed as part of the 2000 Summer assessment. It should be noted that this assessment includes the reporting of selected limitations outside of the ECAR Region. These facilities in adjacent Regions were included in an attempt to provide consistency with other regional reports and to capture elements that may be more restrictive for transfers of interest to ECAR. For additional limiting elements in other Regions, refer to the MEN, MET, and VEM, 2001 Summer transmission assessments.

## Kentucky Imports

Transfers into Kentucky from MAIN were analyzed using the ECAR primary (E100) peak load base case. As shown in Tables 1 & 2, the Kentucky Total Import Capability was limited to 2,950 MW by the Gallagher 230-138 kV transformer in Cinergy for an outage of the Clifty Creek - Trimble County (OVEC-LGEE) line.

**West-to-East Transfer Bias:** Kentucky imports from MAIN were analyzed under the E102 study base case, which models a 4,000 MW west-to-east transfer bias. Kentucky Total Import Capability from MAIN was limited to 1,400 MW by the Grahamville - South Paducah - Livingston 161 kV (LGEE) path for an outage of the Shawnee - Marshall 500 kV (TVA) circuit. This is a decrease of 1,550 MW from the E100 base case.

**North-to-South Transfer Bias:** Kentucky imports from MAIN were analyzed under the E104 study base case, which models a 4,000 MW north-to-south transfer bias. With this transfer bias, the Cumberland - Davidson 500 kV (TVA) circuit overloads for an outage of the Cumberland - Johnsonville 500 kV (TVA) circuit. For comparison purposes, this results in a Kentucky Total Import Capability from MAIN of -1,600 MW. This is a decrease of 4,550 MW from the E100 base case.

**Comparison to 2000 Summer:** Kentucky Total Import Capability from MAIN increased by 750 MW when limited by ECAR facilities, but decreased by -1,550 MW when limited by TVA facilities. In the former case, Cinergy increased the ratings for some of its transformers for 2001 Summer as compared to 2000 Summer. In the latter case, the Cumberland - Johnsonville 500 kV (TVA) circuit had an OTDF of 2.6% in this 2001 Summer assessment, while its OTDF during the 2000 Summer assessment was under the 2.5% cut-off used in these ECAR seasonal assessments.

## Indiana Imports

Transfers into Indiana from MAAC were analyzed using the ECAR primary (E100) peak load base case. As shown in Tables 1 & 2, the Indiana Total Import Capability was not limited up to the 3,800 MW test level.

**East-to-West Transfer Bias:** Indiana imports from MAAC were analyzed under the E101a study base case, which reflects a 4,000 MW east-to-west transfer bias and a maximum flow of 2,430 MW from Ontario to Michigan. Indiana Total Import Capability was again not limited up to the 3,800 MW test level.

**South-to-North Transfer Bias:** Indiana imports from MAAC were analyzed under the E103 study base cases, which model a 4,000 MW south-to-north transfer bias. The E103a study base case modeled Cook Unit 1 (AEP) out of service. As compared to the E100 study base case, the Indiana Total Import Capability from MAAC decreased by 5,850 MW, with the Dumont 765-345 kV (AEP) transformer limiting for an outage of the Cook 765-345 kV (AEP) transformer. The E103b study base case modeled Davis-Besse Unit 1 out of service. As compared to the E100 study base case, the Indiana Total Import Capability from MAAC decreased by 3,850 MW, with the Dumont 765-345 kV (AEP) transformer again limiting for an outage of the Cook 765-345 kV (AEP) transformer.

**Comparison to 2000 Summer:** Indiana Total Import Capability increased between 2,400 MW and 4,400 MW as compared to 2000 Summer. This improvement can largely be attributed to the return to service of Cook Unit 1.

## TVA Imports

Transfers into TVA from ECAR, MAAC, or MAIN were analyzed using the ECAR primary (E100) peak load base case. As shown in Tables 1 & 2, the TVA

Total Import Capability ranges from 2,550 MW to 3,350 MW. Transfers from ECAR were limited to 2,550 MW, and transfers from MAAC were limited to 2,600 MW, in both cases by the Clinch River - Spring Creek - North Bristol 138 kV (AEP) path for an outage of the Broadford - Sullivan 500 kV (AEP-TVA) circuit. No limits were found for transfers from MAIN up to the total import test level of 3,350 MW.

**West-to-East Transfer Bias:** TVA imports from MAIN were analyzed under the E102 study base case, which models a 4,000 MW west-to-east transfer bias. TVA Total Import Capability from MAIN was limited to 3,000 MW by the voltage-limited Kanawha River - Matt Funk 345 kV (AEP) circuit for an outage of the Baker - Broadford 765 kV (AEP) circuit. This is a decrease of at least 350 MW from the E100 base case.

**North-to-South Transfer Bias:** TVA imports from ECAR, MAAC, or MAIN were analyzed under the E104 study base case, which models a 4,000 MW north-to-south transfer bias into TVA and through TVA into Southern. With this transfer bias, Total Import Capability into and through TVA from ECAR was limited to 3,200 MW, and from MAAC it was limited to 3,250 MW, in both cases by the Clinch River - Spring Creek - North Bristol 138 kV (AEP) path for an outage of the Broadford - Sullivan 500 kV (AEP-TVA) circuit. Both levels reflect an increase of 650 MW from the E100 base case. The Total Import Capability into and through TVA from MAIN was limited to 4,700 MW by the voltage-limited Kanawha River - Matt Funk 345 kV (AEP) circuit for an outage of the Baker - Broadford 765 kV (AEP) circuit. This is an increase of at least 1,350 MW from the E100 base case. In all three scenarios, the increase in Total Import Capability from the E100 base case is due to the 2,000 MW transfer bias into Southern being included in the calculation of Total Import Capability into and through TVA. If this 2,000 MW transfer bias into Southern was not included, the Total Import Capability into TVA would have decreased 1,350 MW and 650 MW, respectively.

**Comparison to 2000 Summer:** TVA Total Import Capability from ECAR increased by 1,150 MW under the E100 base case, but decreased by 450 MW under the E104 base case. From MAAC, it decreased by 950 MW under the E104 base case. From MAIN it increased 400 MW under the E102 base case, but decreased 500 MW under the E104 base case. These changes can be attributed to higher facility loadings in southeastern ECAR due to higher forecasted loads, the merchant generation additions, the return to service of Cook Unit 1 (AEP), the 400 MW net increase in base case scheduled interchange from the northwest to the

southeast (refer to Appendices B, C, and E). Changes in the number of non-ECAR monitored and outaged facilities also attributed to some of the differences.

## MAIN Imports

Transfers into MAIN from ECAR, MAAC, VACAR or TVA were analyzed using the ECAR primary (E100) peak load base case. As shown in Tables 1 & 2, the MAIN Total Import Capability ranges from 3,550 MW to 4,700 MW. Transfers from ECAR were limited to 4,050 MW, and transfers from MAAC were limited to 4,600 MW, in both cases by the Breed - Casey 345 kV (AEP-AMRN) circuit for an outage of the Rockport - Jefferson 765 kV (AEP) circuit. Transfers from VACAR were limited to 4,700 MW by the East Danville - Danville 138 kV (AEP) circuit for an outage of the Antioch - Jackson Ferry 500 kV (DUKE-AEP) circuit. Transfers from TVA were limited to 3,550 MW by the Summer Shade - Summer Shade Tap 161 kV (TVA-EKPC) circuit for an outage of the Summer Shade - Summer Shade 161 kV (TVA-EKPC) circuit.

**East-to-West Transfer Bias:** MAIN imports from MAAC or VACAR were analyzed under the three E101 study base cases, which reflect a 4,000 MW east-to-west transfer bias. Transfer capability was determined with different modes of operation for the Michigan - Ontario Phase Angle Regulating (PAR) transformers. Total Import Capability from MAAC ranged from -1,400 MW to 3,600 MW, and Total Import Capability from VACAR ranged from 3,550 MW to 3,700 MW. In all cases but one, MAIN Total Import Capability was limited to the 3,550 MW to 3,700 MW range by the Sidney 345-138 kV (IP) transformer for an outage of the Dumont - Wilton Center 765 kV (AEP-CE) circuit. The only exception was the Total Import Capability from MAAC which was limited to -1,400 MW by the Queenston Flow West (QFW) interface in Ontario under the E101a study base case conditions (the E101a study base case reflects a maximum flow of 2,430 MW from Ontario to Michigan). This is a condition that MECS does not anticipate operating in, as this scenario models the holding of fixed minimum angles on the PARs, when in reality it is anticipated that if the system conditions were those modeled in this base case, the PARs would most likely be used to retard flow not contracted through Ontario. The other two E101 study base cases used in this analysis reflected zero-fixed-angle PAR settings (E101b), resulting in an 1,890 MW flow from Ontario to Michigan, and maximum-fixed-angle PAR settings (E101c), resulting in a 1,220 MW flow from Ontario to Michigan. Excluding the QFW-limited scenario, MAIN Total Import Capability from MAAC

or VACAR decrease by 1,000 MW to 1,150 MW under the E101 base cases as compared to the E100 base case.

**South-to-North Transfer Bias:** MAIN imports from ECAR, MAAC, or TVA were analyzed under the E103 study base cases, which model a 4,000 MW south-to-north transfer bias. The E103a study base case modeled Cook Unit 1 (AEP) out of service, while the E103b study base case modeled Davis-Besse Unit 1 out of service. Total Import Capability from ECAR was limited to 5,400 MW (E103a) and 5,550 MW (E103b) by the Sidney 345-138 kV (IP) transformer for an outage of the Dumont - Wilton Center 765 kV (AEP-CE) circuit. This is an increase of 1,350 MW to 1,500 MW from the E100 base case. Total Import Capability from MAAC was limited to -1,800 MW (E103a) and 2,800 MW (E103b) by the Dumont 765-345 kV (AEP) transformer for an outage of the Cook 765-345 kV (AEP) transformer. This is a decrease of 1,800 MW to 6,400 MW from the E100 base case. Total Import Capability from TVA was limited to 1,400 MW (E103a) and 1,500 MW (E103b) by the Summer Shade - Summer Shade Tap 161 kV (TVA-EKPC) circuit for an outage of the Summer Shade - Summer Shade 161 kV (TVA-EKPC) circuit. This is a decrease of 2,050 MW to 2,150 MW from the E100 base case.

**Comparison to 2000 Summer:** MAIN Total Import Capability from ECAR increased from 50 MW to 800 MW, mostly due to the changes in modeling the south-to-north transfer bias from 2000 Summer to 2001 Summer. MAIN Total Import Capability from MAAC increased from 400 MW to 5,000 MW, largely due to the return to service of Cook Unit 1 (AEP), and the changes in modeling the south-to-north transfer bias from 2000 Summer to 2001 Summer. MAIN Total Import Capability from VACAR increased from 50 MW to 2,050 MW, mainly due to the return to service of Cook Unit 1 (AEP). MAIN Total Import Capability from TVA decreased from 1,200 MW to 1,3000 MW, primarily due to the changes in modeling the south-to-north transfer bias from 2000 Summer to 2001 Summer.

# INDIVIDUAL COMPANY ASSESSMENTS

## Introduction

In addition to the ECAR seasonal transmission assessments conducted by the TSPWG under the direction of the TSPP, individual ECAR members also conduct seasonal studies either individually or jointly with other companies. This section of the report presents the significant findings from these studies as reported by the individual ECAR members.

## American Electric Power (AEP)

The AEP System was designed, built, and is operated to perform adequately under a range of outage conditions. However, extreme outages coupled with extreme weather conditions and/or power transfer conditions can potentially stress the system beyond acceptable limits.

In AEP's Fort Wayne Transmission Region, the unavailability of critical facilities, such as the Cook and Dumont 765-345 kV (AEP) transformers, could materially reduce the capability of the transmission system. This is more of a concern in the summer than in the winter. In contrast to 2000 Summer, the return to service of Cook Unit 1 (connected to the 345 kV bus) is expected to reduce loadings on the Cook and Dumont transformers during 2001 Summer. However, these loading reductions could be minimized by the anticipated mode of operation of the Phase Angle Regulators (PAR) on the Michigan - Ontario interface. The PAR owners have stated that the PARs will be operated to control flows through the Michigan - Ontario interface to scheduled levels. By redirecting flows that would otherwise flow around the north end of Lake Erie, a greater percentage of flows into Michigan will now flow through the Cook and Dumont 765-345 kV transformers. Contingency overloads on these two transformers are more probable when sales to Michigan are heavy. If contingency overloads do occur, the NERC Transmission Loading Relief (TLR) procedure will be initiated to maintain reliability. An operating procedure is also available to address contingency loadings on the Cook and Dumont transformers (refer to Appendix H). In addition, the DeSoto - Jay 138 kV (AEP) circuit was found to exceed its summer normal rating under base case conditions (refer to Table 3). An upgrade scheduled for later this year will increase its summer normal rating from 185 MVA to 292 MVA, and its summer

emergency rating from 244 MVA to 301 MVA. This region of AEP is scheduled to have 400 MW of new merchant generation placed in service by 2001 Summer.

Seasonal studies of AEP's Columbus Transmission Region have raised concerns regarding the voltage performance in Central Ohio (primarily the Columbus Metropolitan area) during summer operating conditions. This area has been susceptible to voltage drops for the loss of the Marysville 765-345 kV (AEP) transformer concurrent with generation unavailability at the Conesville (AEP) generating plant. These concerns are heightened during outages of the Cook (AEP) generating units, and during periods of heavy transfers to the north and west through ECAR. To minimize potential voltage problems in the Columbus area, AEP completed an 1,100 MVAR reactive correction program in 2000, and established the Columbus Region Emergency Procedures (CREP) to reduce the risk of an uncontrolled voltage collapse (refer to Appendix H). To further mitigate the Columbus area voltage condition, AEP will be placing in service the new Orange 765-138 kV station on the Marysville - Kammer 765 kV (AEP) circuit, by May 2001. Figure 4.2 illustrates the improvement in voltage performance which can be attributed to this facility addition. In an effort to address local area needs, the Bixby #1 345-138 kV transformer is being replaced with a higher capability bank, and a second South Canton 345-138 kV transformer is scheduled to be placed in service, both by June 2001. This region of AEP is not scheduled to have any new merchant generation placed in service by 2001 Summer.

In AEP's Roanoke Transmission Region, loss of overlapping EHV elements could result in thermal overloads and low voltages on underlying transmission networks. Based on the results of seasonal assessments and the "ECAR/MAAC/SERC Tri-Regional Assessment, Reliability Impact of the Delayed Completion of the Wyoming-Cloverdale 765 kV Line" (dated March 1997), AEP has identified the need to employ (with the assistance of its neighbors) operating procedures to reduce the reliability risks of potential widespread power interruptions in the southeastern portion of ECAR. These operating procedures, referred to as the Southern Transmission Emergency Procedures (STEP), are designed to maximize the loadability of the critical Kanawha River - Matt Funk 345 kV (AEP) circuit and reduce excessive loadings on AEP's southeastern transmission system. The risk for a voltage collapse in this area is greater in the winter than in the summer, due to the higher area loads in the winter. Details on the STEP and Kanawha River - Matt Funk 345 kV operating procedures can be found in Appendix H. In addition, the Cloverdale #1B 345-138 kV transformer has been replaced with a higher capability bank to address local area needs. This region of AEP is

scheduled to have 1,530 MW of new merchant generation placed in service for 2001 Summer.

Overall, AEP will continue to operate its system so that transmission loadings and voltage levels are maintained within safe levels. This may require the redispatch of generation, the initiation of the NERC TLR procedure, and/or the purchase of power from neighboring systems to reduce high loadings on critical transmission elements or severe voltage depressions.

## Allegheny Power (AP)

Allegheny Power expects to have adequate control area generation to meet its forecasted peak load this summer. No major transmission facilities are anticipated to be out of service during the summer peak, and no generation is planned to be out of service. AP does not anticipate any potential operating problems for this summer peak.

## Big Rivers Electric (BREC)

Based on internal power flow studies and actual experiences, BREC expects its system to generally perform well during this summer season. The load flow screening studies showed no violations of NERC Planning Standard IA under both normal and single contingency conditions.

However, BREC facilities have the potential to reach normal or emergency ratings during times of heavy north-to-south flows. In particular, the New Hardinsburg 138-161 kV (BREC) transformer and/or the New Hardinsburg - Paradise 161 kV (BREC-TVA) interconnection may experience loadings that are especially severe during TVA dispatch scenarios that include Paradise generating unit outages. In addition, the Henderson County 138-161 kV (BREC) transformer may experience loadings that are particularly severe during BREC generation outages. The initiation of the NERC TLR procedure may be necessary to reduce these facility loadings. In addition, the outage of the New Hardinsburg - Paradise interconnection may be necessary to reduce the New Hardinsburg transformer loading when TLRs prove ineffective.

BREC does not expect any generation or transmission facilities to be out of service this summer. A 58 MW co-generation facility is being installed by Willamette Industries that will result in a reduced load at the Skillman substation.

## Cinergy (CIN)

The Cinergy transmission system is expected to perform well, with no significant problems. Cinergy screening studies using the ECAR 2001 Summer (E100) base case indicated no violations of the NERC Planning Standard IA under normal and single contingency conditions. Some of the study scenarios, which resulted in contingency overloads or low voltages, were due to modeling reasons (the equivalizing of the Cinergy 69 kV system and the choice of base voltage for the CG&E 66 kV system) rather than expected system conditions. The remainder is discussed below.

The Wabash River - Crawfordsville 138 kV circuit appeared as loaded above its emergency rating for several outages. Cinergy has an operating procedure for this circuit that essentially opens this circuit to relieve the overload. This operating procedure is included in Appendix H. In addition, upgrade of this circuit is budgeted for the summer of 2002.

The 138 kV windings of the three 230-138-69 kV transformers at Kokomo Highland Park may overload for large transfers from either west-to-east or south-to-north or during certain generation or transmission outages in the vicinity of the Greentown 765 kV substation. This overload may be reduced or eliminated by altering the configuration of the Greentown 138 kV station, as noted under the subject operating procedure in Appendix H. There are no plans to expand the transmission system to handle these contingencies due to the low probability that all of the necessary conditions will occur.

The new Foster - Bath 345 kV (CIN-DPL) circuit is planned to be in service by this summer. This circuit is being built to help alleviate congestion during high south-to-north transfers across the ECAR Region. The Terminal 345-138 kV transformer's return to service is scheduled for this summer upon completion of its repairs. The Port Union - Todhunter 138 kV double circuit is scheduled to be rebuilt to increase its rating by this summer. There are no major bulk facilities scheduled to be out of service on the Cinergy system this summer.

The connection of one merchant plant is planned for the Cinergy transmission system by this summer. This plant, located in Henry County, Indiana, has experienced delays due regulatory proceedings. Depending on the actual level and direction of transfers across the Cinergy transmission system, Cinergy may experience loading and or voltage concerns. Cinergy will utilize various

mechanisms including but not limited to TLR's and redispatch alternatives to address these concerns.

## Consumers Energy (CONS)

The Consumers Energy bulk power transmission system is expected to perform well during the 2001 Summer season. Power flow simulations using the ECAR 2001 Summer base case (E100) indicate no violations of NERC Planning Standard IA for both normal peak load conditions and for single contingency conditions, including double circuit tower contingencies, within the Consumers Energy service territory.

Generating plant modifications at Palisades, Whiting, and Cobb will increase Consumers Energy's capacity by 24 MW. The completion of two units at Zeeland will add 370 MW of merchant plant capacity. In addition, there will be approximately 75 MW of capacity added by several smaller merchant plants.

In past summers, Consumers had a Long Term Power Reservation to purchase 300 MW from Ontario. This purchase was modeled in the base case. Consumers, however, has not extended the purchase for this summer. Consumers has purchased 600 MW of firm transmission capacity through AEP from Cinergy and 150 MW through NIPS. With the addition of two 138-69 kV transformers at Barton Lake (NIPS) and the completion of NIPS' 69 kV reinforcement project, the NIPS - MECS interface capacity will increase to 293 MW this summer.

The Phase Angle Regulating (PAR) transformer planned for last summer on the Lambton - Saint Clair (L4D) 345 kV (HONI-DECO) circuit, failed factory testing and is now scheduled for completion by mid-August. Until the completion of this project, the operating procedures that exist to maximize transfer capability across the Michigan - Ontario interface may be utilized more often. These procedures include adjusting the J5D phase shifter (HONI), moving Saint Clair Unit 6 (DECO) generation to the 120 kV system, and arming Lambton (HONI) generation rejection for the loss of either Lambton - Saint Clair 345 kV (HONI-DECO) interconnection (L4D or L51D).

The range of MECS import capability is highly dependent upon the amount of power flow scheduled across the HONI/DECO Phase Angle Regulating (PAR) transformers. Internal studies indicate that with 600 MW scheduled across the PAR transformers, the simultaneous MECS import capability is 3,500 MW, limited by the Dumont 765-345 kV (AEP) transformer for the outage of the Cook

765-345 kV (AEP) transformer. With 2,100 MW scheduled across the PAR transformers and 2,500 MW through ECAR into MAIN, the simultaneous MECS import capability is 4,100 MW, also limited by the Dumont transformer for an outage of the Cook transformer. As shown in last summer's assessment, an outage of Cook Unit 1 (AEP) or large transfers through ECAR into MAIN will significantly reduce MECS import capability.

Consumers Energy is in the second year of a multi-year plan to increase import capability by 2002, as required by Michigan's new electric restructuring law. Approximately half of the $37 million project will be completed by summer 2001. A major portion of this project, which will be completed by this summer, is the looping of the Oneida (CONS) substation into the Battle Creek - Majestic (CONS-DECO) 345 kV line. This will maintain a 345 kV feed into the Lansing area in the event of any single 345 kV line outage or double circuit tower outage between Battle Creek and Majestic. Consumers will also add 291.6 MVAR of 138 kV capacitors prior to this summer to support voltages during large imports.

Ignoring limits external to MECS, the Oneida loop increases transfer capability into MECS by approximately 1,300 MW. With 600 MW scheduled across the Ontario - Michigan Phase Angle Regulating transformers, the simultaneous MECS import capability, as limited by MECS facilities, will be 4,900 MW. The Canal - Island Road 138 kV (CONS) line limits for an outage of the Argenta - Tompkins 345 kV and Battle Creek - Oneida 345 kV (CONS) double-circuit tower.

For the past three summers, Consumers has reported that the NERC Transmission Loading Relief (TLR) Procedure could affect power transactions by Consumers and Detroit Edison for overloads on other systems. Consumers Energy has entered into an agreement with all major electric utilities located around Lake Erie to use generation re-dispatch to mitigate TLR curtailments in situations where the affected system is about to curtail load. This operating procedure, called the Lake Erie Emergency Re-dispatch (LEER) Procedure, is documented in Appendix H.

## Detroit Edison (DECO) / International Transmission (ITC)

Detroit Edison expects to serve its customers this summer with a combination of native generation and purchased power, much the same as it did in 2000. Dearborn Industrial Generation, which added approximately 170 MW in 1999, will be adding another 540 MW this year.

The International Transmission Company has three major projects that will aid Southeastern Michigan this summer. They are described below.

The Blackfoot Project is in service and involves the addition of a 345 kV line between the new Blackfoot station and Belle River. Also, the Jewell end of the Greenwood - Belle River - Pontiac 345 kV circuit was reterminated at Pontiac, using the existing Jewell - Pontiac 345 kV circuit. The transmission line is in service, creating a three-ended transmission line between Belle River, Madrid, and Pontiac. There is a switching station under construction which will break that three-ended circuit into three two-ended circuits; the Belle River - Blackfoot, Blackfoot - Madrid, Blackfoot - Pontiac 345 kV circuits. This station is scheduled to be in service this summer.

The Bismarck Project is scheduled to be in service this summer. This project will add a 345-120 kV autotransformer at the Bismarck station, and cut into the St. Clair - Stephens 120 kV circuit. This autotransformer will relieve overloading of either Stephens 345-120 kV autotransformer for the loss of the other one.

Previous limiting elements in Ontario and on the Michigan - Ontario interface will be relieved by the addition of the Phase Angle Regulating (PAR) transformers and the new autotransformer on the Michigan - Ontario interface. This project is mostly complete, with the new autotransformer and two of the three new PAR transformers in place. The L4D PAR transformer failed an in-factory test, and is now scheduled to be in place by mid-August. The PAR transformers will be used to relieve the potential overloads on the DECO-HONI interconnections during periods of heavy transfers by redistributing the flows in an efficient manner.

## Duquesne Light (DLCO)

The Duquesne Light power system is expected to perform adequately during this summer season. Power flow simulations indicate that transmission facility loadings and voltages are within acceptable limits for both normal peak load conditions (with all facilities in service) and for single contingency conditions within and outside Duquesne's control area. There are no planned outages of either generating or transmission facilities or abnormal system conditions this summer and there are no bulk power facility additions scheduled. Interconnection capability between Duquesne and its directly connected neighbors is adequate to support economic power transfers, generation outages within Duquesne, and to supply reserve sharing assistance to other control areas upon demand.

The Elrama - Mitchell 138 kV interconnection between Duquesne and Allegheny Power has been reported as a limit to interregional transfers in past appraisals and may be limiting for similar power transfers this summer. Elrama - Mitchell responds approximately five percent to power transfers from ECAR to the east and southeast. Elrama - Mitchell responds as much as 50% to power transfers from and to the Elrama Power Station and Duquesne's directly connected neighbors.

Operating procedures to mitigate loadings on the Elrama - Mitchell 138 kV circuit are available and can be employed to maximize transfers. The Springdale - Cheswick 138 kV (AP-DLCO) operating procedure is also available and can be initiated for outages of the Cheswick and/or Beaver Valley generating units. Details on both of these operating procedures can be found in Appendix H.

## Dayton Power and Light (DPL)

Based on DPL's transmission system assessment, Dayton Power and Light does not anticipate any operating problems, or any negative impact on the ECAR bulk transmission system performance during the 2001 Summer period under normal or single contingency conditions.

Construction of the new Foster - Bath 345 kV (CIN-DPL) circuit, scheduled for completion by June 1, will significantly reduce loadings on the existing Foster - Sugarcreek 345 kV (CIN-DPL) circuit. This circuit has been susceptible to single contingency overloads during periods of heavy south-to-north power transfers. Construction of the Adkins merchant plant on the Atlanta - Beatty 345 kV (DPL-AEP) circuit is in progress, and is scheduled to be in service for the summer of 2001. The replacement of the Clinton 345-69 kV transformer with a higher capacity bank is scheduled for the spring of 2001. The upgraded transformer will have a normal rating of 250 MVA and an emergency rating of 275 MVA.

There are no anticipated operating procedures for the summer of 2001 involving the 345 kV or 138 kV system. Depending on the generation dispatch at the O. H. Hutchings generating station, an overload can occur on the Carlisle 138-69 kV (CIN) transformer. Operating procedures are in place to correct this overload, up to and including the opening of the Carlisle - Hutchings 69 kV circuit.

## East Kentucky Power Cooperative (EKPC)

Under normal system conditions during the upcoming peak load season, EKPC expects that all of its facilities will be in service; that all line and equipment loadings will fall within normal thermal limits; that all voltage levels will fall within normal limits; that the stability of the network will be maintained; that all customer demands will be supplied; that all contracted firm (non-recallable reserved) transfers will be maintained; and that no cascading outages will occur.

Furthermore, for the loss of any single transmission component, EKPC expects that all voltage levels will fall within emergency limits; that the stability of the network will be maintained; that no unplanned loss of customer demand or generation will occur; that no contracted firm (non-recallable reserved) transfers will be curtailed; and that no cascading outages will occur.

## FirstEnergy (FE) / American Transmission Systems (ATSI)

FirstEnergy's bulk transmission, generation, and interconnection capacities are expected to be adequate to supply FE's projected 2001 Summer peak load, with interchange schedules as indicated in the ECAR 2001 Summer base case. Items of note relative to local area thermal loading concerns and potential regional transfer capability limitations are summarized below.

The Bay Shore - Dixie 138 kV circuit may thermally overload for loss of the Allen Junction 345-138 kV transformer. This circuit is scheduled to be re-conductored prior to the fall of 2001. Until completed, a local 138 kV line can be opened through supervisory control to eliminate the overload without any customer supply interruptions.

The Pleasant Valley - Griffin (Q3) 138 kV circuit may thermally overload for loss of the Fox #2 and/or #3 345-138 kV transformers. This line is scheduled to be re-conductored prior to the summer of 2001. Until completed, a local 138 kV line can be opened through supervisory control to eliminate the overload without any customer supply interruptions.

The Star #1 345-138 kV transformer may thermally overload for loss of the Star #2 and #3 345-138 kV transformers which are paralleled on the same set of breakers. Local 138 kV lines can be opened to eliminate the overload without customer supply interruption.

The Tangy 138-69 kV transformer may thermally overload for loss of the Galion #1 and #2 345-138 kV transformers. A local 69 kV line can be opened through supervisory control to eliminate the overload without any customer supply interruptions.

## Hoosier Energy (HE)

Hoosier Energy expects its transmission grid (100 kV and above) to function without incident under system normal conditions during the summer of 2001. Under contingency conditions, the Georgetown 138-69 kV transformer could reach 100% of its 100 MVA summer fan rating, while the Ramsey 345-69 kV transformer could reach 104% of its 150 MVA summer fan rating (as noted in Table 3). In both cases, HE can transfer some of the load off the 69 kV buses to reduce transformer loadings. HE will permit its transformers to operate at 132% of their summer fan ratings for an eight-hour period accepting a 2% loss of life. Therefore, HE accepts the conditions noted in Table 3 and feels that there is no threat to jeopardizing the integrity of their transmission grid or that of the ECAR bulk transmission system. Furthermore, HE plans to install a second Georgetown 138-69 kV (100 MVA) transformer by June 1, 2001. In addition to reducing any HE overloaded conditions (reduces flows on the existing Greentown and Ramsey 138-69 kV transformers), this new transformer will provide increased support to the Hoosier Energy and Cinergy 69 kV systems.

As was the case during 2000 Summer, HE will implement an established operating procedure which calls for the Worthington 345-138 kV transformer to be operated out-of-service during the summer period when the Worthington CT (170 MW), connected to the Worthington 138 kV station, is in operation. This is being done to prevent any potential contingency overloads on the Cinergy transmission system when the Worthington CT is in operation.

## Indianapolis Power and Light (IPL)

IPL's analysis did not identify any transmission overloads under normal, single contingency, or single-with-common-mode contingency conditions. The IPL transmission system, however, will experience local overloads under double-contingency conditions. Overloads in the Indianapolis area will be mitigated by re-dispatching generation, reconfiguring the distribution system, calling on interruptibles, or dropping load. None of these actions should impact ECAR bulk transmission system performance.

During the past year, IPL experienced more thermal overloads on it's Petersburg East 345-138 kV autotransformer. When power is flowing to the south, this autotransformer overloads, requiring IPL to implement the Local Petersburg Autotransformer Operating Procedure (refer to Appendix H). IPL is concerned that the frequency of implementing this operating procedure may increase in 2001.

## LG&E Energy (LGEE)

The LGEE transmission system is expected to perform adequately to reliably transmit electrical energy from company owned generating resources to native load customers for a wide range of summer conditions. The Trimble County to Middletown 345 kV line and the Middletown 345-138 kV transformer additions that were completed in 2000 will strengthen the EHV transmission system in the Louisville area. The abnormal system conditions that existed during 2000 Summer due to the January 2000 failure of the Blue Lick 345-138 kV (LGEE) transformer will be eliminated for 2001 Summer. Installation of the replacement transformer is scheduled prior to the 2001 Summer peak. System generation changes include the installation of combustion turbines at the Brown CT and Paddys Run substation sites. The new units will increase LGEE's summer generating capacity by 295 MW.

The TSPWG assessment of 2001 Summer peak conditions, using the ECAR primary (E100) base case, indicated that some LGEE facilities could exceed their emergency ratings during contingency conditions (refer to Table 3). Limitations must be observed and corrective action may need to be taken during contingency situations to alleviate these problems. Specifically, the Kenton - Flemingsburg - Goddard 138 kV (LGEE) line could overload during an outage of the Spurlock - Maysville - Plumville 138 kV (EKPC) line. The level of generation at EKPC's Spurlock Plant has a significant effect on the contingency flow. Corrective measures to alleviate the problem include reducing generation at EKPC's Spurlock Plant. In addition, terminal equipment upgrades have been accomplished that eliminate an overload of the Tyrone - Adams 138 kV (LGEE) line during an outage of the Ghent - Owen County - Scott County 138 kV (LGEE) line and EKPC's Owen County 138-69 kV transformer.

LGEE's transmission system has experienced numerous overload and voltage problems during shoulder peak periods with high north-to-south transfers. TLRs have been called in an attempt to control the north-to-south flow through the LGEE system, and relieve overloading of the Blue Lick 345-161 kV transformer

(south of Louisville) and the Paddy's Run - Summershade 161 kV (LGEE-TVA) line. However, due to the low response factors, sufficient relief has sometimes not been obtained via the TLR process and LGEE has been forced to redispatch generation and open 161 kV transmission interconnection facilities to eliminate the problems. Additionally, LGEE has experienced depressed voltages in the central Kentucky area and had to dispatch combustion turbines at the Brown CT site to provide reactive and voltage support. Problems due to north to south flow are anticipated this summer and similar responses will be required unless the TLR process is modified to recognize and respond to the problem.

## Northern Indiana Public Service (NIPS)

The Northern Indiana Public Service transmission system is expected to perform adequately during this summer season. Various capacitor installations and circuit conductor upgrades will eliminate possible overload or low voltage conditions for most credible outage contingencies. For the simultaneous outage of the Dequine - Olive 345 kV (AEP) and Dequine - Westwood 345 kV (AEP-CIN) circuits, the NIPS 345-138 kV transformer at the Reynolds substation could overload (refer to Table 3). If this situation were to occur, temporary switching could alleviate this transformer overload.

## Ohio Valley Electric (OVEC)

Based on an analysis of projected 2001 Summer conditions, as modeled in the ECAR 2001 Summer (E100) base case, no OVEC facilities are expected to experience flows above summer normal ratings with all facilities in service, or above summer emergency ratings for loss of any single bulk power system facility.

Past operating experience indicates that high levels of west-to-east transactions may heavily load the Kyger Creek - Sporn 345 kV (OVEC-AEP) tieline, especially if these transfers coincide with reduced output at any of several AEP generating plants east of this tieline. AEP and OVEC have agreed to open the tie as needed. Opening the tie under these conditions will increase loading on the Sargents 345-138 kV (OVEC) transformer, but existing procedures can be used to address transformer-loading concerns if they arise. No other overloads would be expected to result from implementation of these operating procedures.

To prevent exposure to possible fault duties in excess of the capability of many of the 345 kV breakers at the Pierce station, Pierce circuit breakers E and G will be

operated "Normally Open" until installation of higher capability breakers is completed, expected by 2003 Summer. This temporary reconfiguration will leave the Dearborn - Pierce #1 345 kV (OVEC) and Pierce - X533 #1 345 kV (OVEC) circuits connected to each other, but isolated from the remainder of the Pierce station. This temporary change is expected to have little effect on flows in the area for most operating conditions. Breakers E and G could be reclosed, if desired, during outages of the Pierce - Foster 345 kV (OVEC-CIN) tieline.

For nearly fifty years, the OVEC system has supplied just one customer load, the Portsmouth Gaseous Diffusion Plant located near Piketon, Ohio, presently owned and operated by the United States Enrichment Corporation. This load, which at times in the past has reached nearly 2,000 MW, has been served under agreements between OVEC and the consortium of utilities known as the OVEC Sponsors, and the various plant owners and operators over the years. USEC has indicated that they intend to cease enrichment operations at Portsmouth this year, and has initiated termination of supply under the OVEC - DOE/USEC agreement effective August 31, 2001. After that date, essentially all of the approximately 2,300 MW of OVEC generation output will be delivered to the Sponsors, instead of only that deemed "Surplus" to the needs of the USEC load. Compared to the most recent summer and winter peak load periods, this will make 600 MW to 1,000 MW of additional capacity available to the OVEC Sponsors. Although the OVEC-DOE/USEC agreement will still be in effect through the summer, the precise schedule for ending enrichment operations is not known at this time. There are indications that the USEC load could be significantly below the 600 MW level represented in the ECAR power flow model, dropping down to 35 MW for June, July, and August. Flows on the Sargents 345-138 kV (OVEC) transformer, and the Sargents - Waverly 138 kV, Sargents - Wakefield 138 kV, and Kyger Creek - Sporn 345 kV (OVEC-AEP) tielines, will all increase with increased deliveries to the OVEC Sponsors, but significant margin will remain for transfers and/or contingencies.

## Southern Indiana Gas and Electric (SIGE)

SIGE does not expect to have any operating problems this summer, which would affect ECAR bulk transmission system performance. In addition, SIGE is not planning any facility additions, removals, or modifications for this summer.

There is a potential overloading condition involving the Newtonville - Cloverport 138 kV (SIGE-LGEE) circuit and the Newtonville 161-138 kV (SIGE) transformer

during heavy exports by SIGE and/or BREC. This potential problem can be addressed through an established operating procedure documented in Appendix H.

There is a potential overloading condition involving the remaining Newtonville 138-69 kV (SIGE) transformer should the other Newtonville 138-69 kV (SIGE) transformer fail under peak load conditions. A temporary operating procedure is in place that calls for SIGE to install a spare transformer which will be supplied by Hoosier Energy, thus providing for the needed capacity during contingency conditions. This temporary operating procedure will remain in effect until permanent transformer capacity is added in the Newtonville area.

Finally, there is a potential overloading condition involving the Petersburg East and West 345-138 kV (IPL) transformers during heavy north-to-south transfers, and/or the loss of SIGE generation. IPL and Cinergy have an operating agreement to open the Petersburg - Vincennes Jct. 138 kV (IPL-CIN) circuit. If this action fails to provide enough relief to these transformers, SIGE and IPL have agreed to open the Petersburg - Dubois 138 kV (IPL-SIGE) circuit (refer to Appendix H).

# TRANSFER CAPABILITY ANALYSIS

## Introduction and Detailed Study Results (Table 2)

The transfer capabilities table (Table 2) provides a listing of the Normal Incremental Transfer Capabilities (NITC), the First Contingency Incremental Transfer Capabilities (FCITC), the Normal Total Transfer Capabilities (NTTC), the First Contingency Total Transfer Capabilities (FCTTC), and the Total Import Capability, for each of the transfer scenarios analyzed, as defined in Appendix J. A given facility was only listed as a limiting facility for the lowest FCITC level at which it appeared as a limitation. The facility may continue to be overloaded at higher transfer levels for other contingencies, but for brevity, it was not repeated in this table. However, this facility would appear a second time in Table 2 if it also limited under NITC conditions. Limitations imposed by the following types of contingencies appear in Table 2: (1) single circuits; (2) single circuit segments of multiple terminal circuits; (3) multiple terminal circuits; and (4) double-circuit towers in MECS and IMO.

The transfer capabilities listed in Table 2 were based on a linear analysis screening of single and selected double-circuit tower transmission contingencies under the stated base case and power transfer conditions. All monitored facilities which exceeded their emergency ratings and which had an OTDF greater than or equal to 2.5% were included in the table in increasing levels of permissible transfer. The purpose of Table 2 is not to define an absolute transfer capability for each of the transfers modeled, but to provide a measure of the level of transfers that can be supported between each of the study areas and give an idea of what facilities could limit those transfers. These transfer capabilities were determined primarily by analyzing ECAR outages and limitations for the specific base case and transfer conditions modeled for this seasonal study.

Selected non-ECAR outages and limitations were also included in this assessment. These non-ECAR facilities were added in an attempt to provide consistency with other regional reports and to capture elements that may be more restrictive to transfers of interest to ECAR. Additional limiting elements not reported in this study may exist in other Regions for various transfers from, to, or through ECAR. Refer to the MEN, MET, and VEM seasonal transmission assessments for additional insight into transmission limitations in adjacent Regions. Finally, it should be noted that transfer capabilities might vary significantly as specific generation, transmission, and scheduled transfer conditions change.

## Geographic Location of Limiting Facilities (Figure 3)

To facilitate use of the study results documented in Table 2, this section of the report includes a diagram (Figure 3) that shows the geographic location of all limiting facilities identified in this seasonal transmission assessment. For lines, the direction of flow corresponding to the limiting condition is indicated through the use of an arrowhead. For transformers, the limiting flow direction is from left-to-right based on the voltage designation (e.g., the Dumont 765-345 label indicates that the flow through this transformer is from 765 kV to 345 kV).

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ECAR to IMO | ----- | | | | | | | (Tested During Winter Assessments) | | | | | | | |
| ECAR to MAAC | E100 | 1550 | 600 | 2150 | -50 | 1500 | | Hatfiled - Black Oak 500 kV (Voltage) | AP | 2265 | Pruntytown - Mount Storm 500 kV | AP-VP | 9.6 | 26.8 | 13.8 |
| | | 2300 | 600 | 2900 | -50 | 2250 | | Doubs #1 or #2 or #3 or #4 500-230 kV | AP | 488 | Doubs - Brighton 500 kV | AP-PEPCO | 1.3 | 8.7 | 3.1 |
| | | 2450 | 600 | 3050 | -50 | 2400 | 2 | Mount Storm - Doubs 500 kV | VP-AP | 2271 | Mount Storm - Meadow Brook 500 kV | VP-AP | 11.9 | 35.0 | 14.5 |
| | | 2700 | 600 | 3300 | -50 | 2650 | | Doubs - Aqueduct - Station H 230 kV | AP-PEPCO | 629 | Doubs - Station H 230 kV | AP-PEPCO | 3.8 | 60.5 | 6.1 |
| | | 2700 | 600 | 3300 | -50 | 2650 | | Doubs - Station H 230 kV | AP-PEPCO | 628 | Doubs - Aqueduct 230 kV | AP | 3.8 | 60.3 | 6.1 |
| | | 3950 | 600 | 4550 | -50 | 3900 | | Black Oak - Bedington 500 kV | AP | 2783 | Pruntytown - Mount Storm 500 kV | AP-VP | 11.7 | 31.1 | 16.7 |
| | | 4600 | 600 | 5200 | -50 | 4550 | 3 | Black Oak 138-500 kV | AP | 531 | Hatfield - Black Oak 500 kV | AP | 1.9 | 20.2 | 3.9 |
| | | 4850 | 600 | 5450 | -50 | 4800 | | Pruntytown - Mount Storm 500 kV | AP-VP | 3326 | Black Oak - Bedington 500 kV | AP | 16.1 | 44.6 | 21.3 |
| | | 5000 | 600 | 5600 | -50 | 4950 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | 2200 | 600 | 2800 | -100 | 2100 | | Hatfiled - Black Oak 500 kV (Voltage) | AP | 1940 | Mount Storm - Meadow Brook 500 kV | VP-AP | 8.7 | 10.1 | 9.4 |
| | | 2900 | 600 | 3500 | -100 | 2800 | | Doubs #1 or #2 or #3 or #4 500-230 kV | AP | 479 | Doubs - Brighton 500 kV | AP-PEPCO | 1.2 | 8.7 | 3.0 |
| | | 3600 | 600 | 4200 | -100 | 3500 | 2 | Mount Storm - Doubs 500 kV | VP-AP | 2330 | Mount Storm - Meadow Brook 500 kV | VP-AP | 11.5 | 35.0 | 13.8 |
| ECAR to VACAR | E100 | 2050 | 0 | 2050 | 400 | 2450 | | Hatfield - Black Oak 500 kV (Voltage) | AP | 2265 | Pruntytown - Mount Storm 500 kV | AP-VP | 5.9 | 26.8 | 10.6 |
| | | 4050 | 0 | 4050 | 400 | 4450 | 3 | Kanawha - Matt Funk 345 kV (Voltage) | AEP | 1040 | Broadford - Jackson Ferry 765 kV<br>Broadford 138 kV Series Reactor Inserted | AEP<br>AEP | 5.8 | 14.9 | 9.6 |
| | | 4550 | 0 | 4550 | 400 | 4950 | | Pruntytown - Mount Storm 500 kV | AP-VP | 3326 | Black Oak - Bedington 500 kV | AP | 19.3 | 44.6 | 22.6 |
| | | 4900 | 0 | 4900 | 400 | 5300 | | Black Oak - Bedington 500 kV | AP | 2783 | Pruntytown - Mount Storm 500 kV | AP-VP | 7.3 | 31.1 | 13.4 |
| | | 5000 | 0 | 5000 | 400 | 5400 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | 3350 | -50 | 3300 | 50 | 3400 | | Bedington - Doubs 500 kV (Voltage) | AP | 1590 | Pruntytown - Mount Storm 500 kV | AP-VP | 6.4 | 26.1 | 10.6 |
| | | 4300 | -50 | 4250 | 50 | 4350 | | Leesville - Altavista 138 kV | AEP-VP | 209 | Base Case | ----- | 2.7 | ----- | ----- |
| | | 4000 | -50 | 3950 | 50 | 4050 | | Test Level - No Other Limits Found | | | | | | | |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ECAR to TVA | E100 | 4200 | -300 | 3900 | -1650 | 2550 | | Clinch R - Spring Ck - N Bristol 138 kV | AEP | 239 | Broadford 765-500 kV & Broadford - Sullivan 500 kV | AEP AEP-TVA | 1.9 | 7.5 | 3.4 |
| | | 5000 | -300 | 4700 | -1650 | 3350 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | 2550 | -400 | 2150 | -1150 | 1400 | 2 | River Queen - Earlington North 161 kV | LGEE | 184 | Green R - Corydon - Morganfield 161 kV & Corydon 161-69 kV | LGEE LGEE | 2.4 | ----- | 2.8 |
| | | 2850 | -400 | 2450 | -1150 | 1700 | 2 | Reid - Hopkins County - Barkley 161 kV | BREC-TVA | 265 | Wilson - Green River 161 kV | BREC-LGEE | 3.9 | 25.6 | 4.7 |
| | | 2900 | -400 | 2500 | -1150 | 1750 | 2 | Brown - Danville North - Lebanon 138 kV | LGEE | 182 | Brown - Alcalde - Pineville 345 kV & Alcalde 345-138 kV | LGEE LGEE | 2.2 | ----- | 2.8 |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ECAR to TVA | E104 | 900 | -300 | 600 | 2300 | 3200 | | Clinch R - Spring Ck - N Bristol 138 kV | AEP | 239 | Broadford 765-500 kV & Broadford - Sullivan 500 kV | AEP AEP-TVA | 1.9 | 7.5 | 3.4 |
| | | 2000 | -300 | 1700 | 2300 | 4300 | 2,3 | Kanawha - Matt Funk 345 kV (Voltage) | AEP | 1010 | Baker - Broadford 765 kV | AEP | 2.8 | 12.7 | 5.5 |
| | | 2650 | -300 | 2350 | 2300 | 4950 | 2 | Brown - Alcalde 345 kV | LGEE | 956 | Baker - Broadford 765 kV | AEP | 6.2 | 6.9 | 7.6 |
| | | 2650 | -300 | 2350 | 2300 | 4950 | | North Bristol - North Bristol 138 kV | AEP-TVA | 260 | Broadford 765-500 kV & Broadford - Sullivan 500 kV | AEP AEP-TVA | 1.4 | 7.5 | 2.7 |
| | | 2950 | -300 | 2650 | 2300 | 5250 | 2 | New Hardinsburg 138-161 kV | BREC | 224 | Coleman - National Aluminum 161 kV | BREC | 2.6 | 77.2 | 3.4 |
| | | 3200 | -300 | 2900 | 2300 | 5500 | | Brown 138-345 kV | LGEE | 515 | Ghent-West Lexington-Brown 345 kV & West Lexington 345-138 kV | LGEE LGEE | 3.6 | ----- | 5.6 |
| | | 3350 | -300 | 3050 | 2300 | 5650 | 2 | Broadford 765-500 kV or Broadford - Sullivan 500 kV | AEP AEP-TVA | 1920 1920 | Broadford - Jacksons Ferry 765 kV & Broadford 138 kV Series Reactor Inserted | AEP AEP | 17.4 | 28.9 | 18.5 |
| | | 3950 | -300 | 3650 | 2300 | 6250 | | Reid - Hopkins County - Barkley 161 kV | BREC-TVA | 265 | Wilson - Green River 161 kV | BREC-LGEE | 2.7 | 23.3 | 3.3 |
| | | 3950 | -300 | 3650 | 2300 | 6250 | 2 | Pineville - Pocket 500 kV or Pineville 345-500 kV | LGEE LGEE | 550 580 | Baker - Broadford 765 kV | AEP | 3.9 | 7.1 | 5.4 |
| | | 4000 | -300 | 3700 | 2300 | 6300 | 2 | Pineville - Pineville 161 kV | LGEE-TVA | 242 | Pocket - Phipps Bend 500 kV | LGEE-TVA | 1.2 | 30.1 | 2.9 |
| | | 4200 | -300 | 3900 | 2300 | 6500 | | Wolf Hills - Orebank 138 kV | AEP | 239 | Broadford 765-500 kV & Broadford - Sullivan 500 kV | AEP AEP-TVA | 1.3 | 6.2 | 2.8 |
| | | 5000 | -300 | 4700 | 2300 | 7300 | | Test Level - 5 Other Limits Found | Note: Michigan-Ontario PARs @ Minimum Degrees Fixed Angle (Flow into Michigan is 2610 MW) | | | | | | |
| | 2000S Top 3 Limits | 850 | -400 | 450 | 2800 | 3650 | 2 | Brown - Danville North - Lebanon 138 kV | LGEE | 182 | Brown - Alcalde - Pineville 345 kV & Alcalde 345-138 kV | LGEE LGEE | 2.2 | ----- | 2.8 |
| | | 1450 | -400 | 1050 | 2800 | 4250 | | Lebanon - Marion County 161 kV or Marion County 138-161 kV | LGEE-EKPC EKPC | 167 167 | Brown - Alcalde - Pineville 345 kV & Alcalde 345-138 kV | LGEE LGEE | 1.9 | ----- | 2.6 |
| | | 1550 | -400 | 1150 | 2800 | 4350 | 2 | River Queen - Earlington North 161 kV | LGEE | 184 | Green R - Corydon - Morganfield 161 kV & Corydon 161-69 kV | LGEE LGEE | 2.4 | ----- | 2.8 |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ECAR to MAIN | E100 | 4050 | -100 | 3950 | 0 | 4050 | | Breed - Casey 345 kV | AEP-AMRN | 1442 | Rockport - Jefferson 765 kV | AEP | 14.9 | 34.0 | 11.7 |
| | | 4350 | -100 | 4250 | 0 | 4350 | | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 5.2 | 39.0 | 11.0 |
| | | 5000 | -100 | 4900 | 0 | 5000 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | 3450 | -100 | 3350 | 550 | 4000 | | Breed - Casey 345 kV | AEP-AMRN | 1442 | Rockport - Jefferson 765 kV | AEP | 16.0 | 34.2 | 12.5 |
| | | 3800 | -100 | 3700 | 550 | 4350 | | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 5.4 | 39.5 | 11.8 |
| | | 4000 | -100 | 3900 | 550 | 4550 | | Test Level - No Other Limits Found | | | | | | | |
| ECAR to MAIN | E103a | 4450 | -100 | 4350 | 950 | 5400 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.7 |
| | | 4700 | -100 | 4600 | 950 | 5650 | | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 5.2 | 39.0 | 11.0 |
| | | 4850 | -100 | 4750 | 950 | 5800 | | Breed - Casey 345 kV | AEP-AMRN | 1442 | Rockport - Jefferson 765 kV | AEP | 14.9 | 34.0 | 11.7 |
| | | 5000 | -100 | 4900 | 950 | 5950 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 & 3 / Palisades 1 / Cook 1 | | | | | | |
| | 2000S Top 3 Limits | 2200 | -100 | 2100 | 2550 | 4750 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.6 |
| | | 3400 | -100 | 3300 | 2550 | 5950 | | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 5.4 | 39.5 | 11.8 |
| | | 3700 | -100 | 3600 | 2550 | 6250 | | Dumont 765-345 kV | AEP | 2070 | Dumont - Wilton Center 765 kV | AEP-CE | 0.4 | 42.0 | 11.1 |
| ECAR to MAIN | E103b | 4500 | -100 | 4400 | 1050 | 5550 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.7 |
| | | 4700 | -100 | 4600 | 1050 | 5750 | | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 5.2 | 39.0 | 11.0 |
| | | 4850 | -100 | 4750 | 1050 | 5900 | | Breed - Casey 345 kV | AEP-AMRN | 1442 | Rockport - Jefferson 765 kV | AEP | 14.9 | 34.0 | 11.7 |
| | | 5000 | -100 | 4900 | 1050 | 6050 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 & 3 / Palisades 1 / Davis-Besse 1 | | | | | | |
| | 2000S Top 3 Limits | 2200 | -100 | 2100 | 2550 | 4750 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.6 |
| | | 3400 | -100 | 3300 | 2550 | 5950 | | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 5.4 | 39.5 | 11.8 |
| | | 3700 | -100 | 3600 | 2550 | 6250 | | Dumont 765-345 kV | AEP | 2070 | Dumont - Wilton Center 765 kV | AEP-CE | 0.4 | 42.0 | 11.1 |

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## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAAC to MECS | E100 | 2900 | 0 | 2900 | 300 | 3200 | 3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 10.5 | 51.9 | 19.3 |
| | | 3650 | 0 | 3650 | 300 | 3950 | 3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 16.9 | 42.7 | 21.4 |
| | | 4150 | 0 | 4150 | 300 | 4450 | | Muskingum - Ohio Central 345 kV | AEP | 938 | Base Case | ----- | 5.2 | ----- | 5.2 |
| | | 4300 | 0 | 4300 | 300 | 4600 | | Greenfield - Lakeview 138 kV | FE | 248 | Beaver - Davis Besse 345 kV | FE | 3.4 | 12.6 | 5.7 |
| | | 4400 | 0 | 4400 | 300 | 4700 | | Marysville - East Lima 345 kV | AEP | 923 | Base Case | ----- | 7.6 | ----- | 7.6 |
| | | 4850 | 0 | 4850 | 300 | 5150 | | Twin Branch - Argenta 345 kV | AEP-CONS | 1434 | Cook - Palisades 345 kV &<br>Cook-Benton Harbor-Palisades 345 kV &<br>Benton Harbor 345-138 kV | AEP-CONS<br>AEP-CONS<br>AEP | 9.9 | ----- | 23.1 |
| | | 4850 | 0 | 4850 | 300 | 5150 | | Muskingum - Ohio Central 345 kV | AEP | 1076 | Muskingum - W. Millersport 345 kV &<br>W. Millersport 345-138 kV | AEP<br>AEP | 5.2 | ----- | 5.5 |
| | | 4950 | 0 | 4950 | 300 | 5250 | | Cook - Palisades 345 kV | AEP-CONS | 1554 | Cook-Benton Harbor-Palisades 345 kV &<br>Benton Harbor 345-138 kV | AEP-CONS<br>AEP | 15.6 | ----- | 26.7 |
| | | 4950 | 0 | 4950 | 300 | 5250 | | Cook - Benton Harbor - Palisades 345 kV | AEP-CONS | 1554 | Cook - Palisades 345 kV | AEP-CONS | 14.5 | 65.7 | 23.4 |
| | | 5000 | 0 | 5000 | 300 | 5300 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Lambton Generation Rejection was modeled for outages involving the L4D and L51D tielines<br>Note (c): Maple - Krendale 138 kV (FE-AP) circuit opened at FCITC = 2100 MW | | | | | | |
| | 2000S Top 3 Limits | | | | | | | (Not Tested During 2000 Summer Study) | | | | | | | |

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## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAAC to MECS | E103a | -650 | 0 | -650 | 2300 | 1650 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 10.4 | 51.9 | 18.7 |
| | | -150 | 0 | -150 | 2300 | 2150 | 2,3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 15.9 | 42.7 | 20.3 |
| | | 1050 | 0 | 1050 | 2300 | 3350 | 2 | Muskingum - Ohio Central 345 kV | AEP | 938 | Base Case | ----- | 5.3 | ----- | 5.3 |
| | | 1750 | 0 | 1750 | 2300 | 4050 | | Marysville - East Lima 345 kV | AEP | 923 | Base Case | ----- | 7.8 | ----- | 7.8 |
| | | 1800 | 0 | 1800 | 2300 | 4100 | | Muskingum - Ohio Central 345 kV | AEP | 1076 | Muskingum - W. Millersport 345 kV & W. Millersport 345-138 kV | AEP AEP | 5.3 | ----- | 5.6 |
| | | 1950 | 0 | 1950 | 2300 | 4250 | 3 | Cook 765-345 kV | AEP | 1875 | Base Case | ----- | 15.9 | ----- | 15.9 |
| | | 2050 | 0 | 2050 | 2300 | 4350 | | Greenfield - Lakeview 138 kV | FE | 248 | Beaver - Davis Besse 345 kV | FE | 3.5 | 12.7 | 5.9 |
| | | 2600 | 0 | 2600 | 2300 | 4900 | 2 | Beaver - Davis Besse 345 kV | FE | 984 | Galion - Fostoria Central 345 kV | AEP | 18.9 | 20.0 | 20.9 |
| | | 2650 | 0 | 2650 | 2300 | 4950 | | Marysville - East Lima 345 kV | AEP | 1220 | Marysville - Southwest Lima 345 kV | AEP | 7.8 | 32.8 | 9.2 |
| | | 2750 | 0 | 2750 | 2300 | 5050 | | Fostoria Central - Lemoyne 345 kV | AEP | 1076 | Davis Besse - Lemoyne 345 kV | FE | 11.6 | 46.2 | 14.4 |
| | | 2950 | 0 | 2950 | 2300 | 5250 | | Greenfield - Lakeview 138 kV | FE | 184 | Base Case | ----- | 3.5 | ----- | 3.5 |
| | | 3000 | 0 | 3000 | 2300 | 5300 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 & 3 / Palisades 1 / Cook 1<br>Note (c): Lambton Generation Rejection was modeled for outages involving the L4D and L51D tielines | | | | | | |
| | 2000S Top 3 Limits | -900 | 0 | -900 | 2500 | 1600 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 10.6 | 52.0 | 19.1 |
| | | -500 | 0 | -500 | 2500 | 2000 | 2,3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 16.3 | 42.8 | 20.8 |
| | | 1300 | 0 | 1300 | 2500 | 3800 | | Marysville - East Lima 345 kV | AEP | 923 | Base Case | ----- | 7.8 | ----- | ----- |

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| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAAC to MECS | E103b | 350 | 0 | 350 | 2300 | 2650 | | Muskingum - Ohio Central 345 kV | AEP | 938 | Base Case | ----- | 5.3 | ----- | 5.3 |
| | | 400 | 0 | 400 | 2300 | 2700 | 3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 10.4 | 51.9 | 18.7 |
| | | 1100 | 0 | 1100 | 2300 | 3400 | 2 | Muskingum - Ohio Central 345 kV | AEP | 1076 | Muskingum - W. Millersport 345 kV & W. Millersport 345-138 kV | AEP AEP | 5.3 | ----- | 5.6 |
| | | 1150 | 0 | 1150 | 2300 | 3450 | | Marysville - East Lima 345 kV | AEP | 923 | Base Case | ----- | 7.8 | ----- | 7.8 |
| | | 1200 | 0 | 1200 | 2300 | 3500 | 3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 15.9 | 42.7 | 20.3 |
| | | 1500 | 0 | 1500 | 2300 | 3800 | | Greenfield - Lakeview 138 kV | FE | 248 | Beaver - Davis Besse 345 kV | FE | 3.5 | 12.7 | 5.9 |
| | | 1600 | 0 | 1600 | 2300 | 3900 | 2 | Beaver - Davis Besse 345 kV | FE | 984 | Galion - Fostoria Central 345 kV | AEP | 18.9 | 20.0 | 20.9 |
| | | 2000 | 0 | 2000 | 2300 | 4300 | | Marysville - East Lima 345 kV | AEP | 1220 | Marysville - Southwest Lima 345 kV | AEP | 7.8 | 32.8 | 9.2 |
| | | 2100 | 0 | 2100 | 2300 | 4400 | | Beaver - Davis Besse 345 kV | FE | 950 | Base Case | ----- | 18.9 | ----- | 18.9 |
| | | 2250 | 0 | 2250 | 2300 | 4550 | | South Canton - Star 345 kV | AEP-FE | 1076 | Sammis - Star 345 kV | FE | 2.6 | 39.0 | 4.2 |
| | | 2550 | 0 | 2550 | 2300 | 4850 | 2 | Fostoria Central - Lemoyne 345 kV | AEP-FE | 1076 | Fostoria Central - Bay Shore 345 kV | AEP-FE | 11.6 | 60.4 | 17.8 |
| | | 2650 | 0 | 2650 | 2300 | 4950 | | Twin Branch - Argenta 345 kV | AEP-CONS | 1434 | Cook - Palisades 345 kV & Cook-Benton Harbor-Palisades 345 kV & Benton Harbor 345-138 kV | AEP-CONS AEP-CONS AEP | 10.8 | ----- | 22.7 |
| | | 2750 | 0 | 2750 | 2300 | 5050 | | Greenfield - Lakeview 138 kV | FE | 184 | Base Case | ----- | 3.5 | ----- | 3.5 |
| | | 2750 | 0 | 2750 | 2300 | 5050 | | Carlisle 345-138 kV | FE | 505 | Carlisle - Beaver 345 kV | FE | 0.3 | 37.6 | 3.2 |
| | | 2800 | 0 | 2800 | 2300 | 5100 | | Cook - Benton Harbor - Palisades 345 kV | AEP-CONS | 1554 | Cook - Palisades 345 kV | AEP-CONS | 13.1 | 65.7 | 21.1 |
| | | 2800 | 0 | 2800 | 2300 | 5100 | | Cook - Palisades 345 kV | AEP-CONS | 1554 | Cook-Benton Harbor-Palisades 345 kV & Benton Harbor 345-138 kV | AEP-CONS AEP | 14.0 | ----- | 24.0 |
| | | 2850 | 0 | 2850 | 2300 | 5150 | | Lorain - Johnson 138 kV | FE | 215 | Star - Carlisle 345 kV | FE | 1.8 | 9.2 | 2.5 |
| | | 3000 | 0 | 3000 | 2300 | 5300 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 & 3 / Palisades 1 / Davis-Besse 1<br>Note (c): Lambton Generation Rejection was modeled for outages involving the L4D and L51D tielines | | | | | | |
| | 2000S Top 3 Limits | -900 | 0 | -900 | 2500 | 1600 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 10.6 | 52.0 | 19.1 |
| | | -500 | 0 | -500 | 2500 | 2000 | 2,3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 16.3 | 42.8 | 20.8 |
| | | 1300 | 0 | 1300 | 2500 | 3800 | | Marysville - East Lima 345 kV | AEP | 923 | Base Case | ----- | 7.8 | ----- | ----- |

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| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VACAR to MECS | E100 | 2900 | 0 | 2900 | 300 | 3200 | 3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 10.1 | 51.9 | 19.1 |
| | | 3600 | 0 | 3600 | 300 | 3900 | 3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 17.3 | 42.7 | 21.6 |
| | | 4000 | 0 | 4000 | 300 | 4300 | | Muskingum - Ohio Central 345 kV | AEP | 938 | Base Case | ----- | 5.4 | ----- | 5.4 |
| | | 4450 | 0 | 4450 | 300 | 4750 | | Marysville - East Lima 345 kV | AEP | 923 | Base Case | ----- | 7.5 | ----- | 7.5 |
| | | 4450 | 0 | 4450 | 300 | 4750 | | East Danville - Danville 138 kV | AEP | 384 | Antioch - Jacksons Ferry 500 kV & Jacksons Ferry 500-765 kV | DUKE-AEP AEP | 4.5 | 15.1 | 7.9 |
| | | 4550 | 0 | 4550 | 300 | 4850 | | Twin Branch - Argenta 345 kV | AEP-CONS | 1434 | Cook - Palisades 345 kV & Cook-Benton Harbor-Palisades 345 kV & Benton Harbor 345-138 kV | AEP-CONS AEP-CONS AEP | 10.6 | ----- | 24.5 |
| | | 4700 | 0 | 4700 | 300 | 5000 | | Cook - Palisades 345 kV | AEP-CONS | 1554 | Cook-Benton Harbor-Palisades 345 kV & Benton Harbor 345-138 kV | AEP-CONS AEP | 16.3 | ----- | 27.9 |
| | | 4750 | 0 | 4750 | 300 | 5050 | | Cook - Benton Harbor - Palisades 345 kV | AEP-CONS | 1554 | Cook - Palisades 345 kV | AEP-CONS | 15.2 | 65.7 | 24.5 |
| | | 4800 | 0 | 4800 | 300 | 5100 | | Muskingum - Ohio Central 345 kV | AEP | 1076 | Muskingum - W. Millersport 345 kV & W. Millersport 345-138 kV | AEP AEP | 5.4 | ----- | 5.6 |
| | | 5000 | 0 | 5000 | 300 | 5300 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Lambton Generation Rejection was modeled for outages involving the L4D and L51D tielines | | | | | | |
| | 2000S Top 3 Limits | | | | | | | (Not Tested During 2000 Summer Study) | | | | | | | |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VACAR to MECS | E101a | -2400 | 0 | -2400 | 1800 | -600 | 2 | Beck - Hannon Jct (Q24HM) 220 kV | HONI | 616 | Beck - Neale Jct (Q25BM) 220 kV &<br>Beck - Hannon Jct (Q29HM) 220 kV | HONI<br>HONI | 2.7 | ----- | 4.0 |
| | | -1600 | 0 | -1600 | 1800 | 200 | 2,3 | Scott - Bunce (B3N) 220 kV | HONI-DECO | 482 | Lambton - Saint Clair (L4D) 345 kV &<br>Saint Clair - Belle River 345 kV &<br>Lambton Generation Rejection | HONI-DECO<br>DECO<br>HONI | 1.7 | ----- | 3.2 |
| | | -900 | 0 | -900 | 1800 | 900 | 3 | Lambton - Saint Clair (L4D) 345 kV | HONI-DECO | 845 | Base Case | ----- | 5.9 | ----- | 5.9 |
| | | -550 | 0 | -550 | 1800 | 1250 | 2,3 | Lambton - Saint Clair (L4D) 345 kV | HONI-DECO | 1170 | Lambton - Saint Clair (L51D) 345 kV &<br>Lambton - Chatham (L29C) 230 kV &<br>Lambton Generation Rejection | HONI-DECO<br>HONI<br>HONI | 5.9 | ----- | 8.7 |
| | | -400 | 0 | -400 | 1800 | 1400 | 3 | Lambton - Saint Clair (L51D) 345 kV | HONI-DECO | 845 | Base Case | ----- | 5.3 | ----- | 5.3 |
| | | -150 | 0 | -150 | 1800 | 1650 | | Beck - Hannon Jct (Q24HM) 220 kV | HONI | 465 | Base Case | ----- | 2.7 | ----- | 2.7 |
| | | 100 | 0 | 100 | 1800 | 1900 | 2,3 | Lambton - Saint Clair (L51D) 345 kV | HONI-DECO | 1170 | Lambton - Saint Clair (L4D) 345 kV &<br>Lambton Generation Rejection | HONI-DECO<br>HONI | 5.3 | 54.9 | 8.5 |
| | | 2300 | 0 | 2300 | 1800 | 4100 | | Allanburg Jct - Middleport (Q30M) 220 kV | HONI | 408 | Base Case | ----- | 2.6 | ----- | 2.6 |
| | | 2400 | 0 | 2400 | 1800 | 4200 | | Packard - Beck (PA27) 220 kV | HONI | 400 | Base Case | ----- | 2.9 | ----- | 2.9 |
| | | 2450 | 0 | 2450 | 1800 | 4250 | | Beck - Hannon Jct (Q29HM) 220 kV | HONI | 530 | Base Case | ----- | 2.7 | ----- | 2.7 |
| | | 2600 | 0 | 2600 | 1800 | 4400 | 3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 8.8 | 51.9 | 16.4 |
| | | 3500 | 0 | 3500 | 1800 | 5300 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ Minimum Degrees Fixed Angle (Flow into Michigan is 2430 MW)<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 and Palisades 1<br>Note (c): Lambton Generation Rejection was modeled for outages involving the L4D and L51D tielines<br>Note (d): St. Clair Unit 6 moved to 120 kV system<br>Note (e): Additional QFW facilities limit under contingency conditions, but are not shown for brevity | | | | | | |
| | 2000S Top 3 Limits | 650 | 200 | 850 | 2000 | 2650 | 3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 10.1 | 52.0 | 18.7 |
| | | 1200 | 200 | 1400 | 2000 | 3200 | 3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 16.5 | 42.8 | 20.9 |
| | | 1900 | 200 | 2100 | 2000 | 3900 | 2 | East Danville - Danville 138 kV | AEP | 384 | Axton - Jacksons Ferry 765 kV &<br>Axton 138-765 kV | AEP<br>AEP | 6.1 | 56.5 | 3.1 |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VACAR to MECS | E101b | 1650 | 0 | 1650 | 1800 | 3450 | 3 | Lambton - Saint Clair (L4D) 345 kV | HONI-DECO | 845 | Base Case | ----- | 6.6 | ----- | 6.6 |
| | | 1700 | 0 | 1700 | 1800 | 3500 | 2 | Beck - Hannon Jct (Q24HM) 220 kV | HONI | 616 | Beck - Neale Jct (Q25BM) 220 kV &<br>Beck - Hannon Jct (Q29HM) 220 kV | HONI<br>HONI | 2.7 | ----- | 4.1 |
| | | 2100 | 0 | 2100 | 1800 | 3900 | 3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 8.8 | 51.9 | 16.3 |
| | | 2150 | 0 | 2150 | 1800 | 3950 | 2,3 | Lambton - Saint Clair (L4D) 345 kV | HONI-DECO | 1170 | Lambton - Saint Clair (L51D) 345 kV &<br>Lambton - Chatham (L29C) 230 kV &<br>Lambton Generation Rejection | HONI-DECO<br>HONI<br>HONI | 6.6 | ----- | 10.0 |
| | | 2450 | 0 | 2450 | 1800 | 4250 | 3 | Scott - Bunce (B3N) 220 kV | HONI-DECO | 482 | Lambton - Saint Clair (L4D) 345 kV &<br>Saint Clair - Belle River 345 kV &<br>Lambton Generation Rejection | HONI-DECO<br>DECO<br>HONI | 1.5 | ----- | 3.3 |
| | | 3100 | 0 | 3100 | 1800 | 4900 | 3 | Lambton - Saint Clair (L51D) 345 kV | HONI-DECO | 1170 | Lambton - Saint Clair (L4D) 345 kV &<br>Lambton Generation Rejection | HONI-DECO<br>HONI | 5.6 | 62.8 | 9.7 |
| | | 3350 | 0 | 3350 | 1800 | 5150 | 3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 14.5 | 42.7 | 18.2 |
| | | 3500 | 0 | 3500 | 1800 | 5300 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ Zero Degrees Fixed Angle (Flow into Michigan is 1890 MW)<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 and Palisades 1<br>Note (c): Lambton Generation Rejection was modeled for outages involving the L4D and L51D tielines<br>Note (d): St. Clair Unit 6 moved to 120 kV system<br>Note (e): Additional QFW facilities limit under contingency conditions, but are not shown for brevity | | | | | |
| | 2000S Top 3 Limits | 550 | 200 | 750 | 2000 | 2550 | 3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 8.9 | 52.0 | 16.5 |
| | | 1200 | 200 | 1400 | 2000 | 3200 | 3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 14.7 | 42.8 | 18.5 |
| | | 1900 | 200 | 2100 | 2000 | 3900 | 2 | East Danville - Danville 138 kV | AEP | 384 | Axton - Jacksons Ferry 765 kV &<br>Axton 138-765 kV | AEP<br>AEP | 5.9 | 56.5 | 3.0 |

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## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VACAR to MECS | E101c | 1400 | 0 | 1400 | 1800 | 3200 | 3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 8.9 | 51.9 | 16.4 |
| | | 2650 | 0 | 2650 | 1800 | 4450 | 3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 14.6 | 42.7 | 18.3 |
| | | 2750 | 0 | 2750 | 1800 | 4550 | | Muskingum - Ohio Central 345 kV | AEP | 938 | Base Case | ----- | 4.9 | ----- | 4.9 |
| | | 3450 | 0 | 3450 | 1800 | 5250 | | East Danville - Danville 138 kV | AEP | 384 | Antioch - Jacksons Ferry 500 kV & Jacksons Ferry 500-765 kV | DUKE-AEP AEP | 4.4 | 15.1 | 7.7 |
| | | 3500 | 0 | 3500 | 1800 | 5300 | | Marysville - East Lima 345 kV | AEP | 923 | Base Case | ----- | 6.8 | ----- | 6.8 |
| | | 3500 | 0 | 3500 | 1800 | 5300 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ Maximum Degrees Fixed Angle (Flow into Michigan is 1220 MW)<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 and Palisades 1<br>Note (c): Lambton Generation Rejection was modeled for outages involving the L4D and L51D tielines | | | | | | |
| | 2000S Top 3 Limits | -100 | 200 | 100 | 2000 | 1900 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 9.0 | 52.0 | 16.7 |
| | | 550 | 200 | 750 | 2000 | 2550 | 2,3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 14.8 | 42.8 | 18.6 |
| | | 1800 | 200 | 2000 | 2000 | 3800 | 2 | East Danville - Danville 138 kV | AEP | 384 | Axton - Jacksons Ferry 765 kV & Axton 138-765 kV | AEP AEP | 5.9 | 56.5 | 3.0 |

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## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TVA to MECS | E100 | 2800 | 0 | 2800 | 300 | 3100 | | Norris - La Follette 161 kV | TVA | 234 | Volunteer - Phipps Bend 500 kV | TVA | 1.8 | 6.2 | 2.9 |
| | | 2900 | 0 | 2900 | 300 | 3200 | | Summer Shade-Summer Shade Tap 161 | TVA-EKPC | 240 | Summer Shade - Summer Shade 161 kV | TVA-EKPC | 2.1 | 99.6 | 3.7 |
| | | 3200 | 0 | 3200 | 300 | 3500 | 3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 8.5 | 51.9 | 17.4 |
| | | 3500 | 0 | 3500 | 300 | 3800 | | Bull Run - Volunteer 500 kV | TVA | 1732 | Watts Bar - Volunteer 500 kV | TVA | 12.8 | 75.6 | 17.1 |
| | | 3750 | 0 | 3750 | 300 | 4050 | 3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 17.1 | 42.7 | 20.7 |
| | | 4200 | 0 | 4200 | 300 | 4500 | | New London - Webster 230 kV | CIN | 495 | Jefferson - Greentown 765 kV | AEP | 2.0 | 10.7 | 3.2 |
| | | 4300 | 0 | 4300 | 300 | 4600 | | Twin Branch - Argenta 345 kV | AEP-CONS | 1434 | Cook - Palisades 345 kV &<br>Cook-Benton Harbor-Palisades 345 kV &<br>Benton Harbor 345-138 kV | AEP-CONS<br>AEP-CONS<br>AEP | 11.4 | ----- | 26.0 |
| | | 4450 | 0 | 4450 | 300 | 4750 | | Muskingum - Ohio Central 345 kV | AEP | 938 | Base Case | ----- | 4.8 | ----- | 4.8 |
| | | 4500 | 0 | 4500 | 300 | 4800 | | Cook - Palisades 345 kV | AEP-CONS | 1554 | Cook-Benton Harbor-Palisades 345 kV &<br>Benton Harbor 345-138 kV | AEP-CONS<br>AEP | 17.1 | ----- | 29.4 |
| | | 4500 | 0 | 4500 | 300 | 4800 | | Cook - Benton Harbor - Palisades 345 kV | AEP-CONS | 1554 | Cook - Palisades 345 kV | AEP-CONS | 15.9 | 65.7 | 25.7 |
| | | 4650 | 0 | 4650 | 300 | 4950 | | Paradise - New Hardinsburg 161 kV | TVA-BREC | 265 | Volunteer - Phipps Bend 500 kV | TVA | 3.5 | 2.3 | 3.9 |
| | | 4950 | 0 | 4950 | 300 | 5250 | | Marysville - East Lima 345 kV | AEP | 923 | Base Case | ----- | 6.7 | ----- | 6.7 |
| | | 5000 | 0 | 5000 | 300 | 5300 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Lambton Generation Rejection was modeled for outages involving the L4D and L51D tielines | | | | | | |
| | 2000S Top 3 Limits | | | | | | | (Not Tested During 2000 Summer Study) | | | | | | | |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAIN to MECS | E100 | 3450 | 0 | 3450 | 300 | 3750 | 2,3 | State Line - Wolf Lake - Sheffield 138 kV | CE-NIPS | 160 | Burnham - Sheffield 345 kV | CE-NIPS | 1.8 | 23.3 | 2.8 |
| | | 3900 | 0 | 3900 | 300 | 4200 | | Twin Branch - Argenta 345 kV | AEP-CONS | 1434 | Cook - Palisades 345 kV & Cook-Benton Harbor-Palisades 345 kV & Benton Harbor 345-138 kV | AEP-CONS AEP-CONS AEP | 12.8 | ----- | 28.7 |
| | | 4000 | 0 | 4000 | 300 | 4300 | 3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 5.2 | 51.9 | 13.9 |
| | | 4100 | 0 | 4100 | 300 | 4400 | 3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 16.8 | 42.7 | 19.0 |
| | | 4150 | 0 | 4150 | 300 | 4450 | | Cook - Palisades 345 kV | AEP-CONS | 1554 | Cook-Benton Harbor-Palisades 345 kV & Benton Harbor 345-138 kV | AEP-CONS AEP | 18.5 | ----- | 31.9 |
| | | 4150 | 0 | 4150 | 300 | 4450 | | Cook - Benton Harbor - Palisades 345 kV | AEP-CONS | 1554 | Cook - Palisades 345 kV | AEP-CONS | 21.7 | 65.7 | 33.9 |
| | | 4600 | 0 | 4600 | 300 | 4900 | | Olive 345-138 kV | AEP | 544 | Olive - Cook 345 kV | AEP | 1.4 | 15.3 | 3.5 |
| | | 4850 | 0 | 4850 | 300 | 5150 | | Dune Acres - Michigan City 138 kV | NIPS | 157 | Wilton Center - Dumont 765 kV | CE-AEP | 1.6 | 3.2 | 2.5 |
| | | 5000 | 0 | 5000 | 300 | 5300 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Lambton Generation Rejection was modeled for outages involving the L4D and L51D tielines | | | | | | |
| | 2000S Top 3 Limits | | | | | | | (Not Tested During 2000 Summer Study) | | | | | | | |

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## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAIN to MECS | E102 | -50 | 0 | -50 | 300 | 250 | 2,3 | State Line - Wolf Lake - Sheffield 138 kV | CE-NIPS | 160 | Burnham - Sheffield 345 kV | CE-NIPS | 1.7 | 23.3 | 2.8 |
| | | 750 | 0 | 750 | 300 | 1050 | | Cumberland - Davidson 500 kV | TVA | 2597 | Cumberland - Johnsonville 500 kV | TVA | 3.4 | 75.7 | 3.5 |
| | | 1600 | 0 | 1600 | 300 | 1900 | | Dune Acres - Michigan City 138 kV | NIPS | 157 | Wilton Center - Dumont 765 kV | CE-AEP | 1.6 | 3.2 | 2.5 |
| | | 3200 | 0 | 3200 | 300 | 3500 | | Twin Branch - Argenta 345 kV | AEP-CONS | 1434 | Cook - Palisades 345 kV & Cook-Benton Harbor-Palisades 345 kV & Benton Harbor 345-138 kV | AEP-CONS | 12.8 | ----- | 28.7 |
| | | 3500 | 0 | 3500 | 300 | 3800 | | Olive 345-138 kV | AEP | 544 | Olive - Cook 345 kV | AEP | 1.4 | 15.3 | 3.5 |
| | | 3550 | 0 | 3550 | 300 | 3850 | 2 | Cook - Palisades 345 kV | AEP-CONS | 1554 | Cook-Benton Harbor-Palisades 345 kV & Benton Harbor 345-138 kV | AEP-CONS AEP | 18.5 | ----- | 31.9 |
| | | 3600 | 0 | 3600 | 300 | 3900 | 2 | Cook - Benton Harbor - Palisades 345 kV | AEP-CONS | 1554 | Cook - Palisades 345 kV | AEP-CONS | 21.7 | 65.7 | 33.9 |
| | | 4150 | 0 | 4150 | 300 | 4450 | | Cumberland - Johnsonville 500 kV | TVA | 2597 | Cumberland - Davidson 500 kV | TVA | 0.1 | 77.3 | 2.8 |
| | | 4600 | 0 | 4600 | 300 | 4900 | 3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 16.9 | 42.7 | 19.1 |
| | | 4850 | 0 | 4850 | 300 | 5150 | | Olive - Cook 345 kV | AEP | 1383 | Cook 765-345 kV | AEP | 13.9 | 35.0 | 19.8 |
| | | 4950 | 0 | 4950 | 300 | 5250 | | Cook - Palisades 345 kV | AEP | 1239 | Base Case | ----- | 18.5 | ----- | 18.5 |
| | | 5000 | 0 | 5000 | 300 | 5300 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Lambton Generation Rejection was modeled for outages involving the L4D and L51D tielines | | | | | | |
| | 2000S Top 3 Limits | -600 | 0 | -600 | 500 | -100 | | Cumberland - Johnsonville 500 kV | TVA | 2597 | Cumberland - Davidson 500 kV | TVA | 0.1 | 77.4 | 2.5 |
| | | -50 | 0 | -50 | 500 | 450 | 2,3 | State Line - Wolf Lake - Sheffield 138 kV | CE-NIPS | 160 | Burnham - Sheffield 345 kV | CE-NIPS | 2.0 | 23.4 | 3.2 |
| | | 250 | 0 | 250 | 500 | 750 | | Cumberland - Davidson 500 kV | TVA | 2597 | Cumberland - Johnsonville 500 kV | TVA | 3.4 | 76.2 | 3.3 |

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| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAIN to MECS | E103a | -900 | 0 | -900 | 2300 | 1400 | 3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 5.0 | 51.9 | 13.2 |
| | | -200 | 0 | -200 | 2300 | 2100 | 2,3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 15.8 | 42.7 | 18.0 |
| | | 1450 | 0 | 1450 | 2300 | 3750 | | Muskingum - Ohio Central 345 kV | AEP | 938 | Base Case | ----- | 3.9 | ----- | 3.9 |
| | | 2000 | 0 | 2000 | 2300 | 4300 | 3 | Cook 765-345 kV | AEP | 1875 | Base Case | ----- | 15.8 | ----- | 15.8 |
| | | 2350 | 0 | 2350 | 2300 | 4650 | | Marysville - East Lima 345 kV | AEP | 923 | Base Case | ----- | 5.8 | ----- | 5.8 |
| | | 2550 | 0 | 2550 | 2300 | 4850 | 2 | Muskingum - Ohio Central 345 kV | AEP | 1076 | Muskingum - W. Millersport 345 kV &<br>W. Millersport 345-138 kV | AEP<br>AEP | 3.9 | ----- | 3.9 |
| | | 2550 | 0 | 2550 | 2300 | 4850 | | Olive 345-138 kV | AEP | 544 | Olive - Cook 345 kV | AEP | 1.3 | 15.3 | 3.4 |
| | | 2750 | 0 | 2750 | 2300 | 5050 | | Twin Branch - Argenta 345 kV | AEP-CONS | 1434 | Cook - Palisades 345 kV &<br>Cook-Benton Harbor-Palisades 345 kV &<br>Benton Harbor 345-138 kV | AEP-CONS<br>AEP-CONS<br>AEP | 13.8 | ----- | 28.4 |
| | | 3000 | 0 | 3000 | 2300 | 5300 | | Morrow - Battle Creek 138 kV | CONS | 253 | Argenta - Battle Creek 345 kV &<br>Argenta - Tompkins 345 kV | CONS<br>CONS | 0.6 | ----- | 2.7 |
| | | 3000 | 0 | 3000 | 2300 | 5300 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 & 3 / Palisades 1 / Cook 1<br>Note (c): Lambton Generation Rejection was modeled for outages involving the L4D and L51D tielines | | | | | | |
| | 2000S Top 3 Limits | -1200 | 0 | -1200 | 2500 | 1300 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 5.4 | 52.0 | 14.0 |
| | | -550 | 0 | -550 | 2500 | 1950 | 2,3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 16.6 | 42.8 | 18.9 |
| | | 1600 | 0 | 1600 | 2500 | 4100 | | Cook 765-345 kV | AEP | 1875 | Base Case | ----- | 16.6 | ----- | ----- |

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## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAIN to MECS | E103b | 450 | 0 | 450 | 2300 | 2750 | | Muskingum - Ohio Central 345 kV | AEP | 938 | Base Case | ----- | 3.9 | ----- | 3.9 |
| | | 550 | 0 | 550 | 2300 | 2850 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 5.0 | 51.9 | 13.2 |
| | | 1350 | 0 | 1350 | 2300 | 3650 | 2,3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 15.8 | 42.7 | 18.0 |
| | | 1500 | 0 | 1500 | 2300 | 3800 | | Morrow - Battle Creek 138 kV | CONS | 253 | Argenta - Battle Creek 345 kV &<br>Argenta - Tompkins 345 kV | CONS<br>CONS | 0.6 | ----- | 2.8 |
| | | 1550 | 0 | 1550 | 2300 | 3850 | | Marysville - East Lima 345 kV | AEP | 923 | Base Case | ----- | 5.8 | ----- | 5.8 |
| | | 1600 | 0 | 1600 | 2300 | 3900 | 2 | Muskingum - Ohio Central 345 kV | AEP | 1076 | Muskingum - W. Millersport 345 kV &<br>W. Millersport 345-138 kV | AEP<br>AEP | 3.9 | ----- | 3.9 |
| | | 2100 | 0 | 2100 | 2300 | 4400 | | Twin Branch - Argenta 345 kV | AEP-CONS | 1434 | Cook - Palisades 345 kV &<br>Cook-Benton Harbor-Palisades 345 kV &<br>Benton Harbor 345-138 kV | AEP-CONS<br>AEP-CONS<br>AEP | 13.8 | ----- | 28.4 |
| | | 2300 | 0 | 2300 | 2300 | 4600 | | Cook - Palisades 345 kV | AEP-CONS | 1554 | Cook-Benton Harbor-Palisades 345 kV &<br>Benton Harbor 345-138 kV | AEP-CONS<br>AEP | 17.1 | ----- | 29.3 |
| | | 2300 | 0 | 2300 | 2300 | 4600 | | Cook - Benton Harbor - Palisades 345 kV | AEP-CONS | 1554 | Cook - Palisades 345 kV | AEP-CONS | 15.8 | 65.7 | 25.6 |
| | | 2400 | 0 | 2400 | 2300 | 4700 | | South Canton - Star 345 kV | AEP-FE | 1076 | Sammis - Star 345 kV | FE | 3.2 | 39.0 | 3.9 |
| | | 2650 | 0 | 2650 | 2300 | 4950 | | Fostoria Central - Lemoyne 345 kV | AEP-FE | 1076 | Fostoria Central - Bay Shore 345 kV | AEP-FE | 11.1 | 60.4 | 17.1 |
| | | 2800 | 0 | 2800 | 2300 | 5100 | | Greenfield - Lakeview 138 kV | FE | 248 | Beaver - Davis Besse 345 kV | FE | 1.9 | 12.7 | 3.2 |
| | | 2800 | 0 | 2800 | 2300 | 5100 | | Marysville - East Lima 345 kV | AEP | 1220 | Marysville - Southwest Lima 345 kV | AEP | 5.8 | 32.8 | 6.7 |
| | | 2850 | 0 | 2850 | 2300 | 5150 | 2 | Beaver - Davis Besse 345 kV | FE | 984 | East Lima - Fostoria Central 345 kV | AEP | 10.3 | 15.0 | 12.2 |
| | | 3000 | 0 | 3000 | 2300 | 5300 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 & 3 / Palisades 1 / Davis-Besse 1<br>Note (c): Lambton Generation Rejection was modeled for outages involving the L4D and L51D tielines | | | | | | |
| | 2000S Top 3 Limits | -1200 | 0 | -1200 | 2500 | 1300 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 5.4 | 52.0 | 14.0 |
| | | -550 | 0 | -550 | 2500 | 1950 | 2,3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 16.6 | 42.8 | 18.9 |
| | | 1600 | 0 | 1600 | 2500 | 4100 | | Cook 765-345 kV | AEP | 1875 | Base Case | ----- | 16.6 | ----- | ----- |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TVA to NE | E100 | 2750 | 0 | 2750 | 2200 | 4950 | 2 | Norris - La Follette 161 kV | TVA | 234 | Volunteer - Phipps Bend 500 kV | TVA | 1.7 | 6.2 | 2.9 |
| | | 3050 | 0 | 3050 | 2200 | 5250 | | Summer Shade-Summer Shade Tap 161 | TVA-EKPC | 240 | Summer Shade - Summer Shade 161 kV | TVA-EKPC | 2.0 | 99.7 | 3.5 |
| | | 3200 | 0 | 3200 | 2200 | 5400 | 2 | Bull Run - Volunteer 500 kV | TVA | 1732 | Watts Bar - Volunteer 500 kV | TVA | 13.9 | 75.6 | 18.6 |
| | | 3950 | 0 | 3950 | 2200 | 6150 | | South Canton 765-345 kV | AEP | 1660 | Base Case | ----- | 12.5 | ----- | ----- |
| | | 4550 | 0 | 4550 | 2200 | 6750 | 2 | South Canton 765-345 kV | AEP | 1890 | Tidd - Canton Central 345 kV | AEP | 12.5 | 27.5 | 12.5 |
| | | 4900 | 0 | 4900 | 2200 | 7100 | | Paradise - New Hardinsburg 161 kV | TVA-BREC | 265 | Volunteer - Phipps Bend 500 kV | TVA | 3.2 | 2.3 | 3.7 |
| | | 5050 | 0 | 5050 | 2200 | 7250 | | Kammer - West Bellaire 345 kV | AEP | 1023 | Kammer - South Canton 765 kV &<br>South Canton 765-345 kV | AEP<br>AEP | 7.3 | 21.8 | 10.0 |
| | | 5400 | 0 | 5400 | 2200 | 7600 | 2 | Bay Shore 345-138 kV | FE | 650 | Allen Junction 345-138 kV | FE | 3.4 | 31.8 | 4.2 |
| | | 5500 | 0 | 5500 | 2200 | 7700 | | Summer Shade - Summer Shade 161 kV | TVA-EKPC | 327 | Summer Shade-Summer Shade Tap 161 | TVA-EKPC | 1.6 | 99.6 | 3.5 |
| | | 5750 | 0 | 5750 | 2200 | 7950 | | New Hardinsburg 161-138 kV | BREC | 224 | Volunteer - Phipps Bend 500 kV | TVA-EKPC | 2.9 | 2.3 | 3.3 |
| | | 6000 | 0 | 6000 | 2200 | 8200 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | | | | | | | (Not Tested During 2000 Summer Study) | | | | | | | |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TVA to NE | E101a | 2850 | 0 | 2850 | 2200 | 5050 | 2 | Norris - La Follette 161 kV | TVA | 234 | Volunteer - Phipps Bend 500 kV | TVA | 1.7 | 6.2 | 2.9 |
| | | 2850 | 0 | 2850 | 2200 | 5050 | | Summer Shade-Summer Shade Tap 161 | TVA-EKPC | 240 | Summer Shade - Summer Shade 161 kV | TVA-EKPC | 2.0 | 99.7 | 3.5 |
| | | 3750 | 0 | 3750 | 2200 | 5950 | 2 | Bull Run - Volunteer 500 kV | TVA | 1732 | Watts Bar - Volunteer 500 kV | TVA | 13.9 | 75.6 | 18.5 |
| | | 4700 | 0 | 4700 | 2200 | 6900 | | Paradise - New Hardinsburg 161 kV | TVA-BREC | 265 | Volunteer - Phipps Bend 500 kV | TVA | 3.2 | 2.3 | 3.7 |
| | | 4900 | 0 | 4900 | 2200 | 7100 | | South Canton 765-345 kV | AEP | 1660 | Base Case | ----- | 12.5 | ----- | ----- |
| | | 5300 | 0 | 5300 | 2200 | 7500 | | Summer Shade - Summer Shade 161 kV | TVA-EKPC | 327 | Summer Shade-Summer Shade Tap 161 | TVA-EKPC | 1.6 | 99.6 | 3.5 |
| | | 5450 | 0 | 5450 | 2200 | 7650 | 2 | South Canton 765-345 kV | AEP | 1890 | Tidd - Canton Central 345 kV | AEP | 12.5 | 27.5 | 12.3 |
| | | 5450 | 0 | 5450 | 2200 | 7650 | | Coffeen - Pana 345 kV | AMRN | 952 | Rockport - Jefferrson 765 kV | AEP | 4.4 | 5.1 | 4.7 |
| | | 5650 | 0 | 5650 | 2200 | 7850 | 2 | Bay Shore 345-138 kV | FE | 650 | Allen Junction 345-138 kV | FE | 3.3 | 31.8 | 4.1 |
| | | 5850 | 0 | 5850 | 2200 | 8050 | | New Hardinsburg 161-138 kV | BREC | 224 | Coleman - Newtonville - Taswell 161 kV & Newtonville 161-138 kV | BR-SIGE-HE SIGE | 3.0 | ----- | 3.0 |
| | | 5850 | 0 | 5850 | 2200 | 8050 | | Paradise - New Hardinsburg 161 kV | TVA-BREC | 265 | Base Case | ----- | 3.2 | ----- | ----- |
| | | 6000 | 0 | 6000 | 2200 | 8200 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ Minimum Degrees Fixed Angle (Flow into Michigan is 2430 MW)<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 and Palisades 1 | | | | | | |
| | 2000S Top 3 Limits | 2500 | 0 | 2500 | 1950 | 4450 | | Norris - La Follette 161 kV | TVA | 234 | Volunteer - Phipps Bend 500 kV | TVA | 1.8 | 6.2 | 3.0 |
| | | 3000 | 0 | 3000 | 1950 | 4950 | | Summer Shade-Summer Shade Tap 161 | TVA-EKPC | 240 | Summer Shade - Summer Shade 161 kV | TVA-EKPC | 2.1 | 99.7 | 3.8 |
| | | 4100 | 0 | 4100 | 1950 | 6050 | 2 | Bull Run - Volunteer 500 kV | TVA | 1732 | Watts Bar - Volunteer 500 kV | TVA | 13.5 | 75.8 | 17.8 |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TVA to NE | E102 | 3150 | 0 | 3150 | 2200 | 5350 | | South Canton 765-345 kV | AEP | 1660 | Base Case | ----- | 12.3 | ----- | ----- |
| | | 3300 | 0 | 3300 | 2200 | 5500 | 2 | Bull Run - Volunteer 500 kV | TVA | 1732 | Watts Bar - Volunteer 500 kV | TVA | 14.3 | 75.6 | 19.6 |
| | | 3400 | 0 | 3400 | 2200 | 5600 | 2 | South Canton 765-345 kV | AEP | 1890 | Kammer 765-500 kV & Kammer - Harrison - Fort Martin 500 kV | AEP-AP AP | 12.3 | ----- | 14.0 |
| | | 3450 | 0 | 3450 | 2200 | 5650 | 2 | Norris - La Follette 161 kV | TVA | 234 | Volunteer - Phipps Bend 500 kV | TVA | 1.8 | 6.2 | 3.0 |
| | | 3600 | 0 | 3600 | 2200 | 5800 | | Kammer - West Bellaire 345 kV | AEP | 1023 | Kammer - South Canton 765 kV & South Canton 765-345 kV | AEP AEP | 7.1 | 21.8 | 9.7 |
| | | 3850 | 0 | 3850 | 2200 | 6050 | | Summer Shade-Summer Shade Tap 161 | TVA-EKPC | 240 | Summer Shade - Summer Shade 161 kV | TVA-EKPC | 1.9 | 99.7 | 3.5 |
| | | 5150 | 0 | 5150 | 2200 | 7350 | | Mountaineer - Belmont 765 kV | AEP | 3313 | Gavin - Marysville 765 kV | AEP | 23.1 | 43.9 | 24.4 |
| | | 5150 | 0 | 5150 | 2200 | 7350 | 2 | Bay Shore 345-138 kV | FE | 650 | Allen Junction 345-138 kV | FE | 3.3 | 31.8 | 4.1 |
| | | 5800 | 0 | 5800 | 2200 | 8000 | | Paradise - New Hardinsburg 161 kV | TVA-BREC | 265 | Volunteer - Phipps Bend 500 kV | TVA | 3.2 | 2.3 | 3.6 |
| | | 5800 | 0 | 5800 | 2200 | 8000 | | Kammer 765-500 kV | AEP-AP | 1700 | Belmont - Harrison 500 kV | AP | 8.3 | 39.8 | 11.9 |
| | | 6000 | 0 | 6000 | 2200 | 8200 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | 1750 | 0 | 1750 | 1950 | 3700 | | Foster - Sugarcreek 345 kV | CIN-DPL | 1315 | Stuart - Clinton - Greene 345 kV & Clinton 345-69 kV | DPL DPL | 2.6 | ----- | 2.9 |
| | | 3250 | 0 | 3250 | 1950 | 5200 | 2 | Norris - La Follette 161 kV | TVA | 234 | Volunteer - Phipps Bend 500 kV | TVA | 1.8 | 6.2 | 3.0 |
| | | 3300 | 0 | 3300 | 1950 | 5250 | | South Canton 765-345 kV | AEP | 1660 | Base Case | ----- | 12.0 | ----- | ----- |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAIN to NE | E100 | 3800 | 0 | 3800 | 2200 | 6000 | 2,3 | State Line - Wolf Lake - Sheffield 138 kV | CE-NIPS | 160 | Wilton Center - Dumont 765 kV | CE-AEP | 1.5 | 3.6 | 2.5 |
| | | 4050 | 0 | 4050 | 2200 | 6250 | | South Canton 765-345 kV | AEP | 1660 | Base Case | ----- | 12.3 | ----- | ----- |
| | | 4650 | 0 | 4650 | 2200 | 6850 | 2 | South Canton 765-345 kV | AEP | 1890 | Tidd - Canton Central 345 kV | AEP | 12.3 | 27.5 | 12.2 |
| | | 4950 | 0 | 4950 | 2200 | 7150 | | Kammer - West Bellaire 345 kV | AEP | 1023 | Kammer - South Canton 765 kV & South Canton 765-345 kV | AEP AEP | 7.6 | 21.8 | 10.3 |
| | | 5200 | 0 | 5200 | 2200 | 7400 | 2 | Bay Shore 345-138 kV | FE | 650 | Allen Junction 345-138 kV | FE | 3.4 | 31.8 | 4.3 |
| | | 6000 | 0 | 6000 | 2200 | 8200 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | | | | | | | (Not Tested During 2000 Summer Study) | | | | | | | |
| MAIN to NE | E102 | 200 | 0 | 200 | 2200 | 2400 | 2,3 | State Line - Wolf Lake - Sheffield 138 kV | CE-NIPS | 160 | Wilton Center - Dumont 765 kV | CE-AEP | 1.6 | 3.6 | 2.6 |
| | | 500 | 0 | 500 | 2200 | 2700 | | Cumberland - Davidson 500 kV | TVA | 2597 | Cumberland - Johnsonville 500 kV | TVA | 4.5 | 75.7 | 4.8 |
| | | 2850 | 0 | 2850 | 2200 | 5050 | | Cumberland - Johnsonville 500 kV | TVA | 2597 | Cumberland - Davidson 500 kV | TVA | 0.4 | 77.3 | 3.9 |
| | | 3250 | 0 | 3250 | 2200 | 5450 | | South Canton 765-345 kV | AEP | 1660 | Base Case | ----- | 12.0 | ----- | ----- |
| | | 3400 | 0 | 3400 | 2200 | 5600 | 2 | South Canton 765-345 kV | AEP | 1890 | Kammer 765-500 kV & Kammer - Harrison - Fort Martin 500 kV | AEP-AP AP | 12.0 | ----- | 14.2 |
| | | 3550 | 0 | 3550 | 2200 | 5750 | | Kammer - West Bellaire 345 kV | AEP | 1023 | Kammer - South Canton 765 kV & South Canton 765-345 kV | AEP AEP | 7.3 | 21.8 | 9.9 |
| | | 4750 | 0 | 4750 | 2200 | 6950 | | Kammer 765-500 kV | AEP-AP | 1700 | Belmont - Harrison 500 kV | AP | 10.5 | 39.8 | 14.6 |
| | | 5100 | 0 | 5100 | 2200 | 7300 | 2 | Bay Shore 345-138 kV | FE | 650 | Allen Junction 345-138 kV | FE | 3.3 | 31.8 | 4.2 |
| | | 5550 | 0 | 5550 | 2200 | 7750 | 3 | Kyger Creek - Sporn 345 kV | OVEC-AEP | 1100 | Amos 765-345 kV | AEP | 6.1 | 28.7 | 6.4 |
| | | 6000 | 0 | 6000 | 2200 | 8200 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | -500 | 0 | -500 | 1950 | 1450 | | Cumberland - Johnsonville 500 kV | TVA | 2597 | Cumberland - Davidson 500 kV | TVA | 0.4 | 77.4 | 3.8 |
| | | 0 | 0 | 0 | 1950 | 1950 | 2,3 | State Line - Wolf Lake - Sheffield 138 kV | CE-NIPS | 160 | Burnham - Sheffield 345 kV | CE-NIPS | 1.9 | 23.4 | 3.0 |
| | | 150 | 0 | 150 | 1950 | 2100 | | Cumberland - Davidson 500 kV | TVA | 2597 | Cumberland - Johnsonville 500 kV | TVA | 4.4 | 75.9 | 4.7 |

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## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAIN to Kentucky | E100 | 2350 | 200 | 2550 | 600 | 2950 | | Gallagher 230-138 kV | CIN | 162 | Clifty Creek - Trimble County 345 kV | OVEC-LGEE | 2.1 | 11.3 | 4.3 |
| | | 2500 | 200 | 2700 | 600 | 3100 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | | | | | | | (Not Tested During 2000 Summer Study) | | | | | | | |
| MAIN to Kentucky | E102 | 800 | 200 | 1000 | 600 | 1400 | | Grahamville-S Paducah-Livingston 161kV | LGEE | 223 | Shawnee - Marshall 500 kV | TVA | 2.2 | 9.1 | 2.9 |
| | | 950 | 200 | 1150 | 600 | 1550 | | Cumberland - Davidson 500 kV | TVA | 2597 | Cumberland - Johnsonville 500 kV | TVA | 3.5 | 75.7 | 2.6 |
| | | 1800 | 200 | 2000 | 600 | 2400 | | Gallagher 230-138 kV | CIN | 162 | Clifty Creek - Trimble County 345 kV | OVEC-LGEE | 2.1 | 11.3 | 4.3 |
| | | 2300 | 200 | 2500 | 600 | 2900 | | Livingston Co - Earlington North 161 kV | LGEE | 193 | Livingston-Crittenden-Morgenfield 161 & Crittenden 161-69 kV | LGEE LGEE | 4.1 | ----- | 5.3 |
| | | 2500 | 200 | 2700 | 600 | 3100 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | -50 | 200 | 150 | 500 | 450 | 2,3 | State Line - Wolf Lake - Sheffield 138 kV | CE-NIPS | 160 | Burnham - Sheffield 345 kV | CE-NIPS | 2.1 | 23.4 | 2.8 |
| | | 150 | 200 | 350 | 500 | 650 | 2 | Buffington 345-138 kV | CIN | 440 | Red Bank-Silver Grove-Zimmer 345 kV & Silver Grove 345-138 kV | CIN CIN | 3.5 | ----- | 3.8 |
| | | 850 | 200 | 1050 | 500 | 1350 | 2 | Miami Fort 345-138 kV | CIN | 440 | East Bend - Terminal 345 kV | CIN | 3.1 | 19.0 | 3.2 |

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## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAIN to Kentucky | E104 | -2200 | 200 | -2000 | 600 | -1600 | | Cumberland - Davidson 500 kV | TVA | 2597 | Cumberland - Johnsonville 500 kV | TVA | 3.5 | 75.7 | 2.6 |
| | | 1100 | 200 | 1300 | 600 | 1700 | | Grahamville-S Paducah-Livingston 161kV | LGEE | 223 | Shawnee - Marshall 500 kV | TVA | 2.2 | 9.1 | 2.9 |
| | | 1250 | 200 | 1450 | 600 | 1850 | | Gallagher 230-138 kV | CIN | 162 | Clifty Creek - Trimble County 345 kV | OVEC-LGEE | 2.1 | 11.3 | 4.3 |
| | | 1750 | 200 | 1950 | 600 | 2350 | | Clifty Creek #1B 345-138 kV | OVEC | 155 | Clifty Creek - Trimble County 345 kV | OVEC-LGEE | 1.9 | 8.6 | 3.6 |
| | | 1900 | 200 | 2100 | 600 | 2500 | | Clifty Creek - Northside 138 kV | OVEC-LGEE | 113 | Clifty Creek - Trimble County 345 kV | OVEC-LGEE | 0.9 | 13.4 | 3.5 |
| | | 2000 | 200 | 2200 | 600 | 2600 | 2 | Clifty Creek - Carrollton 138 kV | OVEC-LGEE | 191 | Baker - Broadford 765 kV | AEP | 3.8 | 1.3 | 3.8 |
| | | 2100 | 200 | 2300 | 600 | 2700 | 2 | Buffington 345-138 kV | CIN | 499 | Red Bank-Silver Grove-Zimmer 345 kV & Silver Grove 345-138 kV | CIN CIN | 3.4 | ----- | 3.6 |
| | | 2100 | 200 | 2300 | 600 | 2700 | | Gallagher - Paddys West 138 kV | CIN-LGEE | 382 | Clifty Creek - Trimble County 345 kV | OVEC-LGEE | 2.8 | 27.0 | 8.1 |
| | | 2200 | 200 | 2400 | 600 | 2800 | | Clifty Creek #1A 345-138 kV | OVEC | 193 | Clifty Creek - Trimble County 345 kV | OVEC-LGEE | 2.0 | 9.6 | 4.0 |
| | | 2500 | 200 | 2700 | 600 | 3100 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ Minimum Degrees Fixed Angle (Flow into Michigan is 2610 MW) | | | | | | |
| | 2000S Top 3 Limits | -550 | 200 | -350 | 500 | -50 | 2 | Buffington 345-138 kV | CIN | 440 | Red Bank-Silver Grove-Zimmer 345 kV & Silver Grove 345-138 kV | CIN CIN | 3.5 | ----- | 3.8 |
| | | 750 | 200 | 950 | 500 | 1250 | 2 | Gallagher 230-138 kV | CIN | 147 | Clifty Creek - Trimble County 345 kV | OVEC-LGEE | 2.1 | 11.3 | 4.3 |
| | | 1000 | 200 | 1200 | 500 | 1500 | 2 | Miami Fort 345-138 kV | CIN | 440 | East Bend - Terminal 345 kV | CIN | 3.1 | 19.0 | 3.2 |

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## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAAC to Indiana | E100 | 3250 | -400 | 2850 | -1200 | 2050 | 3 | Butler - Krendale - Maple 138 kV | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 2.0 | 7.8 | 3.3 |
| | | 5000 | -400 | 4600 | -1200 | 3800 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | | | | | | | (Not Tested During 2000 Summer Study) | | | | | | | |
| MAAC to Indiana | E101a | -1000 | -400 | -1400 | -1200 | -2200 | 3 | Lambton - Saint Clair (L4D) 345 kV | HONI-DECO | 845 | Base Case | ----- | 2.6 | ----- | 2.6 |
| | | -650 | -400 | -1050 | -1200 | -1850 | 2,3 | Lambton - Saint Clair (L4D) 345 kV | HONI-DECO | 1170 | Lambton - Saint Clair (L51D) 345 kV & Saint Clair Unit 6 & Lambton Generation Rejection | HONI-DECO DECO HONI | 2.6 | ----- | 4.0 |
| | | 0 | -400 | -400 | -1200 | -1200 | 2,3 | Lambton - Saint Clair (L51D) 345 kV | HONI-DECO | 1170 | Lambton - Saint Clair (L4D) 345 kV & Saint Clair Unit 6 & Lambton Generation Rejection | HONI-DECO DECO HONI | 2.4 | ----- | 3.8 |
| | | 1350 | -400 | 950 | -1200 | 150 | 3 | Butler - Krendale - Maple 138 kV | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 1.8 | 7.8 | 3.0 |
| | | 5000 | -400 | 4600 | -1200 | 3800 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ Minimum Degrees Fixed Angle (Flow into Michigan is 2430 MW) Note (b): Generating units outaged to model transfer bias: Monroe 1 and Palisades 1 | | | | | | |
| | 2000S Top 3 Limits | 1350 | -400 | 950 | -1350 | 0 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 5.8 | 52.0 | 6.4 |
| | | 1350 | -400 | 950 | -1350 | 0 | 3 | Butler - Krendale - Maple 138 kV | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 2.0 | 8.0 | 3.5 |
| | | 2100 | -400 | 1700 | -1350 | 750 | 3 | Corner - Wolf Ck. - Muskingum 138 kV | AP-AEP | 174 | Kammer - Belmont - Mountain 765 kV & Belmont 765-500 kV | AEP AEP-AP | 1.0 | ----- | 2.5 |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAAC to Indiana | E103a | -1850 | -400 | -2250 | -200 | -2050 | 3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 5.8 | 52.0 | 6.4 |
| | | -900 | -400 | -1300 | -200 | -1100 | 3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 1.1 | 42.8 | 3.7 |
| | | 2100 | -400 | 1700 | -200 | 1900 | 3 | Butler - Krendale - Maple 138 kV | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 2.0 | 7.8 | 3.3 |
| | | 4100 | -400 | 3700 | -200 | 3900 | 2 | Cayuga 345-230 kV | CIN | 534 | Cayuga - Nucor 345 kV | CIN | 4.2 | 31.4 | 3.4 |
| | | 4400 | -400 | 4000 | -200 | 4200 | 2 | Newtonville 161-138 kV | SIGE | 179 | Cloverport - Newtonville 138 kV | LGEE-SIGE | 2.0 | 76.0 | 3.4 |
| | | 4600 | -400 | 4200 | -200 | 4400 | 3 | Cloverport - Newtonville 138 kV | LGEE-SIGE | 143 | Coleman-Newtonville-Taswell 161 kV & Newtonville 161-138 kV | BR-SIGE-HE SIGE | 1.2 | ----- | 2.9 |
| | | 4800 | -400 | 4400 | -200 | 4600 | | Greenfield - Lakeview 138 kV | FE | 248 | Beaver - Davis Besse 345 kV | FE | 1.5 | 12.7 | 2.5 |
| | | 5000 | -400 | 4600 | -200 | 4800 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 & 3 / Palisades 1 / Cook 1 | | | | | | |
| | 2000S Top 3 Limits | -3100 | -400 | -3500 | -1350 | -4450 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 5.8 | 52.0 | 6.4 |
| | | -3050 | -400 | -3450 | -1350 | -4400 | 3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 1.1 | 42.8 | 3.6 |
| | | 2200 | -400 | 1800 | -1350 | 850 | 2 | Cayuga 345-230 kV | CIN | 480 | Cayuga - Nucor 345 kV | CIN | 4.2 | 31.4 | 3.2 |
| MAAC to Indiana | E103b | 1150 | -400 | 750 | -1200 | -50 | 3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 5.8 | 52.0 | 6.4 |
| | | 2000 | -400 | 1600 | -1200 | 800 | 3 | Butler - Krendale - Maple 138 kV | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 1.9 | 7.8 | 3.3 |
| | | 3550 | -400 | 3150 | -1200 | 2350 | | Greenfield - Lakeview 138 kV | FE | 248 | Beaver - Davis Bessie 345 kV | FE | 1.5 | 12.6 | 2.5 |
| | | 3900 | -400 | 3500 | -1200 | 2700 | 2 | Beaver - Davis Bessie 345 kV | FE | 984 | Kammer - Orange 765 kV | AEP | 8.1 | 6.8 | 9.4 |
| | | 4200 | -400 | 3800 | -1200 | 3000 | 2 | Cayuga 345-230 kV | CIN | 534 | Cayuga - Nucor 345 kV | CIN | 4.2 | 31.4 | 3.4 |
| | | 4450 | -400 | 4050 | -1200 | 3250 | 2 | Newtonville 161-138 kV | SIGE | 179 | Cloverport - Newtonville 138 kV | LGEE-SIGE | 2.0 | 76.0 | 3.4 |
| | | 4650 | -400 | 4250 | -1200 | 3450 | 2,3 | Cloverport - Newtonville 138 kV | LGEE-SIGE | 143 | Coleman-Newtonville-Taswell 161 kV & Newtonville 161-138 kV | BR-SIGE-HE SIGE | 2.0 | ----- | 2.9 |
| | | 4900 | -400 | 4500 | -1200 | 3700 | | Beaver - Davis Bessie 345 kV | FE | 950 | Base Case | ----- | 8.1 | ----- | ----- |
| | | 5000 | -400 | 4600 | -1200 | 3800 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 & 3 / Palisades 1 / Davis-Besse 1 | | | | | | |
| | 2000S Top 3 Limits | -3100 | -400 | -3500 | -1350 | -4450 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 5.8 | 52.0 | 6.4 |
| | | -3050 | -400 | -3450 | -1350 | -4400 | 3 | Cook 765-345 kV | AEP | 2115 | Dumont 765-345 kV | AEP | 1.1 | 42.8 | 3.6 |
| | | 2200 | -400 | 1800 | -1350 | 850 | 2 | Cayuga 345-230 kV | CIN | 480 | Cayuga - Nucor 345 kV | CIN | 4.2 | 31.4 | 3.2 |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TVA to IMO | ----- | | | | | | | | | | | | | | |
| | | | | | | | | (Tested During Winter Assessments) | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| MAIN to IMO | ----- | | | | | | | | | | | | | | |
| | | | | | | | | (Tested During Winter Assessments) | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAIN to MAAC | E100 | 1600 | 0 | 1600 | -50 | 1550 | | Hatfiled - Black Oak 500 kV (Voltage) | AP | 2265 | Pruntytown - Mount Storm 500 kV | AP-VP | 9.6 | 26.8 | 13.4 |
| | | 2300 | 0 | 2300 | -50 | 2250 | | Doubs #1 or #2 or #3 or #4 500-230 kV | AP | 488 | Doubs - Brighton 500 kV | AP-PEPCO | 1.3 | 8.7 | 3.1 |
| | | 2450 | 0 | 2450 | -50 | 2400 | 2 | Mount Storm - Doubs 500 kV | VP-AP | 2271 | Mount Storm - Meadow Brook 500 kV | VP-AP | 12.1 | 35.0 | 14.6 |
| | | 2850 | 0 | 2850 | -50 | 2800 | 2 | Doubs - Aqueduct - Station H 230 kV | AP-PEPCO | 629 | Doubs - Station H 230 kV | AP-PEPCO | 3.5 | 60.5 | 5.7 |
| | | 2850 | 0 | 2850 | -50 | 2800 | 2 | Doubs - Station H 230 kV | AP-PEPCO | 628 | Doubs - Aqueduct 230 kV | AP | 3.5 | 60.3 | 5.7 |
| | | 4150 | 0 | 4150 | -50 | 4100 | | Black Oak - Bedington 500 kV | AP | 2783 | Pruntytown - Mount Storm 500 kV | AP-VP | 11.3 | 31.1 | 15.8 |
| | | 5000 | 0 | 5000 | -50 | 4950 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | | | | | | | (Not Tested During 2000 Summer Study) | | | | | | | |
| MAIN to MAAC | E102 | -450 | 2000 | 1550 | 1900 | 1450 | | Hatfiled - Black Oak 500 kV (Voltage) | AP | 2265 | Pruntytown - Mount Storm 500 kV | AP-VP | 9.6 | 26.8 | 13.4 |
| | | 400 | 2000 | 2400 | 1900 | 2300 | | Cumberland - Davidson 500 kV | TVA | 2597 | Cumberland - Johnsonville 500 kV | TVA | 5.3 | 75.7 | 5.9 |
| | | 650 | 2000 | 2650 | 1900 | 2550 | 2 | Mount Storm - Doubs 500 kV | VP-AP | 2271 | Mount Storm - Meadow Brook 500 kV | VP-AP | 12.1 | 35.0 | 14.6 |
| | | 750 | 2000 | 2750 | 1900 | 2650 | | Doubs #1 or #2 or #3 or #4 500-230 kV | AP | 488 | Doubs - Brighton 500 kV | AP-PEPCO | 1.3 | 8.7 | 3.1 |
| | | 1900 | 2000 | 3900 | 1900 | 3800 | 2 | Doubs - Aqueduct - Station H 230 kV | AP-PEPCO | 629 | Doubs - Brighton 500 kV | AP-PEPCO | 3.6 | 17.1 | 7.1 |
| | | 1900 | 2000 | 3900 | 1900 | 3800 | 2 | Doubs - Station H 230 kV | AP-PEPCO | 628 | Doubs - Aqueduct 230 kV | AP | 3.5 | 60.3 | 5.7 |
| | | 2150 | 2000 | 4150 | 1900 | 4050 | | Black Oak - Bedington 500 kV | AP | 2783 | Pruntytown - Mount Storm 500 kV | AP-VP | 11.3 | 31.1 | 15.8 |
| | | 2350 | 2000 | 4350 | 1900 | 4250 | | Cumberland - Johnsonville 500 kV | TVA | 2597 | Cumberland - Davidson 500 kV | TVA | 0.7 | 77.3 | 4.8 |
| | | 2600 | 2000 | 4600 | 1900 | 4500 | 2 | Wylie Ridge #2 345-500 kV | AP | 942 | Wylie Ridge #1 345-500 kV | AP | 7.8 | 72.2 | 13.2 |
| | | 2900 | 2000 | 4900 | 1900 | 4800 | | Pruntytown - Mount Storm 500 kV | AP-VP | 3326 | Black Oak - Bedington 500 kV | AP | 14.7 | 44.6 | 19.7 |
| | | 2900 | 2000 | 4900 | 1900 | 4800 | | Kammer 765-500 kV | AEP-AP | 1700 | Belmont - Harrison 500 kV | AP | 17.5 | 39.8 | 23.5 |
| | | 2950 | 2000 | 4950 | 1900 | 4850 | | Harrison - Pruntytown 500 kV | AP | 3584 | 502 Junction - Fort Martin 500 kV | AP | 13.1 | 67.7 | 26.1 |
| | | 5000 | 2000 | 7000 | 1900 | 6900 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Ten additional limits were found from 3000 to 5000 but are not shown in this table for brevity | | | | | | |
| | 2000S Top 3 Limits | -450 | 2000 | 1550 | 1850 | 1400 | | Cumberland - Johnsonville 500 kV | TVA | 2597 | Cumberland - Davidson 500 kV | TVA | 0.7 | 77.4 | 4.5 |
| | | -50 | 2000 | 1950 | 1850 | 1800 | 2,3 | State Line - Wolf Lake - Sheffield 138 kV | CE-NIPS | 160 | Burnham - Sheffield 345 kV | CE-NIPS | 1.9 | 23.4 | 3.0 |
| | | 100 | 2000 | 2100 | 1850 | 1950 | | Cumberland - Davidson 500 kV | TVA | 2597 | Cumberland - Johnsonville 500 kV | TVA | 5.0 | 75.9 | 5.5 |

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## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAIN to VACAR | E100 | 2100 | 0 | 2100 | 400 | 2500 | | Hatfiled - Black Oak 500 kV (Voltage) | AP | 2265 | Pruntytown - Mount Storm 500 kV | AP-VP | 5.9 | 26.8 | 10.1 |
| | | 4100 | 0 | 4100 | 400 | 4500 | 2,3 | Kanawha - Matt Funk 345 kV (Voltage) | AEP | 1040 | Broadford - Jackson Ferry 765 kV<br>Broadford 138 kV Series Reactor Inserted | AEP<br>AEP | 5.3 | 14.9 | 9.1 |
| | | 4600 | 0 | 4600 | 400 | 5000 | | Cumberland - Davidson 500 kV | TVA | 2597 | Cumberland - Johnsonville 500 kV | TVA | 6.9 | 75.7 | 8.0 |
| | | 4900 | 0 | 4900 | 400 | 5300 | | Pruntytown - Mount Storm 500 kV | AP-VP | 3326 | Black Oak - Bedington 500 kV | AP | 17.9 | 44.6 | 21.0 |
| | | 5000 | 0 | 5000 | 400 | 5400 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | | | | | | | (Not Tested During 2000 Summer Study) | | | | | | | |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAIN to VACAR | E102 | -600 | 1000 | 400 | 1400 | 800 | | Hatfiled - Black Oak 500 kV (Voltage) | AP | 2265 | Pruntytown - Mount Storm 500 kV | AP-VP | 5.9 | 26.8 | 10.2 |
| | | 300 | 1000 | 1300 | 1400 | 1700 | | Cumberland - Davidson 500 kV | TVA | 2597 | Cumberland - Johnsonville 500 kV | TVA | 6.9 | 75.7 | 8.0 |
| | | 1650 | 1000 | 2650 | 1400 | 3050 | | Cumberland - Johnsonville 500 kV | TVA | 2597 | Cumberland - Davidson 500 kV | TVA | 1.4 | 77.3 | 6.7 |
| | | 2000 | 1000 | 3000 | 1400 | 3400 | 2,3 | Kanawha - Matt Funk 345 kV (Voltage) | AEP | 1040 | Broadford - Jackson Ferry 765 kV<br>Broadford 138 kV Series Reactor Inserted | AEP<br>AEP | 5.3 | 14.9 | 9.1 |
| | | 2750 | 1000 | 3750 | 1400 | 4150 | 2 | Pruntytown - Mount Storm 500 kV | AP-VP | 3326 | Black Oak - Bedington 500 kV | AP | 17.9 | 44.6 | 21.0 |
| | | 2750 | 1000 | 3750 | 1400 | 4150 | | Black Oak - Bedington 500 kV | AP | 2783 | Pruntytown - Mount Storm 500 kV | AP-VP | 6.9 | 31.1 | 12.5 |
| | | 3650 | 1000 | 4650 | 1400 | 5050 | 2 | Axton 765-138 kV | AEP | 792 | Cloverdale - Joshua Falls 765 kV &<br>Joshua Falls 765-138 kV | AEP<br>AEP | 3.9 | 10.9 | 5.3 |
| | | 3800 | 1000 | 4800 | 1400 | 5200 | | Mount Storm - Doubs 500 kV | VP-AP | 2271 | Mount Storm - Meadow Brook 500 kV | VP-AP | 11.3 | 35.0 | 2.6 |
| | | 4200 | 1000 | 5200 | 1400 | 5600 | | Harrison - Pruntytown 500 kV | AP | 3584 | 502 Junction - Fort Martin 500 kV | AP | 11.8 | 67.7 | 18.5 |
| | | 4200 | 1000 | 5200 | 1400 | 5600 | | Hatfield - Black Oak 500kV | AP | 2783 | Pruntytown - Mount Storm 500 kV | VP-AP | 6.0 | 26.8 | 10.8 |
| | | 4400 | 1000 | 5400 | 1400 | 5800 | | Pruntytown - Mount Storm 500 kV | AP-VP | 2733 | Base Case | ----- | 17.9 | ----- | ----- |
| | | 4450 | 1000 | 5450 | 1400 | 5850 | | Danville - East Danville 138 kV | AEP | 384 | Jackson Ferry 765-500 kV<br>Jackson Ferry - Antioch 500 kV | AEP<br>AEP-DUKE | 4.0 | 15.1 | 6.1 |
| | | 4750 | 1000 | 5750 | 1400 | 6150 | | Fort Martin - Pruntytown 500 kV | AP | 2654 | Harrison - Pruntytown 500 kV | AP | 4.6 | 68.7 | 12.7 |
| | | 4850 | 1000 | 5850 | 1400 | 6250 | | Harrison - Pruntytown 500 kV | AP | 2733 | Base Case | ----- | 11.8 | ----- | ----- |
| | | 5000 | 1000 | 6000 | 1400 | 6400 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | -300 | 1000 | 700 | 1050 | 750 | | Cumberland - Johnsonville 500 kV | TVA | 2597 | Cumberland - Davidson 500 kV | TVA | 1.4 | 77.4 | 6.5 |
| | | -50 | 1000 | 950 | 1050 | 1000 | 2,3 | State Line - Wolf Lake - Sheffield 138 kV | CE-NIPS | 160 | Burnham - Sheffield 345 kV | CE-NIPS | 1.8 | 23.4 | 2.8 |
| | | 100 | 1000 | 1100 | 1050 | 1150 | | Cumberland - Davidson 500 kV | TVA | 2597 | Cumberland - Johnsonville 500 kV | TVA | 6.6 | 75.9 | 7.6 |

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## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAIN to VACAR | E104 | -750 | 0 | -750 | 400 | -350 | | Cumberland - Davidson 500 kV | TVA | 2597 | Cumberland - Johnsonville 500 kV | TVA | 6.8 | 75.7 | 7.8 |
| | | 50 | 0 | 50 | 400 | 450 | | Hatfiled - Black Oak 500 kV (Voltage) | AP | 2265 | Pruntytown - Mount Storm 500 kV | AP-VP | 5.9 | 26.8 | 10.1 |
| | | 450 | 0 | 450 | 400 | 850 | | Cumberland - Johnsonville 500 kV | TVA | 2597 | Cumberland - Davidson 500 kV | TVA | 1.4 | 77.3 | 6.6 |
| | | 1400 | 0 | 1400 | 400 | 1800 | 2,3 | Kanawha - Matt Funk 345 kV (Voltage) | AEP | 1010 | Baker - Broadford 765 kV | AEP | 5.2 | 12.7 | 7.7 |
| | | 3000 | 0 | 3000 | 400 | 3400 | 2 | Pruntytown - Mount Storm 500 kV | AP-VP | 3326 | Black Oak - Bedington 500 kV | AP | 17.5 | 44.6 | 20.4 |
| | | 3500 | 0 | 3500 | 400 | 3900 | | Black Oak - Bedington 500 kV | AP | 2783 | Pruntytown - Mount Storm 500 kV | AP-VP | 6.6 | 31.1 | 12.0 |
| | | 4350 | 0 | 4350 | 400 | 4750 | | Brown - Alcalde 345 kV | LGEE | 956 | Baker - Broadford 765 kV | AEP | 3.2 | 6.9 | 4.6 |
| | | 4500 | 0 | 4500 | 400 | 4900 | | Axton 765-138 kV | AEP | 792 | Jackson Ferry 765-500 kV<br>Jackson Ferry - Antioch 500 kV | AEP<br>AEP-DUKE | 3.8 | 16.9 | 6.1 |
| | | 4550 | 0 | 4550 | 400 | 4950 | | Pruntytown - Mount Storm 500 kV | AP-VP | 2733 | Base Case | ----- | 17.5 | ----- | ----- |
| | | 4600 | 0 | 4600 | 400 | 5000 | | Fort Martin - Pruntytown 500 kV | AP | 2654 | Harrison - Pruntytown 500 kV | AP | 4.7 | 68.7 | 12.5 |
| | | 4900 | 0 | 4900 | 400 | 5300 | | Hatfield - Black Oak 500kV | AP | 2783 | Pruntytown - Mount Storm 500 kV | VP-AP | 5.8 | 26.8 | 10.5 |
| | | 4900 | 0 | 4900 | 400 | 5300 | | Danville - East Danville 138 kV | AEP | 384 | Jackson Ferry 765-500 kV<br>Jackson Ferry - Antioch 500 kV | AEP<br>AEP-DUKE | 3.9 | 15.1 | 6.1 |
| | | 4950 | 0 | 4950 | 400 | 5350 | | Pineville - Pocket 500 kV | LGEE | 550 | Baker - Broadford 765 kV | AEP | 2.9 | 7.1 | 4.3 |
| | | 5000 | 0 | 5000 | 400 | 5400 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ Minimum Degrees Fixed Angle (Flow into Michigan is 2610 MW) | | | | | | |
| | 2000S Top 3 Limits | -1550 | 0 | -1550 | 50 | -1500 | | Cumberland - Johnsonville 500 kV | TVA | 2597 | Cumberland - Davidson 500 kV | TVA | 1.4 | 77.4 | 6.5 |
| | | -1000 | 0 | -1000 | 50 | -950 | | Cumberland - Davidson 500 kV | TVA | 2597 | Cumberland - Johnsonville 500 kV | TVA | 6.6 | 75.9 | 7.6 |
| | | 1250 | 0 | 1250 | 50 | 1300 | | Hatfiled - Black Oak 500 kV (Voltage) | AP | 1940 | Mount Storm - Meadow Brook 500 kV | VP-AP | 5.9 | 10.1 | 6.5 |

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## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAAC to TVA | E100 | 3700 | 0 | 3700 | -1650 | 2050 | 3 | Butler - Shanor Manor - Krendale 138 kV | AP | 227 | Cabot - Wylie Ridge 500 kV | AP | 1.6 | 7.8 | 2.9 |
| | | 4250 | 0 | 4250 | -1650 | 2600 | | Clinch R - Spring Ck - N Bristol 138 kV | AEP | 239 | Broadford 765-500 kV & Broadford - Sullivan 500 kV | AEP AEP-TVA | 1.6 | 7.5 | 3.3 |
| | | 5000 | 0 | 5000 | -1650 | 3350 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | | | | | | | (Not Tested During 2000 Summer Study) | | | | | | | |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAAC to TVA | E104 | -3600 | 0 | -3600 | 2300 | -1300 | 2,3 | Lambton - Saint Clair (L4D) 345 kV | HONI-DECO | 1170 | Lambton - Saint Clair (L51D) 345 kV &<br>Saint Clair Unit 6 &<br>Lambton Generation Rejection | HONI-DECO<br>DECO<br>HONI | 2.1 | ----- | 3.2 |
| | | -3000 | 0 | -3000 | 2300 | -700 | 2,3 | Lambton - Saint Clair (L51D) 345 kV | HONI-DECO | 1170 | Lambton - Saint Clair (L4D) 345 kV &<br>Saint Clair Unit 6 &<br>Lambton Generation Rejection | HONI-DECO<br>DECO<br>HONI | 1.9 | ----- | 3.1 |
| | | 950 | 0 | 950 | 2300 | 3250 | | Clinch R - Spring Ck - N Bristol 138 kV | AEP | 239 | Broadford 765-500 kV &<br>Broadford - Sullivan 500 kV | AEP<br>AEP-TVA | 1.6 | 7.5 | 3.3 |
| | | 2700 | 0 | 2700 | 2300 | 5000 | | North Bristol - North Bristol 138 kV | AEP-TVA | 260 | Broadford 765-500 kV &<br>Broadford - Sullivan 500 kV | AEP<br>AEP-TVA | 1.1 | 7.5 | 2.7 |
| | | 3350 | 0 | 3350 | 2300 | 5650 | 2 | Broadford 765-500kV or<br>Broadford - Sullivan 500 kV | AEP<br>AEP-TVA | 1920<br>1920 | Broadford - Jacksons Ferry 765 kV &<br>Broadford 138 kV Series Reactor Inserted | AEP<br>AEP | 21.2 | 28.9 | 18.6 |
| | | 3850 | 0 | 3850 | 2300 | 6150 | | New Hardinsburg 138-161 kV | BREC | 224 | Coleman - National Aluminum 161 kV | BREC | 2.3 | 77.2 | 2.6 |
| | | 4250 | 0 | 4250 | 2300 | 6550 | | Broadford 765-500kV or<br>Broadford - Sullivan 500 kV | AEP<br>AEP-TVA | 1710<br>1710 | Base Case | ----- | 21.3 | ----- | ----- |
| | | 4300 | 0 | 4300 | 2300 | 6600 | | Clinch River - Copper Ridge - Hill 138 kV | AEP | 269 | Broadford 765-500 kV &<br>Broadford - Sullivan 500 kV | AEP<br>AEP-TVA | 1.3 | 6.2 | 2.8 |
| | | 4550 | 0 | 4550 | 2300 | 6850 | | Newtonville - Coleman 161 kV | SIGE-BREC | 265 | AB Brown - Henderson County 138 kV | SIGE-BREC | 2.3 | 4.8 | 2.7 |
| | | 4600 | 0 | 4600 | 2300 | 6900 | | Wolf Hills - Orebank 138 kV | AEP | 239 | Broadford 765-500 kV &<br>Broadford - Sullivan 500 kV | AEP<br>AEP-TVA | 1.2 | 6.2 | 2.6 |
| | | 4900 | 0 | 4900 | 2300 | 7200 | | Brown - Alcalde 345 kV | LGEE | 956 | Baker - Broadford 765 kV | AEP | 3.0 | 6.9 | 4.1 |
| | | 5000 | 0 | 5000 | 2300 | 7300 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ Minimum Degrees Fixed Angle (Flow into Michigan is 2610 MW) | | | | | | |
| | 2000S Top 3 Limits | 1400 | 0 | 1400 | 2800 | 4200 | | Clinch R. - Abingdon - N. Bristol 138 kV | AEP | 239 | Broadford 765-500 kV &<br>Broadford - Sullivan 500 kV | AEP<br>AEP-TVA | 1.6 | ----- | 3.4 |
| | | 3300 | 0 | 3300 | 2800 | 6100 | 2 | Ghent - West Lexington 345 kV | LGEE | 956 | Baker - Broadford 765 kV | AEP | 3.2 | 4.4 | 3.7 |
| | | 3400 | 0 | 3400 | 2800 | 6200 | | North Bristol - North Bristol 138 kV | AEP-TVA | 260 | Broadford 765-500 kV &<br>Broadford - Sullivan 500 kV | AEP<br>AEP-TVA | 1.1 | ----- | 2.7 |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAIN to TVA | E100 | 5000 | 0 | 5000 | -1650 | 3350 | | Test Level - No Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | | | | | | | (Not Tested During 2000 Summer Study) | | | | | | | |
| | E102 | 3650 | 950 | 4600 | -650 | 3000 | 2,3 | Kanawha - Matt Funk 345 kV (Voltage) | AEP | 1010 | Baker - Broadford 765 kV | AEP | 2.4 | 12.8 | 4.6 |
| | | 4000 | 950 | 4950 | -650 | 3350 | | Bland - Franks 345 kV | AMRN-AECI | 949 | Base Case | ----- | 7.0 | ----- | ----- |
| | | 4400 | 950 | 5350 | -650 | 3750 | | Renshaw - Livingston County 161 kV | SIPC-BREC | 250 | Shawnee - Marshall 500 kV | TVA | 2.1 | 5.8 | 3.0 |
| | | 5000 | 950 | 5950 | -650 | 4350 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | 2750 | 600 | 3350 | -150 | 2600 | 2 | Lutesville - Essex 345 kV | AMRN-AECI | 870 | Shawnee - Marshall 500 kV | TVA | 6.4 | 17.5 | 9.1 |
| | | 4400 | 600 | 5000 | -150 | 4250 | 3 | Kanawha - Matt Funk 345 kV (Voltage) | AEP | 1010 | Baker - Broadford 765 kV | AEP | 2.3 | 12.8 | 4.6 |
| | | 4800 | 600 | 5400 | -150 | 4650 | 2 | Ghent - West Lexington 345 kV | LGEE | 956 | Baker - Broadford 765 kV | AEP | 3.9 | 4.4 | 4.6 |
| | E104 | 2400 | 0 | 2400 | 2300 | 4700 | 3 | Kanawha - Matt Funk 345 kV (Voltage) | AEP | 1010 | Baker - Broadford 765 kV | AEP | 2.3 | 12.8 | 4.6 |
| | | 3400 | 0 | 3400 | 2300 | 5700 | 2 | Brown - Alcalde 345 kV | LGEE | 956 | Baker - Broadford 765 kV | AEP | 4.6 | 6.9 | 5.9 |
| | | 3800 | 0 | 3800 | 2300 | 6100 | | Bland - Franks 345 kV | AMRN-AECI | 949 | Base Case | ----- | 7.0 | ----- | ----- |
| | | 4150 | 0 | 4150 | 2300 | 6450 | | Broadford 765-500kV or | AEP | 1920 | Broadford - Jacksons Ferry 765 kV & | AEP | 14.0 | 28.9 | 15.0 |
| | | | | | | | | Broadford - Sullivan 500 kV | AEP-TVA | 1920 | Broadford 138 kV Series Reactor Inserted | AEP | | | |
| | | 4250 | 0 | 4250 | 2300 | 6550 | | Renshaw - Livingston County 161 kV | SIPC-BREC | 250 | Shawnee - Marshall 500 kV | TVA | 2.1 | 5.8 | 3.0 |
| | | 4900 | 0 | 4900 | 2300 | 7200 | | West Lexington - Brown 345 kV | LGEE | 717 | Base Case | ----- | 4.3 | ----- | ----- |
| | | 5000 | 0 | 5000 | 2300 | 7300 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ Minimum Degrees Fixed Angle (Flow into Michigan is 2610 MW) | | | | | | |
| | 2000S Top 3 Limits | 2400 | -350 | 2050 | 2800 | 5200 | 2 | Lutesville - Essex 345 kV | AMRN-AECI | 870 | Shawnee - Marshall 500 kV | TVA | 6.4 | 17.5 | 9.1 |
| | | 2450 | -350 | 2100 | 2800 | 5250 | 2 | Ghent - West Lexington 345 kV | LGEE | 956 | Baker - Broadford 765 kV | AEP | 3.9 | 4.4 | 4.6 |
| | | 3200 | -350 | 2850 | 2800 | 6000 | 3 | Kanawha - Matt Funk 345 kV (Voltage) | AEP | 1010 | Baker - Broadford 765 kV | AEP | 2.3 | 12.8 | 4.6 |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAAC to MAIN | E100 | 3300 | 0 | 3300 | 0 | 3300 | 3 | Butler - Krendale - Maple 138 kV | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 2.0 | 7.8 | 3.3 |
| | | 4600 | 0 | 4600 | 0 | 4600 | | Breed - Casey 345 kV | AEP-AMRN | 1442 | Rockport - Jefferson 765 kV | AEP | 14.3 | 34.0 | 10.3 |
| | | 4650 | 0 | 4650 | 0 | 4650 | | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 4.7 | 39.0 | 10.3 |
| | | 5000 | 0 | 5000 | 0 | 5000 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | | | | | | | (Not Tested During 2000 Summer Study) | | | | | | | |
| MAAC to MAIN | E101a | -3850 | 1750 | -2100 | 2450 | -1400 | 2 | Beck - Hannon Jct (Q24HM) 220 kV | HONI | 616 | Beck - Neale Jct (Q25BM) 220 kV & Beck - Hannon Jct (Q29HM) 220 kV | HONI | 1.7 | ----- | 2.5 |
| | | -950 | 1750 | 800 | 2450 | 1500 | 3 | Lambton - Saint Clair (L4D) 345 kV | HONI-DECO | 845 | Base Case | ----- | 2.7 | ----- | 2.7 |
| | | -650 | 1750 | 1100 | 2450 | 1800 | 2,3 | Lambton - Saint Clair (L4D) 345 kV | HONI-DECO | 1170 | Lambton - Saint Clair (L51D) 345 kV & Saint Clair Unit 6 & Lambton Generation Rejection | HONI-DECO DECO HONI | 2.7 | ----- | 4.2 |
| | | 0 | 1750 | 1750 | 2450 | 2450 | 2,3 | Lambton - Saint Clair (L51D) 345 kV | HONI-DECO | 1170 | Lambton - Saint Clair (L4D) 345 kV & Saint Clair Unit 6 & Lambton Generation Rejection | HONI-DECO DECO HONI | 2.5 | ----- | 4.0 |
| | | 1250 | 1750 | 3000 | 2450 | 3700 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.5 | 3.9 | 2.7 |
| | | 1350 | 1750 | 3100 | 2450 | 3800 | 3 | Butler - Krendale - Maple 138 kV | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 1.7 | 7.8 | 3.0 |
| | | 2300 | 1750 | 4050 | 2450 | 4750 | | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 4.7 | 39.0 | 10.3 |
| | | 3050 | 1750 | 4800 | 2450 | 5500 | 2 | Breed - Casey 345 kV | AEP-AMRN | 1442 | Rockport - Jefferson 765 kV | AEP | 14.3 | 34.0 | 10.4 |
| | | 3500 | 1750 | 5250 | 2450 | 5950 | 3 | Dumont 765-345 kV | AEP | 2070 | Dumont - Wilton Center 765 kV | AEP-CE | 3.8 | 41.9 | 15.8 |
| | | 5000 | 1750 | 6750 | 2450 | 7450 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ Minimum Degrees Fixed Angle (Flow into Michigan is 2430 MW) Note (b): Generating units outaged to model transfer bias: Monroe 1 and Palisades 1 | | | | | | |
| | 2000S Top 3 Limits | 600 | 1750 | 2350 | 3050 | 3650 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.7 |
| | | 1400 | 1750 | 3150 | 3050 | 4450 | 3 | Butler - Krendale - Maple 138 kV | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 2.0 | 8.0 | 3.5 |
| | | 1750 | 1750 | 3500 | 3050 | 4800 | 2 | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 4.8 | 39.5 | 10.5 |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAAC to MAIN | E101b | 750 | 1750 | 2500 | 2450 | 3200 | 2,3 | Butler - Krendale - Maple 138 kV | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 1.7 | 7.8 | 3.0 |
| | | 1150 | 1750 | 2900 | 2450 | 3600 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.5 | 3.9 | 2.6 |
| | | 2300 | 1750 | 4050 | 2450 | 4750 | | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 4.7 | 39.0 | 10.3 |
| | | 2750 | 1750 | 4500 | 2450 | 5200 | 2 | Beck - Hannon Jct (Q24HM) 220 kV | HONI | 616 | Beck - Neale Jct (Q25BM) 220 kV & Beck - Hannon Jct (Q29HM) 220 kV | HONI | 1.7 | ----- | 2.5 |
| | | 3050 | 1750 | 4800 | 2450 | 5500 | 2 | Breed - Casey 345 kV | AEP-AMRN | 1442 | Rockport - Jefferson 765 kV | AEP | 14.2 | 34.0 | 10.4 |
| | | 3200 | 1750 | 4950 | 2450 | 5650 | 3 | Dumont 765-345 kV | AEP | 2070 | Dumont - Wilton Center 765 kV | AEP-CE | 3.7 | 41.9 | 15.8 |
| | | 4750 | 1750 | 6500 | 2450 | 7200 | | Yukon - Shepler Hill Junction 138 kV | AP | 243 | Keystone - Cabot 500 kV | PENLEC-AP | 2.0 | 4.0 | 2.7 |
| | | 5000 | 1750 | 6750 | 2450 | 7450 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ Zero Degrees Fixed Angle (Flow into Michigan is 1890 MW) Note (b): Generating units outaged to model transfer bias: Monroe 1 and Palisades 1 | | | | | | |
| | 2000S Top 3 Limits | 600 | 1750 | 2350 | 3050 | 3650 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.7 |
| | | 1300 | 1750 | 3050 | 3050 | 4350 | 3 | Butler - Krendale - Maple 138 kV | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 1.8 | 8.0 | 3.2 |
| | | 1750 | 1750 | 3500 | 3050 | 4800 | 2 | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 4.8 | 39.5 | 10.5 |
| MAAC to MAIN | E101c | -50 | 1750 | 1700 | 2450 | 2400 | 3 | Butler - Krendale - Maple 138 kV | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 1.7 | 7.8 | 3.0 |
| | | 1100 | 1750 | 2850 | 2450 | 3550 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.5 | 3.9 | 2.6 |
| | | 2350 | 1750 | 4100 | 2450 | 4800 | | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 4.7 | 39.0 | 10.3 |
| | | 2800 | 1750 | 4550 | 2450 | 5250 | 3 | Dumont 765-345 kV | AEP | 2070 | Dumont - Wilton Center 765 kV | AEP-CE | 3.8 | 41.9 | 15.8 |
| | | 3100 | 1750 | 4850 | 2450 | 5550 | 2 | Breed - Casey 345 kV | AEP-AMRN | 1442 | Rockport - Jefferson 765 kV | AEP | 14.3 | 34.0 | 10.4 |
| | | 4150 | 1750 | 5900 | 2450 | 6600 | 2 | Yukon - Shepler Hill Junction 138 kV | AP | 243 | Keystone - Cabot 500 kV | PENLEC-AP | 2.0 | 4.0 | 2.7 |
| | | 4900 | 1750 | 6650 | 2450 | 7350 | | Kammer 500-765 kV | AP-AEP | 1700 | Belmont 500-765 kV | AP-AEP | 16.2 | 37.8 | 21.9 |
| | | 5000 | 1750 | 6750 | 2450 | 7450 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ Maximum Degrees Fixed Angle (Flow into Michigan is 1220 MW) Note (b): Generating units outaged to model transfer bias: Monroe 1 and Palisades 1 | | | | | | |
| | 2000S Top 3 Limits | -1850 | 1750 | -100 | 3050 | 1200 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 3.7 | 52.0 | 2.8 |
| | | -50 | 1750 | 1700 | 3050 | 3000 | | Ashtabula 345-138 kV | FE | 304 | Ashtabula - Perry 345 kV | FE | 0.8 | 39.2 | 2.7 |
| | | 500 | 1750 | 2250 | 3050 | 3550 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.7 |

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## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MAAC to MAIN | E103a | -2750 | 0 | -2750 | 950 | -1800 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 4.4 | 51.9 | 4.3 |
| | | 2150 | 0 | 2150 | 950 | 3100 | 3 | Butler - Krendale - Maple 138 kV | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 1.9 | 7.8 | 3.3 |
| | | 4550 | 0 | 4550 | 950 | 5500 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.7 |
| | | 4600 | 0 | 4600 | 950 | 5550 | | Greenfield - Lakeview 138 kV | AEP-IP | 248 | Beaver - Davis Besse 345 kV | FE | 1.6 | 12.7 | 2.6 |
| | | 5000 | 0 | 5000 | 950 | 5950 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 & 3 / Palisades 1 / Cook 1 | | | | | | |
| | 2000S Top 3 Limits | -4750 | 0 | -4750 | 2550 | -2200 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 4.4 | 52.0 | 4.1 |
| | | 2050 | 0 | 2050 | 2550 | 4600 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.7 |
| | | 2800 | 0 | 2800 | 2550 | 5350 | 3 | Butler - Krendale - Maple 138 kV | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 2.0 | 8.0 | 3.5 |
| MAAC to MAIN | E103b | 1750 | 0 | 1750 | 1050 | 2800 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 4.5 | 52.0 | 4.3 |
| | | 2000 | 0 | 2000 | 1050 | 3050 | 3 | Butler - Krendale - Maple 138 kV | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 2.0 | 7.8 | 3.3 |
| | | 3350 | 0 | 3350 | 1050 | 4400 | | Greenfield - Lakeview 138 kV | FE | 248 | Beaver - Davis Bessie 345 kV | FE | 1.6 | 12.6 | 2.6 |
| | | 3700 | 0 | 3700 | 1050 | 4750 | 2 | Beaver - Davis Bessie 345 kV | FE | 984 | Kammer - Orange 765 kV | AEP | 8.5 | 6.9 | 9.8 |
| | | 4550 | 0 | 4550 | 1050 | 5600 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.7 |
| | | 4650 | 0 | 4650 | 1050 | 5700 | | Beaver - Davis Bessie 345 kV | FE | 950 | Base Case | ----- | 8.5 | ----- | ----- |
| | | 5000 | 0 | 5000 | 1050 | 6050 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 & 3 / Palisades 1 / Davis-Besse 1 | | | | | | |
| | 2000S Top 3 Limits | -4750 | 0 | -4750 | 2550 | -2200 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 4.4 | 52.0 | 4.1 |
| | | 2050 | 0 | 2050 | 2550 | 4600 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.7 |
| | | 2800 | 0 | 2800 | 2550 | 5350 | 3 | Butler - Krendale - Maple 138 kV | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 2.0 | 8.0 | 3.5 |

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| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VACAR to MAIN | E100 | 4700 | 0 | 4700 | 0 | 4700 | | East Danville - Danville 138 kV | AEP | 384 | Antioch - Jacksons Ferry 500 kV & Jacksons Ferry 500-765 kV | DUKE-AEP AEP | 4.4 | 15.1 | 7.5 |
| | | 5000 | 0 | 5000 | 0 | 5000 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | | | | | | | (Not Tested During 2000 Summer Study) | | | | | | | |
| VACAR to MAIN | E101a | 1250 | 750 | 2000 | 2450 | 3700 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.6 |
| | | 2650 | 750 | 3400 | 2450 | 5100 | | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 4.1 | 39.0 | 8.9 |
| | | 3500 | 750 | 4250 | 2450 | 5950 | 2 | Breed - Casey 345 kV | AEP-AMRN | 1442 | Rockport - Jefferson 765 kV | AEP | 12.5 | 34.0 | 8.9 |
| | | 3700 | 750 | 4450 | 2450 | 6150 | 3 | Dumont 765-345 kV | AEP | 2070 | Dumont - Wilton Center 765 kV | AEP | 3.8 | 42.0 | 14.9 |
| | | 3750 | 750 | 4500 | 2450 | 6200 | | East Danville - Danville 138 kV | AEP | 384 | Antioch - Jacksons Ferry 500 kV & Jacksons Ferry 500-765 kV | DUKE-AEP AEP | 4.4 | 15.1 | 7.4 |
| | | 4300 | 750 | 5050 | 2450 | 6750 | | East Danville - Danville 138 kV | AEP | 310 | Base Case | ----- | 4.4 | ----- | ----- |
| | | 5000 | 750 | 5750 | 2450 | 7450 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ Minimum Degrees Fixed Angle (Flow into Michigan is 2430 MW) Note (b): Generating units outaged to model transfer bias: Monroe 1 and Palisades 1 | | | | | | |
| | 2000S Top 3 Limits | 600 | 750 | 1350 | 3050 | 3650 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.6 |
| | | 2000 | 750 | 2750 | 3050 | 5050 | | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 4.2 | 39.5 | 9.0 |
| | | 2200 | 750 | 2950 | 3050 | 5250 | 2 | East Danville - Danville 138 kV | AEP | 384 | Axton - Jacksons Ferry 765 kV & Axton 138-765 kV | AEP AEP | 4.1 | 56.5 | 2.9 |

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| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VACAR to MAIN | E101b | 1200 | 750 | 1950 | 2450 | 3650 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.6 |
| | | 2650 | 750 | 3400 | 2450 | 5100 | | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 4.2 | 39.0 | 8.9 |
| | | 3400 | 750 | 4150 | 2450 | 5850 | 3 | Dumont 765-345 kV | AEP | 2070 | Dumont - Wilton Center 765 kV | AEP | 3.7 | 42.0 | 14.9 |
| | | 3550 | 750 | 4300 | 2450 | 6000 | 2 | Breed - Casey 345 kV | AEP-AMRN | 1442 | Rockport - Jefferson 765 kV | AEP | 12.5 | 34.0 | 8.9 |
| | | 3650 | 750 | 4400 | 2450 | 6100 | 2 | East Danville - Danville 138 kV | AEP | 384 | Antioch - Jacksons Ferry 500 kV & Jacksons Ferry 500-765 kV | DUKE-AEP AEP | 4.4 | 15.1 | 7.4 |
| | | 4200 | 750 | 4950 | 2450 | 6650 | | East Danville - Danville 138 kV | AEP | 310 | Base Case | ----- | 4.4 | ----- | ----- |
| | | 5000 | 750 | 5750 | 2450 | 7450 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ Zero Degrees Fixed Angle (Flow into Michigan is 1890 MW) Note (b): Generating units outaged to model transfer bias: Monroe 1 and Palisades 1 | | | | | | |
| | 2000S Top 3 Limits | 600 | 750 | 1350 | 3050 | 3650 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.6 |
| | | 1650 | 750 | 2400 | 3050 | 4700 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 3.7 | 52.0 | 3.4 |
| | | 2000 | 750 | 2750 | 3050 | 5050 | | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 4.1 | 39.5 | 9.0 |
| VACAR to MAIN | E101c | 1100 | 750 | 1850 | 2450 | 3550 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.6 |
| | | 2700 | 750 | 3450 | 2450 | 5150 | | Eugene - Bunsonville 345 kV | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 4.1 | 39.0 | 8.9 |
| | | 2950 | 750 | 3700 | 2450 | 5400 | 3 | Dumont 765-345 kV | AEP | 2070 | Dumont - Wilton Center 765 kV | AEP-CE | 3.7 | 41.9 | 14.9 |
| | | 3550 | 750 | 4300 | 2450 | 6000 | 2 | East Danville - Danville 138 kV | AEP | 384 | Antioch - Jacksons Ferry 500 kV & Jacksons Ferry 500-765 kV | DUKE-AEP AEP | 4.4 | 15.1 | 7.4 |
| | | 3600 | 750 | 4350 | 2450 | 6050 | 2 | Breed - Casey 345 kV | AEP-AMRN | 1442 | Rockport - Jefferson 765 kV | AEP | 12.5 | 34.0 | 8.9 |
| | | 4050 | 750 | 4800 | 2450 | 6500 | | East Danville - Danville 138 kV | AEP | 310 | Base Case | ----- | 4.4 | ----- | ----- |
| | | 5000 | 750 | 5750 | 2450 | 7450 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ Maximum Degrees Fixed Angle (Flow into Michigan is 1220 MW) Note (b): Generating units outaged to model transfer bias: Monroe 1 and Palisades 1 | | | | | | |
| | 2000S Top 3 Limits | -1550 | 750 | -800 | 3050 | 1500 | 2,3 | Dumont 765-345 kV | AEP | 2070 | Cook 765-345 kV | AEP | 3.7 | 52.0 | 3.4 |
| | | 500 | 750 | 1250 | 3050 | 3550 | | Sidney 345-138 kV | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 1.6 | 3.9 | 2.6 |
| | | 1950 | 750 | 2700 | 3050 | 5000 | 2 | East Danville - Danville 138 kV | AEP | 384 | Axton - Jacksons Ferry 765 kV & Axton 138-765 kV | AEP AEP | 5.8 | 56.5 | 2.9 |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)



| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TVA to MAIN | E100 | 3550 | 0 | 3550 | 0 | 3550 | | Summer Shade-Summer Shade Tap 161 | TVA-EKPC | 240 | Summer Shade - Summer Shade 161 kV | TVA-EKPC | 1.7 | 99.7 | 3.1 |
| | | 4850 | 0 | 4850 | 0 | 4850 | | Bull Run - Volunteer 500 kV | TVA | 1732 | Watts Barr - Volunteer 500 kV | TVA | 9.2 | 75.6 | 12.3 |
| | | 5000 | 0 | 5000 | 0 | 5000 | | Test Level - No Other Limits Found | Note: Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan | | | | | | |
| | 2000S Top 3 Limits | | | | | | | (Not Tested During 2000 Summer Study) | | | | | | | |
| TVA to MAIN | E103a | 450 | 1000 | 1450 | 950 | 1400 | | Summer Shade-Summer Shade Tap 161 | TVA-EKPC | 240 | Summer Shade - Summer Shade 161 kV | TVA-EKPC | 1.7 | 99.7 | 3.1 |
| | | 2400 | 1000 | 3400 | 950 | 3350 | | Bull Run - Volunteer 500 kV | TVA | 1732 | Watts Barr - Volunteer 500 kV | TVA | 9.2 | 75.6 | 12.3 |
| | | 2450 | 1000 | 3450 | 950 | 3400 | 2 | Paradise - New Hardinsburg 161 kV | TVA-BREC | 265 | Volunteer - Phipps Bend 500 kV | TVA | 3.0 | 2.4 | 3.3 |
| | | 3300 | 1000 | 4300 | 950 | 4250 | | Summer Shade - Summer Shade 161 kV | TVA-EKPC | 327 | Summer Shade-Summer Shade Tap 161 | TVA-EKPC | 1.7 | 99.7 | 3.1 |
| | | 3600 | 1000 | 4600 | 950 | 4550 | | Paradise - New Hardinsburg 161 kV | TVA-BREC | 265 | Base Case | ----- | 3.0 | ----- | ----- |
| | | 4350 | 1000 | 5350 | 950 | 5300 | 2 | New Hardinsburg 161-138 kV | BREC | 224 | Coleman - Newtonville - Taswell 161 kV & Newtonville 161-138 kV | BR-SIGE-HE SIGE | 2.2 | ----- | 2.8 |
| | | 5000 | 1000 | 6000 | 950 | 5950 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 & 3 / Palisades 1 / Cook 1 | | | | | | |
| | 2000S Top 3 Limits | 150 | 2350 | 2500 | 2550 | 2700 | 2 | Summer Shade-Summer Shade Tap 161 | TVA-EKPC | 240 | Summer Shade - Summer Shade 161 kV | TVA-EKPC | 1.5 | 99.7 | 2.7 |
| | | 550 | 2350 | 2900 | 2550 | 3100 | 2 | Norris - La Follette 161 kV | TVA | 234 | Phipps Bend - Pocket 500 kV | TVA-LGEE | 1.7 | 19.0 | 2.6 |
| | | 1900 | 2350 | 4250 | 2550 | 4450 | 2 | Paradise - New Hardinsburg 161 kV | TVA-BREC | 265 | Volunteer - Phipps Bend 500 kV | TVA | 2.6 | 2.4 | 3.0 |

# TABLE 2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Detailed Study Results from Transfer Capability Analysis (1)

| TRANSFER | BASE CASE | NITC FCITC (MW) (A) | BASE Sales (MW) (B) | NTTC FCTTC (MW) (A+B) | BASE Import (MW) (C) | TOTAL Import (MW) (A+C) | NOTE | LIMITING FACILITY | SYSTEM | RATING (MVA) | OUTAGED FACILITY | SYSTEM | PTDF (%) | LODF (%) | OTDF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TVA to MAIN | E103b | 450 | 1100 | 1550 | 1050 | 1500 | | Summer Shade-Summer Shade Tap 161 | TVA-EKPC | 240 | Summer Shade - Summer Shade 161 kV | TVA-EKPC | 2.0 | 99.7 | 3.1 |
| | | 2250 | 1100 | 3350 | 1050 | 3300 | | Bull Run - Volunteer 500 kV | TVA | 1732 | Watts Barr - Volunteer 500 kV | TVA | 9.2 | 75.6 | 12.3 |
| | | 2450 | 1100 | 3550 | 1050 | 3500 | 2 | Paradise - New Hardinsburg 161 kV | TVA-BREC | 265 | Volunteer - Phipps Bend 500 kV | TVA | 3.0 | 2.4 | 3.3 |
| | | 3300 | 1100 | 4400 | 1050 | 4350 | | Summer Shade - Summer Shade 161 kV | TVA-EKPC | 240 | Summer Shade-Summer Shade Tap 161 | TVA-EKPC | 2.0 | 99.7 | 3.1 |
| | | 3600 | 1100 | 4700 | 1050 | 4650 | 2 | Paradise - New Hardinsburg 161 kV | TVA-BREC | 265 | Base Case | | 3.0 | ----- | ----- |
| | | 4350 | 1100 | 5450 | 1050 | 5400 | 2 | New Hardinsburg 161-138 kV | BREC | 224 | Coleman - Newtonville - Taswell 161 kV & Newtonville 161-138 kV | BR-SIGE-HE SIGE | 2.2 | ----- | 2.8 |
| | | 5000 | 1100 | 6100 | 1050 | 6050 | | Test Level - No Other Limits Found | Note (a): Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan<br>Note (b): Generating units outaged to model transfer bias: Monroe 1 & 3 / Palisades 1 / Davis-Besse 1 | | | | | | |
| | 2000S Top 3 Limits | 150 | 2350 | 2500 | 2550 | 2700 | 2 | Summer Shade-Summer Shade Tap 161 | TVA-EKPC | 240 | Summer Shade - Summer Shade 161 kV | TVA-EKPC | 1.5 | 99.7 | 2.7 |
| | | 550 | 2350 | 2900 | 2550 | 3100 | 2 | Norris - La Follette 161 kV | TVA | 234 | Phipps Bend - Pocket 500 kV | TVA-LGEE | 1.7 | 19.0 | 2.6 |
| | | 1900 | 2350 | 4250 | 2550 | 4450 | 2 | Paradise - New Hardinsburg 161 kV | TVA-BREC | 265 | Volunteer - Phipps Bend 500 kV | TVA | 2.6 | 2.4 | 3.0 |

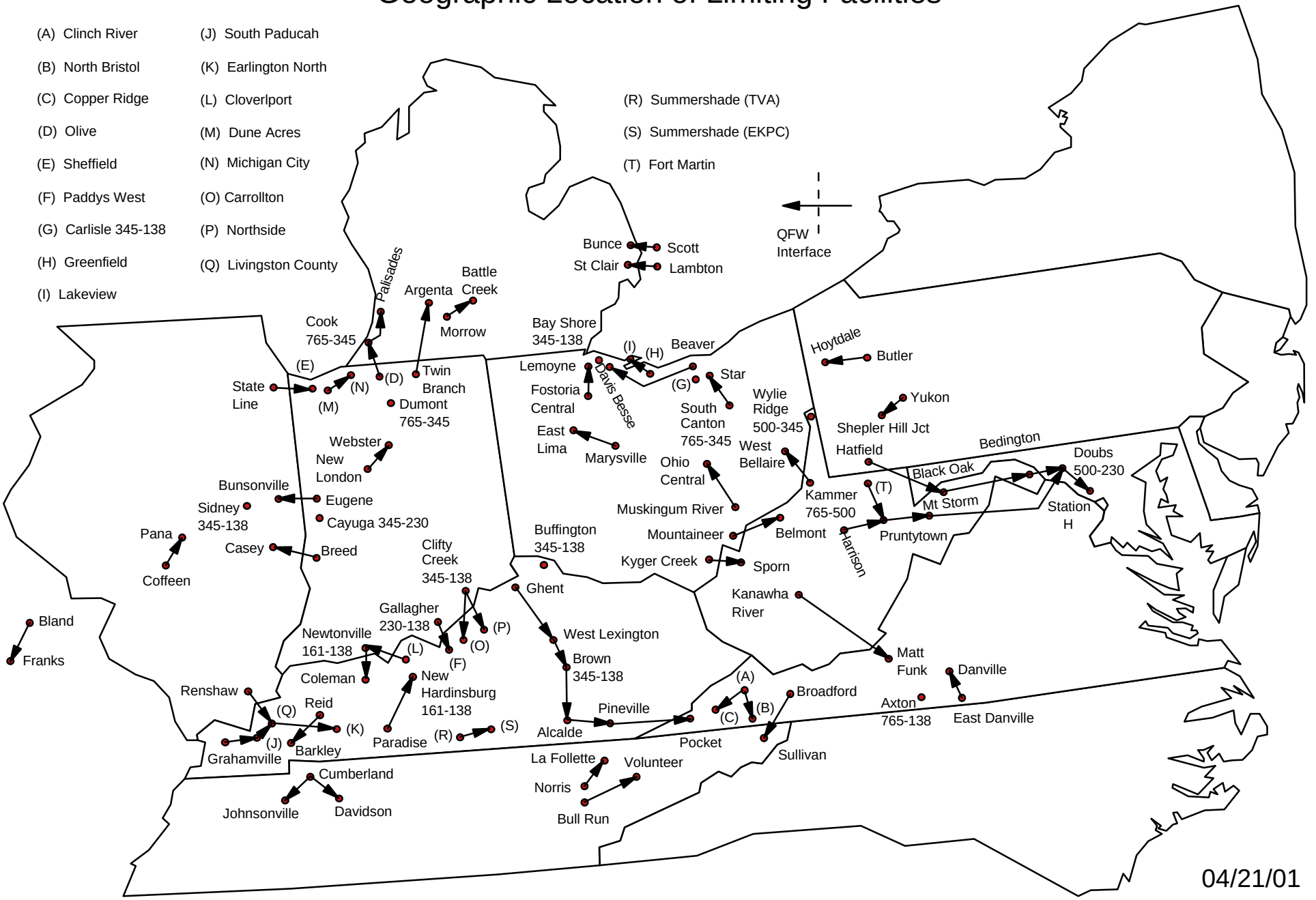
Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

(1) The transfer capabilities stated in this report are NOT the Available Transfer Capabilities (ATC) noted in FERC Orders 888 and 889.
(2) This facility may overload at higher transfer levels for other single contingencies which are not shown in this table for brevity.
(3) This transfer capability does not reflect the implementation of an established operating procedure to relieve this overload (refer to Appendix H).
(4) This transfer capability reflects the implementation of an established operating procedure to relieve a more limiting overload (refer to Appendix H).

# Figure 3

## ECAR 2001 Summer Assessment of Transmission System Performance

## Geographic Location of Limiting Facilities



# BASE CASE CONTINGENCY OVERLOADS

## Introduction and Detailed Study Results (Table 3)

The following table lists facilities found to exceed their thermal emergency ratings under contingency conditions, without any additional incremental transfers. These contingencies were simulated on the ECAR primary base case (E100) and on each of the seven study base cases (E101a, E101b, E101c, E102, E103a, E103b, and E104) developed for this assessment. No additional transfers were simulated other than those already modeled in these eight base cases. These base case contingency overloaded facilities, which may be representative of local area problems, may also require close monitoring during the upcoming peak load season.

**TABLE 3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Base Case Contingency Overloads**
**(Limiting Facilities Exceeding 100% of Emergency Ratings for Critical Outages Under Primary and Study Base Case Conditions)**

Date: 04/18/01



| Limiting Facility | System | Rating (MVA) | Critical Outage | System | LODF (%) | Case E100 (2) | Case E101a (3) | Case E101b (4) | Case E101c (5) | Case E102 (2) | Case E103a (2) | Case E103b (2) | Case E104 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cabot - Osolo 138 kV** | AEP | 201 | Cook - East Elkhart 345 kV | AEP | 19.4 | ----- | ----- | ----- | ----- | 105.1% | ----- | ----- | ----- |
| | | | Cook - East Elkhart 345 kV<br>Robison Park - Argenta 345 kV | AEP<br>AEP-CONS | ----- | ----- | ----- | ----- | ----- | 112.7% | ----- | ----- | 103.4% |
| **Cook 765-345 kV (1)** | AEP | 2070 | Dumont 765-345 kV | AEP | 42.7 | ----- | ----- | ----- | ----- | ----- | 101.7% | ----- | ----- |
| **DeSoto - Jay 138 kV** | AEP | 185 | Base Case | ----- | ----- | 103.0% | ----- | 100.8% | 102.0% | 105.5% | 110.1% | 111.0% | ----- |
| **Dumont 765-345 kV (1)** | AEP | 2070 | Cook 765-345 kV | AEP | 51.9 | ----- | ----- | ----- | ----- | ----- | 105.6% | ----- | ----- |
| **Glen Lyn - Claytor 138 kV** | AEP | 153 | Broadford - Jacksons Ferry 765 kV &<br>Broadford 138 kV Series Reactor Inserted | AEP<br>AEP | ----- | ----- | ----- | ----- | ----- | 104.2% | ----- | ----- | ----- |
| **North Newark - Sharp Road 138 kV** | AEP | 133 | Base Case | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 102.8% | 108.0% | ----- |
| **Torrey - Cloverdale 138 kV** | AEP-FE | 210 | Canton Central - Cloverdale 138 kV | AEP-FE | 48.6 | ----- | ----- | ----- | ----- | ----- | 105.6% | 111.5% | ----- |
| | | | South Canton - Star 345 kV | AEP-FE | 1.4 | ----- | ----- | ----- | ----- | ----- | 104.9% | 111.5% | ----- |
| **West Canton - Dale 138 kV** | AEP-FE | 185 | Base Case | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 100.4% | 103.7% | ----- |
| **Twin Branch - Kline - Northeast 138 kV** | AEP-NIPS | 156 | Base Case | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 105.5% |
| | | 201 | Schahfer - Burr Oak 345 kV | NIPS | 12.8 | ----- | ----- | ----- | ----- | 107.5% | ----- | ----- | 109.3% |

**TABLE 3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
Date: 04/18/01 **Base Case Contingency Overloads** 
**(Limiting Facilities Exceeding 100% of Emergency Ratings for Critical Outages Under Primary and Study Base Case Conditions)**

| Limiting Facility | System | Rating (MVA) | Critical Outage | System | LODF (%) | Case E100 (2) | Case E101a (3) | Case E101b (4) | Case E101c (5) | Case E102 (2) | Case E103a (2) | Case E103b (2) | Case E104 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Butler - Shanor M - Krendale 138kV (1)** | AP | 176 | Base Case | ----- | ----- | ----- | 113.7% | 119.8% | 127.4% | ----- | 107.4% | 109.5% | ----- |
| | | 227 | Mansfield - Hoytdale 345 kV | FE | 9.4 | 101.0% | 116.8% | 121.4% | 127.4% | ----- | 112.5% | 114.3% | ----- |
| | | | Hoytdale 345-138 kV | FE | 23.7 | ----- | 112.8% | 117.1% | 122.5% | ----- | 108.5% | 110.1% | ----- |
| **Millville - Lovettsville 138 kV** | AP | 227 | Bedington - Doubs 500 kV | AP | 8.2 | ----- | ----- | ----- | ----- | 101.0% | ----- | ----- | ----- |
| **Social Hall - Vasco - Edgewater 138 kV** | AP | 106 | Base Case | ----- | ----- | ----- | ----- | 103.3% | 122.1% | ----- | ----- | ----- | ----- |
| | | 136 | Keystone - Yukon 500 kV | PJM-AP | 5.9 | ----- | ----- | ----- | 118.1% | ----- | ----- | ----- | ----- |
| | | | Erie West - Ashtabula - Perry 345 kV & Ashtabula 345-138 kV | PENLEC-FE FE | ----- | ----- | ----- | ----- | 112.1% | ----- | ----- | ----- | ----- |
| **Greene - Roxbury 138 kV (1)** | AP-PENLEC | 142 | Bedington - Black Oak 500 kV | AP | 3.5 | ----- | ----- | ----- | 102.9% | ----- | ----- | ----- | ----- |
| **Hatfield - Black Oak 500 kV (Voltage)** | AP | 2265 | Pruntytown - Mount Storm 500 kV | AP-VP | 26.8 | ----- | ----- | ----- | ----- | 102.7% | ----- | ----- | ----- |
| **Social Hall - Blairsville 138 kV (1)** | AP-PENLEC | 119 | Base Case | ----- | ----- | 107.4% | 111.2% | 129.6% | 153.3% | ----- | 108.9% | 107.7% | 105.8% |
| | | 171 | Cabot - Keystone 500 kV | AP-PJM | 4.9 | ----- | ----- | 104.3% | 123.4% | ----- | ----- | ----- | ----- |
| | | | Yukon - Keystone 500 kV | AP-PJM | 5.1 | ----- | ----- | 102.1% | 122.3% | ----- | ----- | ----- | ----- |
| **State Line - Wolf Lake 138 kV (1)** | CE-NIPS | 160 | Burnham - Sheffield 345 kV | CE-NIPS | 23.2 | ----- | ----- | ----- | ----- | 100.7% | ----- | ----- | ----- |

**TABLE 3**

**ECAR 2001 Summer Assessment of Transmission System Performance**

**Base Case Contingency Overloads**

**(Limiting Facilities Exceeding 100% of Emergency Ratings for Critical Outages Under Primary and Study Base Case Conditions)**

| Limiting Facility | System | Rating (MVA) | Critical Outage | System | LODF (%) | Case E100 (2) | Case E101a (3) | Case E101b (4) | Case E101c (5) | Case E102 (2) | Case E103a (2) | Case E103b (2) | Case E104 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bloomington 230-138 kV** | CIN | 126 | Gibson - Bedford 345 kV & Bedford 345-138 kV | CIN CIN | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 100.7% |
| **Gibson - Princeton 138 kV** | CIN | 246 | Gibson - Petersburg 345 kV & Petersburg E 345-138 kV | CIN-IPL IPL | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 102.9% |
| **Kokomo #4 or #5 or #6 230-138 kV (1)** | CIN | 75 | Jefferson - Greentown 765 kV | AEP | 1.7 | ----- | ----- | ----- | ----- | ----- | 108.5% | 104.0% | ----- |
| **Wabash R - Crawfordsville 138 kV (1)** | CIN | 146 | Dequine - Westwood 345 kV & Westwood 345-138 kV | AEP-CIN CIN | 9.5 | 105.6% | 109.8% | 110.3% | 111.0% | 100.7% | 113.8% | 112.5% | ----- |
| | | | Cayuga - Attica - Lafayette 230 kV | CIN | 7.4 | 105.2% | 111.2% | 112.0% | 112.8% | ----- | 115.6% | 113.7% | ----- |
| | | | Cayuga Sub - Eugene 345 kV | CIN-AEP | 2.7 | ----- | 106.3% | 107.0% | 107.8% | ----- | 109.3% | 107.5% | ----- |
| **Greenwood - Saratoga 345 kV** | DECO | 771 | Base Case | ----- | ----- | ----- | 104.8% | 101.1% | ----- | ----- | 103.2% | 103.5% | 107.5% |
| **Lincoln-Northeast-Northwest 120 kV (1)** | DECO | 222 | Base Case | ----- | ----- | ----- | 102.0% | ----- | ----- | ----- | ----- | ----- | 104.5% |
| | | 250 | Belle River - Pontiac 345 kV | DECO | ----- | ----- | 106.0% | ----- | ----- | ----- | ----- | ----- | 108.9% |
| | | | Quaker 345-120 kV | DECO | ----- | ----- | 102.8% | ----- | ----- | ----- | ----- | ----- | 105.0% |
| **Northeast 230-120 kV** | DECO | 405 | Base Case | ----- | ----- | ----- | 100.4% | ----- | ----- | ----- | ----- | ----- | 102.2% |
| **Spurlock - Kenton #1 or #2 138 kV** | EKPC-LGEE | 280 | Spurlock - Kenton #2 or #1 138 kV | EKPC-LGEE | 82.3 | ----- | ----- | ----- | ----- | ----- | 103.6% | 104.1% | ----- |

**TABLE 3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Base Case Contingency Overloads**
**(Limiting Facilities Exceeding 100% of Emergency Ratings for Critical Outages Under Primary and Study Base Case Conditions)**



| Limiting Facility | System | Rating (MVA) | Critical Outage | System | LODF (%) | Case E100 (2) | Case E101a (3) | Case E101b (4) | Case E101c (5) | Case E102 (2) | Case E103a (2) | Case E103b (2) | Case E104 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bay Shore - Jeep - Dixie 138 kV** | FE | 218 | Allen 345-138 kV | FE | 21.5 | 117.9% | 119.6% | 119.6% | 119.5% | 115.5% | 117.4% | 114.5% | 119.1% |
| | | | Lulu - Allen / Majestic / Monroe 345 kV | DECO-FE | ----- | 101.4% | 103.2% | 102.2% | 101.4% | ----- | ----- | ----- | 105.4% |
| | | | Lemoyne - Midway 345 kV | FE | 6.8 | ----- | ----- | ----- | ----- | ----- | 110.0% | 102.9% | ----- |
| **Cloverdale - Brookside 138 kV** | FE | 188 | Muskingum - Ohio C - Galion 345 kV & Ohio Central 345-138 kV | AEP-FE AEP | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 100.6% | ----- |
| **Pleasant V - Griffin - Faber (Q3) 138 kV** | FE | 141 | Fox T-2 (Q11) 345-138 kV & Fox T-3 (Q13) 345-138 kV | FE FE | ----- | 110.9% | 113.7% | 118.8% | 125.2% | 102.0% | 123.6% | 128.1% | 100.2% |
| | | | Fox T-3 (Q13) 345-138 kV | FE | 29.5 | ----- | ----- | 103.1% | 108.9% | ----- | 107.3% | 111.4% | ----- |
| **Richland - Ridgeville 138 kV** | FE | 124 | East Lima - Fostoria 345 kV | AEP | 3.5 | ----- | ----- | ----- | ----- | ----- | ----- | 107.5% | ----- |
| | | | Allen 345-138 kV | FE | 5.7 | ----- | ----- | ----- | ----- | ----- | ----- | 102.0% | ----- |
| **Star # 1 345-138 kV** | FE | 300 | Star # 2 345-138 kV & Star # 3 345-138 kV | FE FE | ----- | 110.7% | 111.3% | 110.8% | 110.1% | 110.8% | 108.4% | 106.7% | 112.9% |
| **Tangy 138-69 kV** | FE | 64 | Base Case | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 100.4% | ----- |
| | | 64 | Galion # 1 345-138 kV & Galion # 2 345-138 kV | FE FE | ----- | 114.6% | 109.8% | 109.4% | 108.8% | 119.9% | 116.7% | 120.1% | 112.3% |
| | | | Muskingum - Ohio C - Galion 345 kV & Ohio Central 345-138 kV | AEP-FE AEP | ----- | 101.7% | ----- | 100.9% | 104.9% | 101.3% | 118.8% | 126.4% | ----- |

**TABLE 3**

**ECAR 2001 Summer Assessment of Transmission System Performance**

**Base Case Contingency Overloads**

**(Limiting Facilities Exceeding 100% of Emergency Ratings for Critical Outages Under Primary and Study Base Case Conditions)**

| Limiting Facility | System | Rating (MVA) | Critical Outage | System | LODF (%) | Case E100 (2) | Case E101a (3) | Case E101b (4) | Case E101c (5) | Case E102 (2) | Case E103a (2) | Case E103b (2) | Case E104 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Georgetown 138-69 kV** | HE | 100 | Gibson - Ramsey - Speed 345 kV & Ramsey 345-69 kV & Speed 345-138 kV | CIN-HE-CIN HE & CIN | ----- | 100.3% | ----- | ----- | ----- | 102.0% | ----- | ----- | 103.5% |
| **Ramsey 345-69 kV** | HE | 150 | Speed 345-138 kV | CIN | 11.5 | 104.3% | 102.4% | 102.2% | 102.0% | 106.2% | 102.1% | 102.4% | 105.6% |
| **Taswell 161-69 kV** | HE | 67 | Gibson - Ramsey - Speed 345 kV & Ramsey 345-69 kV & Speed 345-138 kV | CIN-HE-CIN HE & CIN | ----- | ----- | ----- | ----- | ----- | ----- | 100.7% | 101.0% | ----- |
| **Beck - Hannon Jct (Q24HM) 220 kV** | HONI | 465 | Base Case | ----- | ----- | ----- | 100.9% | ----- | ----- | ----- | ----- | ----- | ----- |
| | | 616 | Beck - Neale Jct (Q25BM) 220 kV & Beck - Hannon Jct (Q29HM) 220 kV | HONI HONI | ----- | ----- | 115.6% | ----- | ----- | ----- | ----- | ----- | ----- |
| **Lambton - Saint Clair (L4D) 345 kV (1)** | HONI-DECO | 845 | Base Case | ----- | ----- | ----- | 106.3% | ----- | ----- | ----- | ----- | ----- | ----- |
| | | 1170 | Lambton - Saint Clair (L51D) 345 kV | HONI-DECO | 60.0 | ----- | 104.1% | ----- | ----- | ----- | ----- | ----- | 109.8% |
| **Lambton - Saint Clair (L51D) 345 kV (1)** | HONI-DECO | 845 | Base Case | ----- | ----- | ----- | 102.5% | ----- | ----- | ----- | ----- | ----- | ----- |
| | | 1368 | Lambton - Saint Clair (L4D) 345 kV | HONI-DECO | 58.0 | ----- | 100.0% | ----- | ----- | ----- | ----- | ----- | 102.7% |
| **Scott - Bunce Creek (B3N) 220 kV (1)** | HONI-DECO | 461 | Base Case | ----- | ----- | ----- | 108.5% | ----- | ----- | ----- | ----- | ----- | 112.4% |
| | | 482 | Lambton - Saint Clair (L4D) 345 kV | HONI-DECO | 16.2 | ----- | 132.4% | 111.5% | ----- | ----- | ----- | ----- | 138.0% |
| | | | Lambton - Saint Clair (L51D) 345 kV | HONI-DECO | 15.1 | ----- | 129.9% | 106.8% | ----- | ----- | ----- | ----- | 135.5% |

**TABLE 3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
Date: 04/18/01 **Base Case Contingency Overloads** 
**(Limiting Facilities Exceeding 100% of Emergency Ratings for Critical Outages Under Primary and Study Base Case Conditions)**

| Limiting Facility | System | Rating (MVA) | Critical Outage | System | LODF (%) | Case E100 (2) | Case E101a (3) | Case E101b (4) | Case E101c (5) | Case E102 (2) | Case E103a (2) | Case E103b (2) | Case E104 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sidney 345-138 kV** | IP | 560 | Bunsonville 345-138 kV | IP | 48.4 | ----- | 105.7% | 106.0% | 106.4% | ----- | ----- | ----- | ----- |
| | | | Rockport - Jefferson 765 kV | AEP | 4.2 | ----- | 101.0% | 101.1% | 101.3% | ----- | ----- | ----- | ----- |
| **Petersburg East 345-138 kV** | IPL | 180 | Petersburg - Lost River 345 kV & Petersburg West 345-138 kV | IPL-CIN IPL | ----- | ----- | ----- | ----- | ----- | 101.1% | ----- | ----- | 116.0% |
| | | | Gibson 345-138 kV | CIN | 22.6 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 102.6% |
| **Petersburg - Oakland City 138 kV** | IPL-CIN | 143 | Gibson 345-138 kV | CIN | 65.5 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 102.6% |
| **Fawkes - Lake Reba Tap 138 kV** | LGEE | 165 | JK Smith - Powell County 138 kV | EKPC | 27.9 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 107.8% |
| | | | Brown - Alcalde - Pineville 345 kV & Alcalde 345-138 kV | LGEE LGEE | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 102.7% |
| **Ghent - Owen Co. - Scott Co. 138 kV** | LGEE | 227 | Ghent - West Lexington - Brown 345 kV & West Lexington 345-138 kV | LGEE LGEE | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 101.2% |
| **Goddard - Rodburn 138 kV** | LGEE | 179 | Spurlock - Avon 345 kV & Avon 345-138 kV | EKPC EKPC | 16.7 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 100.3% |
| **Kenton-Flemingsburg-Goddard 138 kV** | LGEE | 158 | Spurlock - Maysville - Plumville 138 kV | EKPC | 49.6 | 111.4% | 108.5% | 108.0% | 107.4% | 117.1% | 104.2% | 104.4% | 120.7% |
| **Blue Lick - Bullitt County 161 kV** | LGEE-EKPC | 239 | Baker - Broadford 765 kV | AEP | 1.5 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 108.0% |
| | | | Ghent - West Lexington - Brown 345 kV & West Lexington 345-138 kV | LGEE LGEE | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 101.6% |

**TABLE 3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
Date: 04/18/01 **Base Case Contingency Overloads** 
**(Limiting Facilities Exceeding 100% of Emergency Ratings for Critical Outages Under Primary and Study Base Case Conditions)**

| Limiting Facility | System | Rating (MVA) | Critical Outage | System | LODF (%) | Case E100 (2) | Case E101a (3) | Case E101b (4) | Case E101c (5) | Case E102 (2) | Case E103a (2) | Case E103b (2) | Case E104 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Reynolds 345-138 kV** | NIPS | 224 | Dequine - Olive 345 kV &<br>Dequine - Westwood 345 kV &<br>Westwood 345-138 kV | AEP<br>AEP-CIN<br>CIN | ----- | 100.9% | 103.1% | 102.8% | 102.1% | ----- | ----- | 100.2% | 101.0% |
| **Culley-Grandview-Newtonville 138 kV** | SIGE | 156 | Base Case | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 106.2% |
| | | 179 | A.B.Brown - Henderson County 138 kV | SIGE-BREC | 42.2 | ----- | ----- | ----- | ----- | 105.7% | ----- | ----- | 118.6% |
| | | | Wilson - Coleman 161 kV | BREC | 13.2 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 103.0% |
| **Cumberland - Davidson 500 kV** | TVA | 2597 | Cumberland - Johnsonville 500 kV | TVA | 75.7 | ----- | ----- | ----- | ----- | ----- | ----- | ----- | 102.2% |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

(1) This overload does not reflect the implementation of an established operating procedure to relieve the overload (refer to Appendix H).
(2) Michigan-Ontario PARs @ 600 MW Fixed Flow into Michigan.
(3) Michigan-Ontario PARs @ Minimum Degrees Fixed Angle.
(4) Michigan-Ontario PARs @ Zero Degrees Fixed Angle.
(5) Michigan-Ontario PARs @ Maximum Degrees Fixed Angle.

# VOLTAGE ANALYSIS

## Introduction

In addition to the linear analysis documented in this report, AC analysis was also conducted in an effort to examine the voltage performance of those portions of the ECAR transmission network where potential voltage limitations have been identified through past operating experience or other ECAR assessments. This section of the report documents the results from these AC assessments.

## Summary of Study Results (Table 4)

The voltage performance of the ECAR transmission network was analyzed under eight scenarios, covering seven distinct portions of the ECAR transmission network. The eight scenarios are outlined in Table 4, which also documents the resulting voltage-limited transfer capabilities for each of the eight scenarios. The detailed results are presented in terms of PV-Curves (Figure 4) and discussed below. It should be noted that although voltage limitations are clearly present in all of the scenarios studied, in most cases, more restrictive thermal limitations were identified. In addition, in the first two scenarios, where the sensitivity of the study results to the operation of the Phase Angle Regulators (PAR) on the Michigan-Ontario interface was examined, both the voltage and thermal limitations were found to be more restrictive when the PARs were operated to redirect flows that would otherwise flow around the north end of Lake Erie.

## Northern Indiana (Figure 4.1)

The first scenario examined an outage of the Cook 765-345 kV (AEP) transformer with a prior outage of the Cook 1 (AEP) and Palisades 1 (CONS) generating units. The voltage at the Robison Park 138 kV (AEP) bus was monitored in response to transfers from VACAR to MECS. Study base cases E101b and E101c were used because their east-to-west transfer bias provided a more stressful scenario. In addition, the E101b study base case reflected PAR settings (zero fixed angle) which resulted in a 1,890 MW flow from Ontario to Michigan, while the E101c study base case reflected PAR settings (maximum fixed angle) which resulted in the most restrictive flow (1,220 MW) from Ontario to Michigan. For incremental transfers from VACAR to MECS, the Robison Park 138 kV (AEP) voltage drops

below the 92% voltage limit at a FCITC level of 3,900 MW (FCTTC of 3,900 MW and Total Import Capability of 5,700 MW) when the PARs are set at a zero fixed angle, and at a FCITC level of 3,150 MW (FCTTC of 3,150 MW and Total Import Capability of 4,950 MW) when the PARs are set at a maximum fixed angle. It is anticipated, however, that thermal limitations will be reached before this voltage condition becomes limiting. Transfers from VACAR to MECS were found to be thermally limited by the Lambton - Saint Clair (L4D) 345 kV (HONI-DECO) circuit under base case (no transmission outage) conditions, at a FCITC level of 1,650 MW (FCTTC of 1,650 MW and Total Import Capability of 3,450 MW) when the PARs are set at a zero fixed angle, and by the Dumont 765-345 kV (AEP) transformer for an outage of the Cook 765-345 kV (AEP) transformer, at a FCITC level of 1,400 MW (FCTTC of 1,400 MW and Total Import Capability of 3,200 MW) when the PARs are set at a maximum fixed angle. While the 2001 Summer thermal limits are less restrictive than the 2000 Summer thermal limits, the 2001 Summer voltage limits are basically unchanged from the 2000 Summer voltage limits.

## Central Ohio (Figure 4.2)

The second scenario examined an outage of the Marysville 765-345 kV (AEP) transformer with a prior outage of the Conesville 4 and 5 (AEP) generating units. The voltage at the Saint Clair 138 kV (AEP) bus was monitored in response to transfers from VACAR to MECS. Study base cases E101b and E101c were used because their east-to-west transfer bias provided a more stressful scenario. In addition, the E101b study base case reflected PAR settings (zero fixed angle) which resulted in a 1890 MW flow from Ontario to Michigan, while the E101c study base case reflected PAR settings (maximum fixed angle) which resulted in the most restrictive flow (1220 MW) from Ontario to Michigan. For incremental transfers from VACAR to MECS, the Saint Clair 138 kV (AEP) voltage drops below the 92% voltage limit at a FCITC level of 4,150 MW (FCTTC of 4,150 MW and Total Import Capability of 5,950 MW) when the PARs are set at a zero fixed angle, and at a FCITC of 3,250 MW (FCTTC of 3,250 MW and Total Import Capability of 5,050 MW) when the PARs are set at a maximum fixed angle. It is anticipated, however, that thermal limitations will be reached before this voltage condition becomes limiting. Transfers from VACAR to MECS were found to be thermally limited by the Lambton - Saint Clair (L4D) 345 kV (HONI-DECO) circuit under base case (no transmission outage) conditions, at a FCITC level of 1650 MW (FCTTC of 1650 MW and Total Import Capability of 3,450 MW) when the PARs are set at a zero fixed angle, and by the Dumont 765-345 kV (AEP)

transformer for an outage of the Cook 765-345 kV (AEP) transformer, at a FCITC level of 1,400 MW (FCTTC of 1,400 MW and Total Import Capability of 3,200 MW) when the PARs are set at a maximum fixed angle. Both the 2001 Summer thermal and voltage limits are less restrictive than the 2000 Summer thermal and voltage limits, with the extent to which they are less restrictive being a function of the HONI-DECO PAR settings. The significant improvement in voltage performance is due to the addition of the new Orange 765-138 kV (AEP) Station on the Kammer - Marysville 765 kV (AEP) circuit, which is scheduled to be placed in service by May 2001.

## Southeastern ECAR (Figures 4.3a, 4.3b)

The third scenario examined an outage of the Baker - Broadford 765 kV (AEP) circuit with a prior outage of the Glen Lyn 5 and 6 (AEP) generating units, and separately, an outage of the Broadford - Jacksons Ferry 765 kV (AEP) circuit for the same prior generation outage. The voltage at the Matt Funk 345 kV (AEP) bus was monitored in response to transfers from MAIN to VACAR. Study base case E102 was used because its west-to-east transfer bias provided a more stressful scenario. For incremental transfers from MAIN to VACAR, the Matt Funk 345 kV (AEP) voltage drops below the 95% voltage limit (as determined through the Kanawha River - Matt Funk 345 kV (KMF) Operating Guidelines -- refer to Appendix H for details) at a FCITC level of 2,200 MW (FCTTC of 3,200 MW and Total Import Capability of 3,600 MW) for an outage of the Baker - Broadford 765 kV circuit, and at a FCITC level of 1,850 MW (FCTTC of 2,850 MW and Total Import Capability of 3,250 MW) for an outage of the Broadford - Jacksons Ferry 765 kV circuit. It is anticipated, however, that thermal limitations will be reached before this voltage condition becomes limiting. Transfers from MAIN to VACAR were found to be thermally limited by the Cumberland - Davidson 500 kV (TVA) circuit for an outage of the Cumberland - Johnsonville 500 kV (TVA) circuit, at a FCITC level of 300 MW (FCTTC of 1,300 MW and Total Import Capability of 1,700 MW). While the 2001 Summer thermal limits are less restrictive than the 2000 Summer thermal limits, the 2001 Summer voltage limits are more restrictive than the 2000 Summer voltage limits due to higher load levels.

## Eastern ECAR (Figures 4.4, 4.5a, 4.5b)

The fourth scenario assumed an outage of the Black Oak - Bedington 500 kV (AP) circuit without any prior generation outages. The voltage of the Meadow Brook

500 kV (AP) bus was monitored in response to transfers from MAIN to MAAC. Study base case E102 was used because its west-to-east transfer bias provided a more stressful scenario. For incremental transfers from MAIN to MAAC, the Meadow Brook 500 kV (AP) voltage drops below the calculated 97.98% voltage stability limit (Reliability Coordination Plan Level II) at a FCITC level of 1,150 MW (FCTTC of 3,150 MW and Total Import Capability of 3,050 MW). This voltage limit corresponds to a Mount Storm - Meadow Brook 500 kV (VP-AP) circuit loading of 1,790 MW. It is anticipated, however, that thermal limitations will be reached before this voltage condition becomes limiting. Transfers from MAIN to MAAC were found to be thermally limited by the Cumberland - Davidson 500 kV (TVA) circuit for an outage of the Cumberland - Johnsonville 500 kV (TVA) circuit, at a FCITC level of 400 MW (FCTTC of 2,400 MW and Total Import Capability of 2,300 MW). This thermal limit corresponds to a Mount Storm - Meadow Brook 500 kV (VP-AP) circuit loading of 1,602 MW. The 2001 Summer thermal limit and voltage limits are more restrictive than the 2000 Summer thermal and voltage limits. The decrease in voltage limits can be attributed to base case differences such as the higher real and reactive loads modeled in the AP system.

The fifth scenario assumed an outage of the Pruntytown - Mount Storm 500 kV (AP-VP) circuit without any prior generation outages. Voltages at the Black Oak 500 kV (AP) and Bedington 500 kV (AP) buses were monitored in response to transfers from MAIN to MAAC. Study base case E102 was used because its west-to-east transfer bias provided a more stressful scenario. For incremental transfers from MAIN to MAAC, the Black Oak 500 kV (AP) and Bedington 500 kV (AP) voltages drop below their calculated 95.42% and 96.52% respective voltage stability limits (Reliability Coordination Plan Level II) at a FCITC level of -150 MW (FCTTC of 1,850 MW and Total Import Capability of 1,750 MW). This voltage limit corresponds to a Bedington - Doubs 500 kV (AP) circuit loading of 1,530 MW. It is anticipated that this voltage limit will be reached prior to any thermal limitations. Transfers from MAIN to MAAC were found to be thermally limited by the Cumberland - Davidson 500 kV (TVA) circuit for an outage of the Cumberland - Johnsonville 500 kV (TVA) circuit, at a FCITC level of 400 MW (FCTTC of 2,400 MW and Total Import Capability of 2,300 MW). This thermal limit corresponds to a Bedington - Doubs 500 kV (AP) circuit loading of 1,600 MW. The 2001 Summer voltage limit is more restrictive than the 2000 Summer voltage limit. The decrease in voltage performance can be attributed to base case differences such as the higher real and reactive loads modeled in the AP system.

## Southern Michigan (Figure 4.6)

The sixth scenario assumed no transmission outages and no prior generation outages. The voltage of the Tompkins 345 kV (CONS) bus was monitored in response to transfers from MAIN to MECS. Study base cases E103a and E103b were used because their south-to-north transfer bias, which included an outage of Monroe Units 1 & 3 (DECO) and Palisades Unit 1 (CONS), provided a more stressful scenario. In addition, the E103a study base case reflected an outage of Cook Unit 1 (AEP), while the E103b study base case reflected an outage of Davis-Besse Unit 1 (FE). For incremental transfers from MAIN to MECS, the Tompkins 345 kV (CONS) voltage drops below the 97% voltage limit at a FCITC level of 2,200 MW (FCTTC of 2,200 MW and Total Import Capability of 4,500 MW) when Cook Unit 1 was outaged as part of the south-to-north transfer bias (E103a), and a FCITC level of 1,400 MW (FCTTC of 1,400 MW and Total Import Capability of 3,700 MW) when Davis-Besse Unit 1 was outaged as part of the south-to-north transfer bias (E103b). It is anticipated, however, that thermal limitations will be reached before these voltage conditions become limiting. Transfers from MAIN to MECS were found to be thermally limited by the Dumont 765-345 kV (AEP) transformer for an outage of the Cook 765-345 kV (AEP) transformer (AEP), at a FCITC of -900 MW (FCTTC of -900 MW and Total Import Capability of 1,400 MW) when Cook Unit 1 was outaged as part of the south-to-north transfer bias (E103a), and by the Muskingum - Ohio Central 345 kV (AEP) circuit at its pre-contingency rating to a FCITC of 450 MW (FCTTC of 450 MW and Total Import Capability of 2,750 MW) when Davis-Besse Unit 1 was outaged as part of the south-to-north transfer bias (E103b). This scenario was not tested as part of the 2000 Summer assessment.

## Northwestern Ohio (Figure 4.7)

The seventh scenario assumed an outage of the Allen Junction 345-138 kV (FE) transformer without any prior generation outages. The voltage at the Allen Junction 138 kV (FE) bus was monitored in response to transfers from MAAC to MECS. Study base cases E103a and E103b were used because their south-to-north transfer bias, which included an outage of Monroe Units 1 & 3 (DECO) and Palisades Unit 1 (CONS), provided a more stressful scenario. In addition, the E103a study base case reflected an outage of Cook Unit 1 (AEP), while the E103b study base case reflected an outage of Davis-Besse Unit 1 (FE). For incremental transfers from MAAC to MECS, the Allen Junction 138 kV (FE) voltage drops below the 90% voltage limit at a FCITC level of 1,000 MW (FCTTC of 1,000 MW

and Total Import Capability of 3,300 MW) when Cook Unit 1 was outaged as part of the south-to-north transfer bias (E103a), and a FCITC level of -1,250 MW (FCTTC of -1,250 MW and Total Import Capability of 1,050 MW) when Davis-Besse Unit 1 was outaged as part of the south-to-north transfer bias (E103b). While it is anticipated that thermal limitations will be reached first for an outage of Cook Unit 1, voltage limitation will be reached first for an outage of Davis-Besse Unit 1. Transfers from MAAC to MECS were found to be thermally limited by the Dumont 765-345 kV (AEP) transformer for an outage of the Cook 765-345 kV (AEP) transformer (AEP), at a FCITC of -650 MW (FCTTC of -650 MW and Total Import Capability of 1,650 MW) when Cook Unit 1 was outaged as part of the south-to-north transfer bias (E103a), and by the Muskingum - Ohio Central 345 kV (AEP) circuit at its pre-contingency rating to a FCITC of 350 MW (FCTTC of 350 MW and Total Import Capability of 2,650 MW) when Davis-Besse Unit 1 was outaged as part of the south-to-north transfer bias (E103b). This scenario was not tested as part of the 2000 Summer assessment.

## Central Kentucky (Figure 4.8)

The eighth scenario examined an outage of the Baker - Broadford 765 kV (AEP) circuit under two different prior generation outage conditions. The first condition reflected the outage of just two of the seven Brown CT (LGEE) generating units. The second condition reflected the outage of all seven Brown CT (LGEE) generating units, and the outage of all three J. K. Smith CT (EKPC) generating units. The voltage at the Brown North 138 kV (LGEE) bus was monitored in response to transfers from ECAR to TVA. Study base case E104 was used because its north-to-south transfer bias provided a more stressful scenario. For incremental transfers from ECAR to TVA, the Brown North 138 kV (LGEE) voltage drops below the 95% voltage limit at a FCITC level of 4,200 MW (FCTTC of 3,900 MW and Total Import Capability of 6,500 MW) when just two of the ten CTs are outaged. However, when all ten CTs are outaged, the voltage limit is reached at a FCITC level of 2,600 MW (FCTTC of 2,300 MW and Total Import Capability of 4,900 MW). It is anticipated that thermal limitations will be reached before either of these voltage conditions become limiting. Transfers from ECAR to TVA were found to be thermally limited by the Clinch River - Spring Creek - North Bristol 138 kV (AEP) path for an outage of the Broadford - Sullivan 500 kV (AEP-TVA) circuit, at a FCITC level of 900 MW (FCTTC of 600 MW and Total Import Capability of 3,200 MW). This scenario was not tested as part of the 2000 Summer assessment.

**Figure 4.1**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**East-to-West (E101) Bias, Cook 765-345 kV Outaged, Cook 1 and Palisades 1 Outaged**

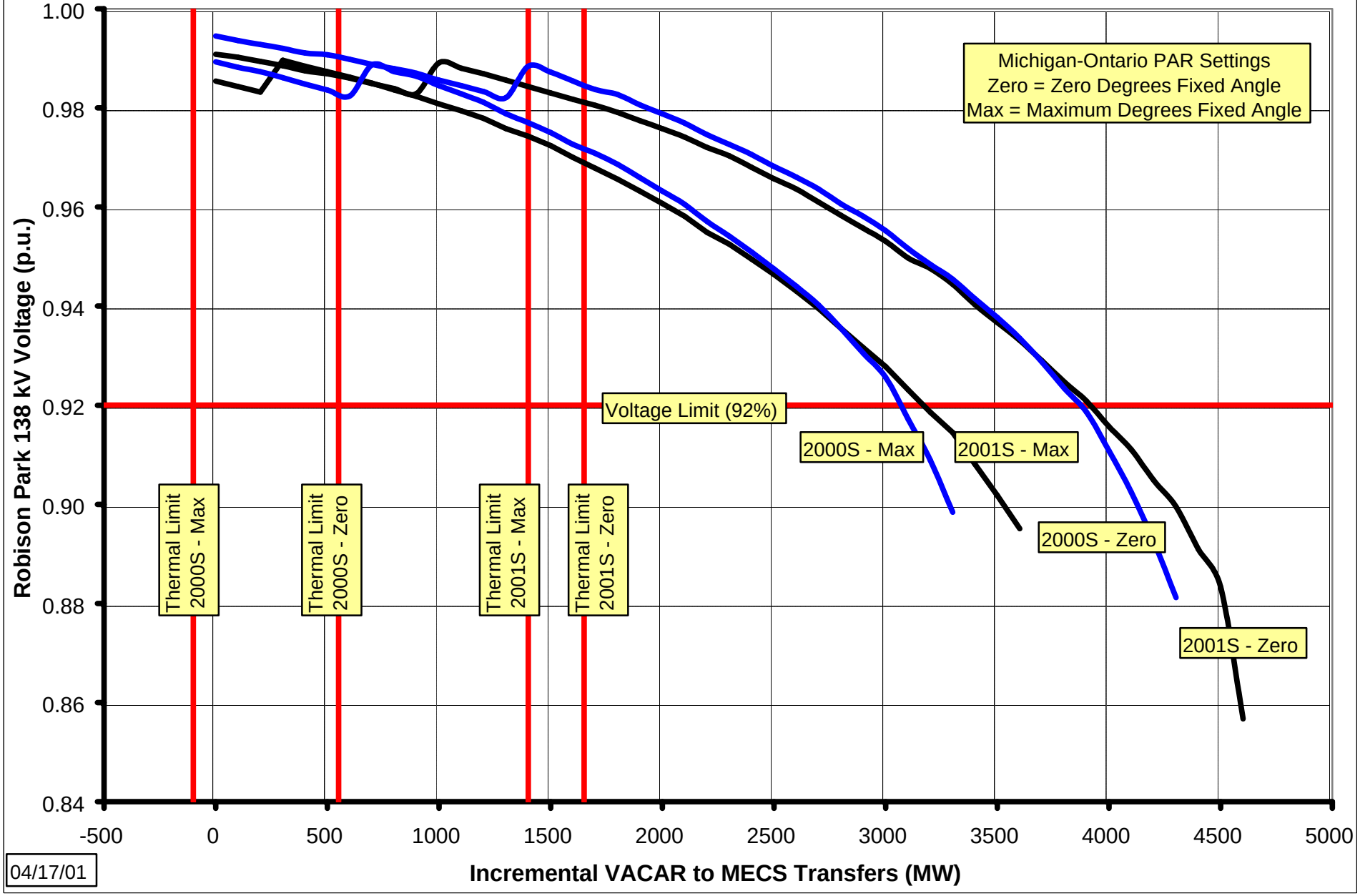



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**Figure 4.2**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**East-to-West (E101) Bias, Marysville 765-345 kV Outaged, Conesville 4 & 5 Outaged**

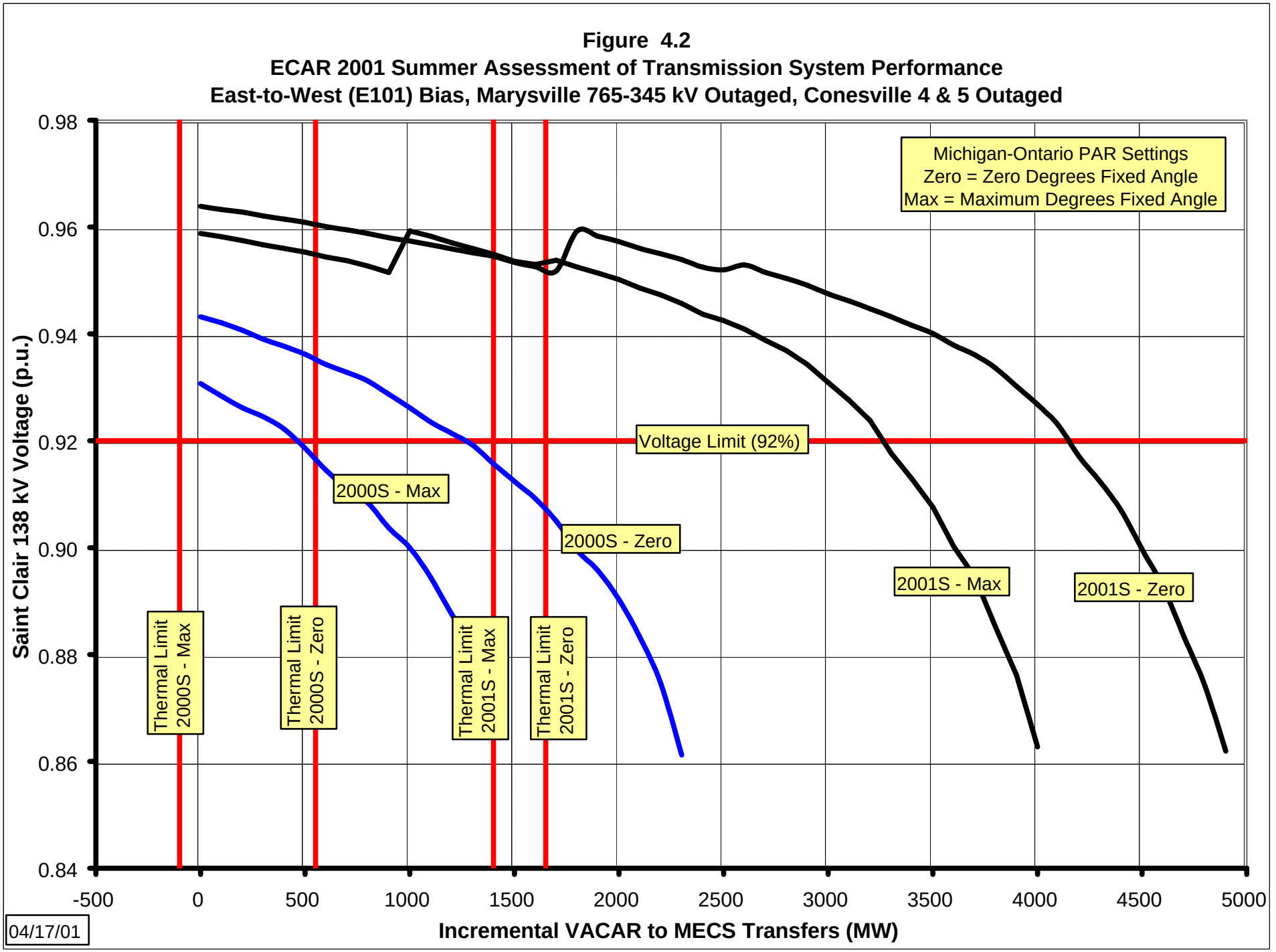

**Figure 4.3a**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**West-to-East (E102) Bias, Baker-Broadford 765 kV Outaged, Glen Lyn 5 & 6 Outaged**

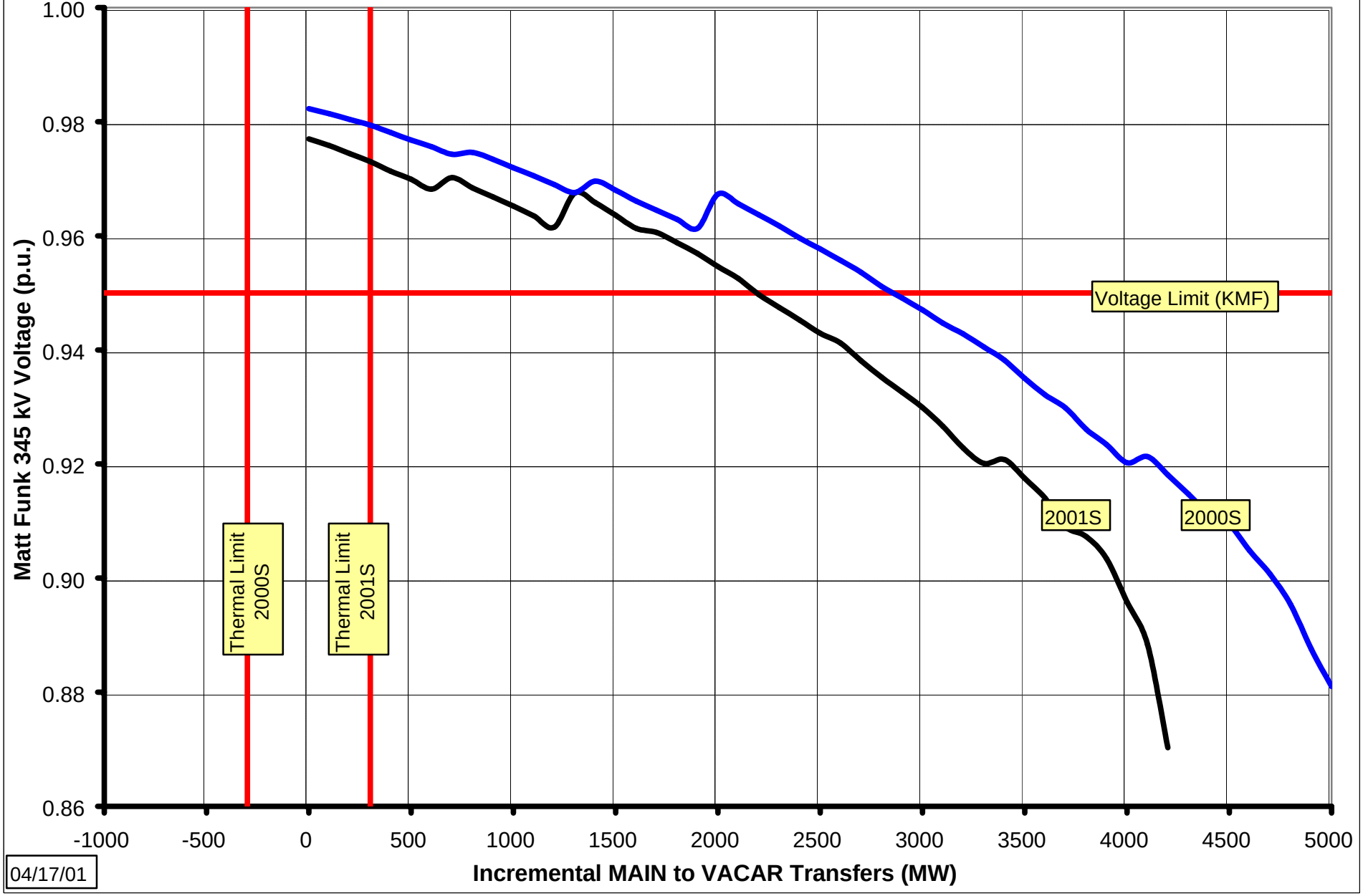

**Figure 4.3b**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**West-to-East (E102) Bias, Broadford-Jacksons Ferry 765 kV, and Glen Lyn 5 & 6 Outaged**

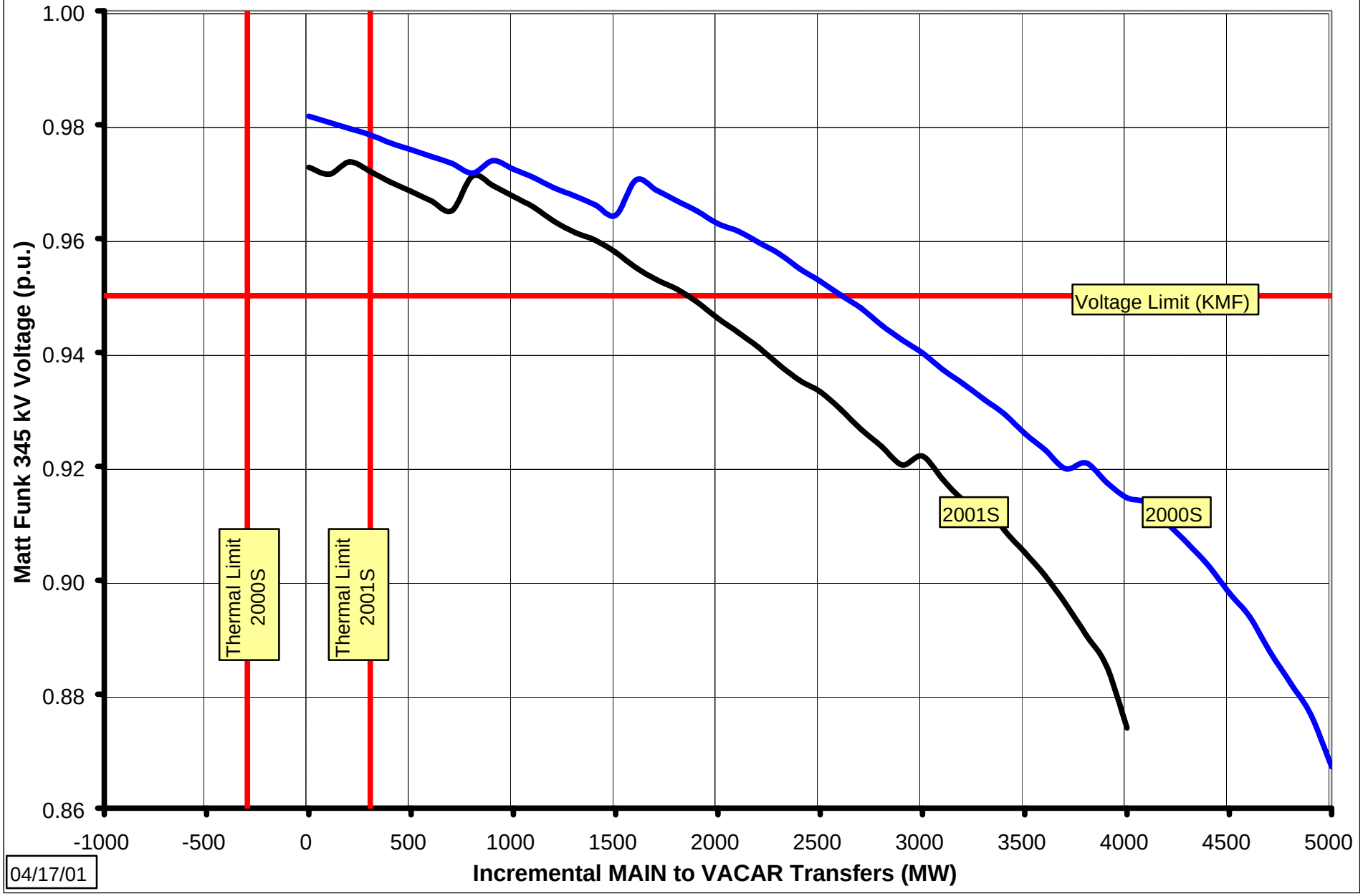

**Figure 4.4**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**West-to-East (E102) Bias, Black Oak-Bedington 500 kV Outaged, No Generation Outaged**

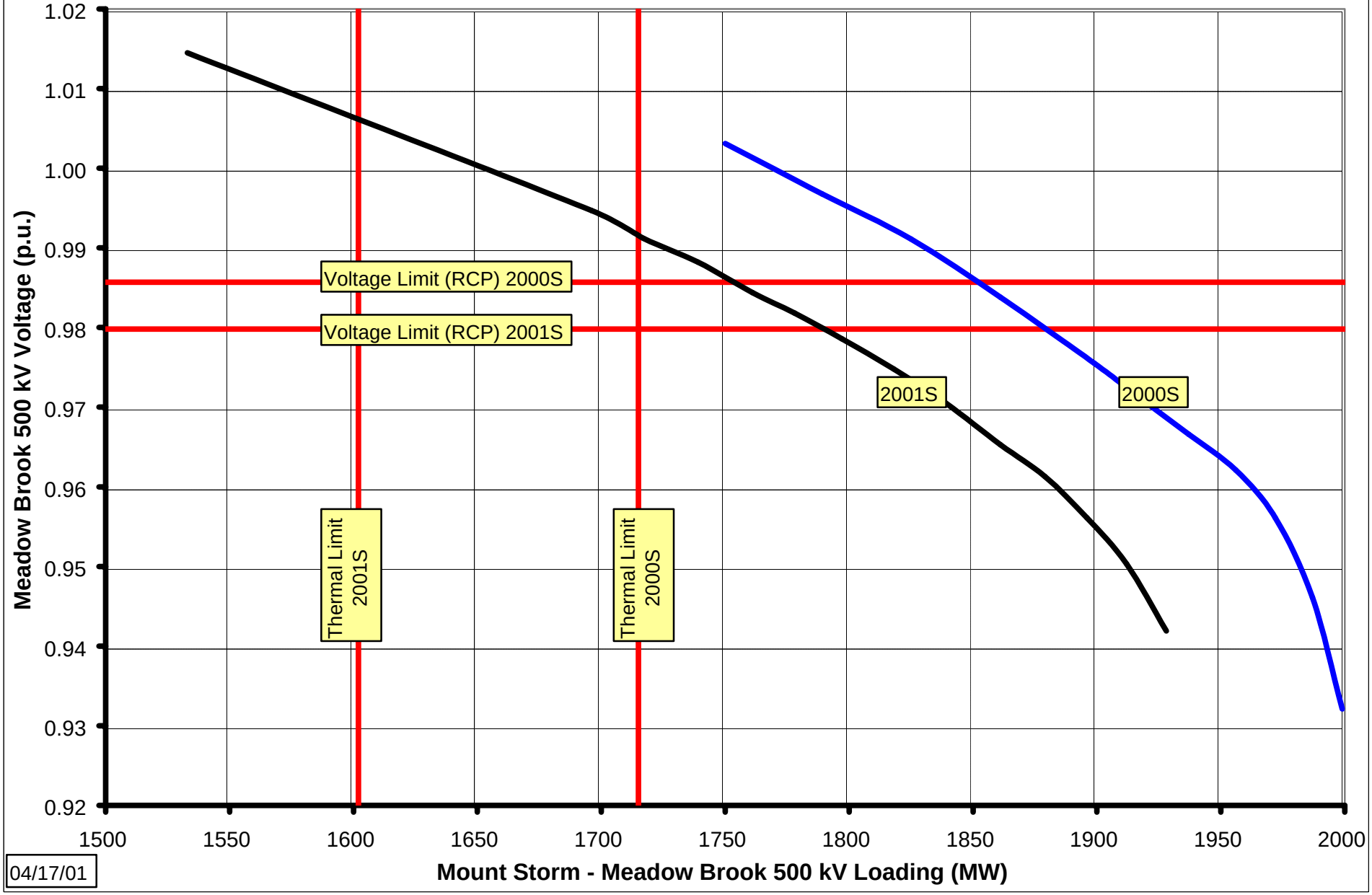

**Figure 4.5a**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**West-to-East (E102) Bias, Pruntytown-Mt. Storm 500 kV Outaged, No Generation Outaged**

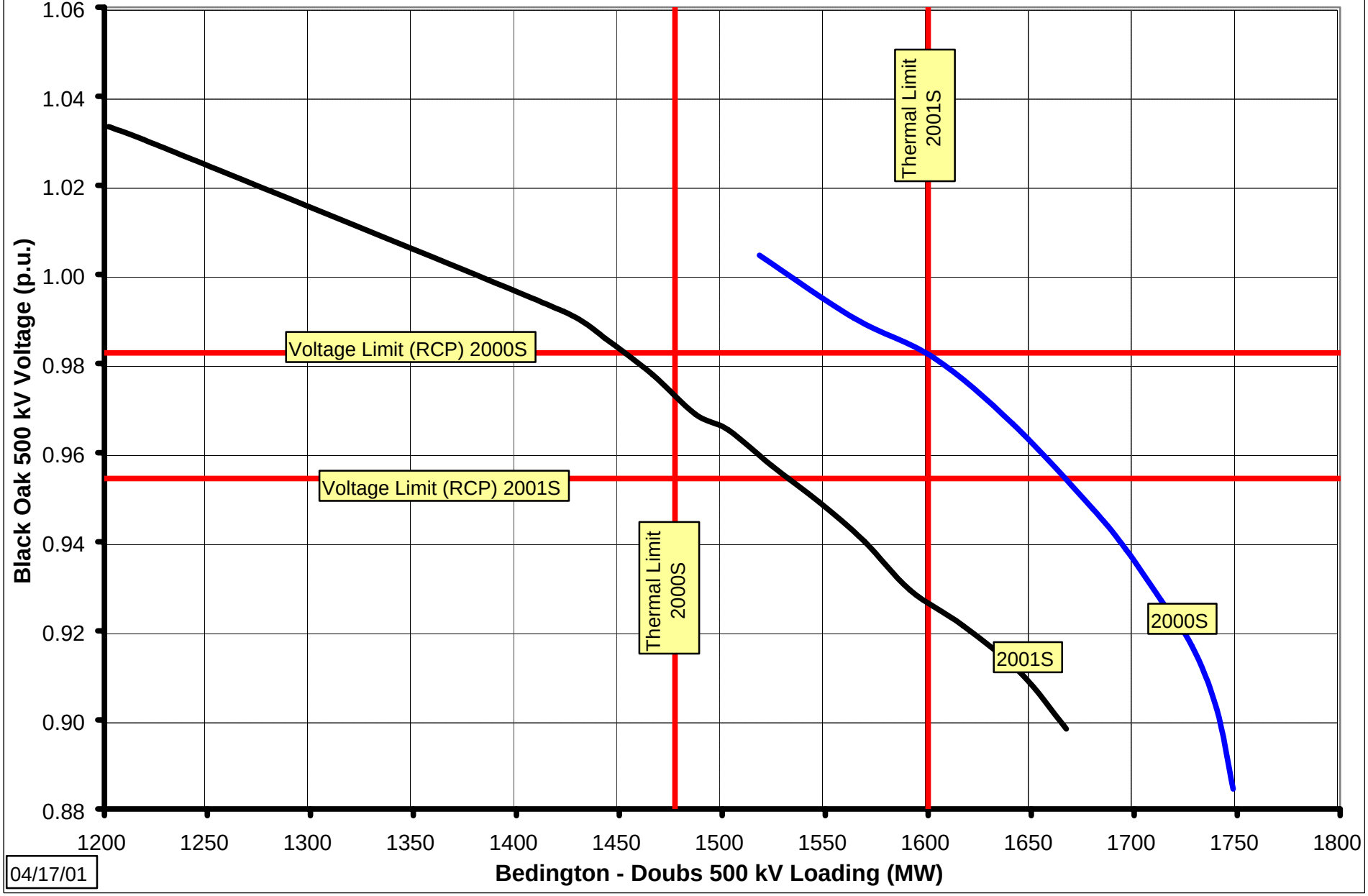


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**Figure 4.5b**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**West-to-East (E102) Bias, Pruntytown-Mt. Storm 500 kV Outaged, No Generation Outaged**

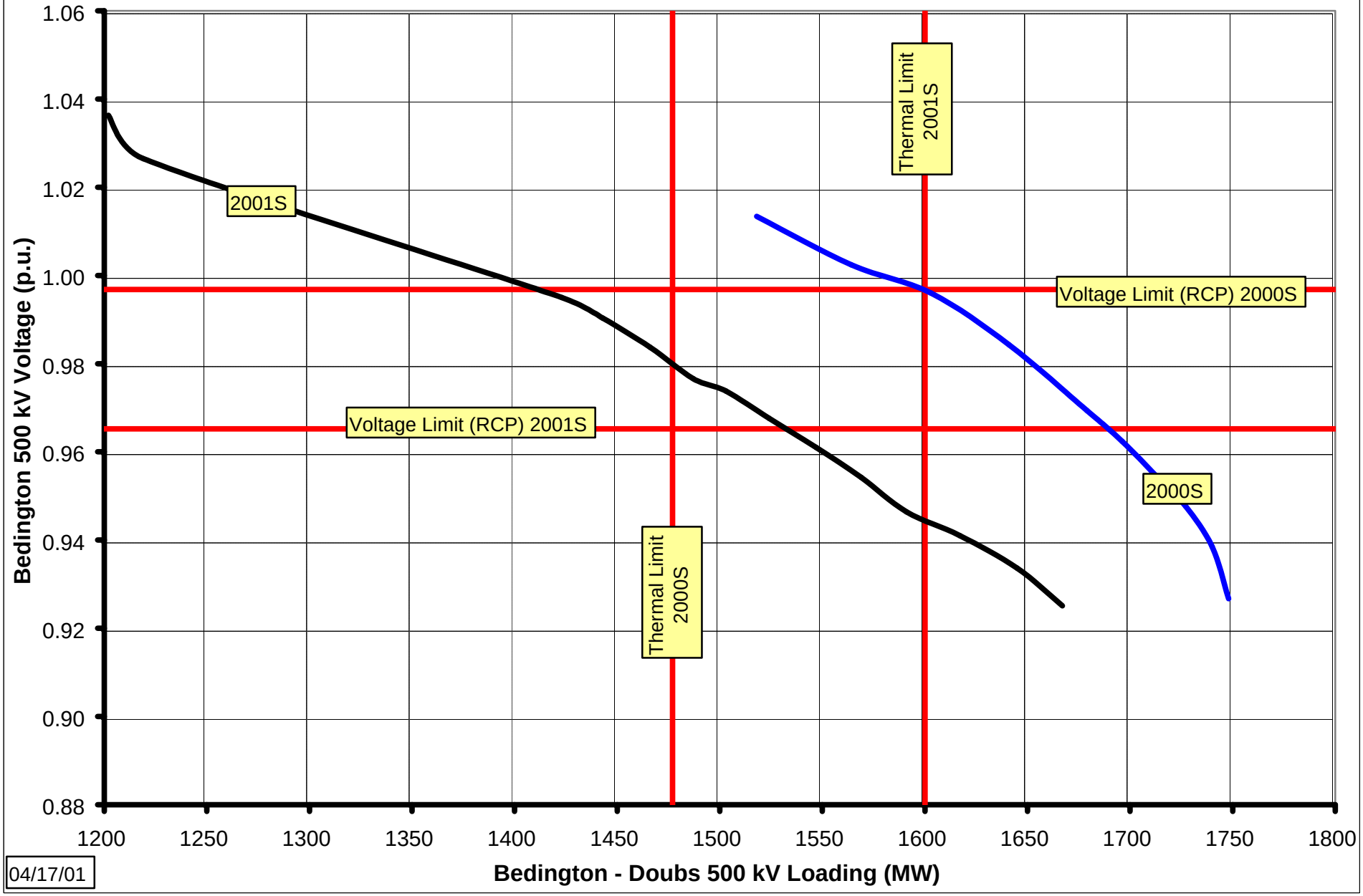

**Figure 4.6**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**South-to-North (E103) Bias, No Transmission Outaged, Selected Generation Outaged**

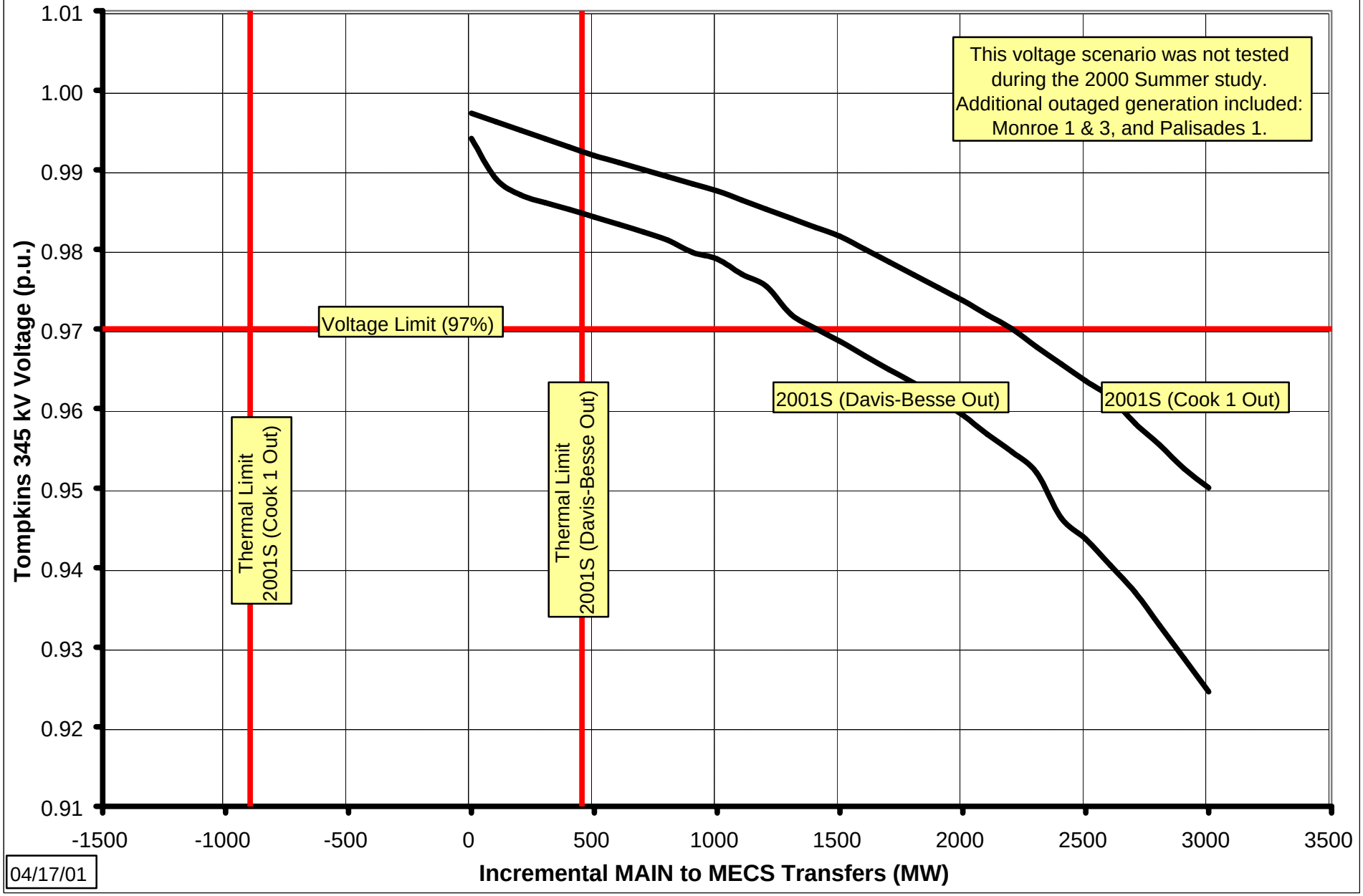


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**Figure 4.7**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**South-to-North (E103) Bias, Allen Jct. 345-138 kV Outaged, Selected Generation Outaged**

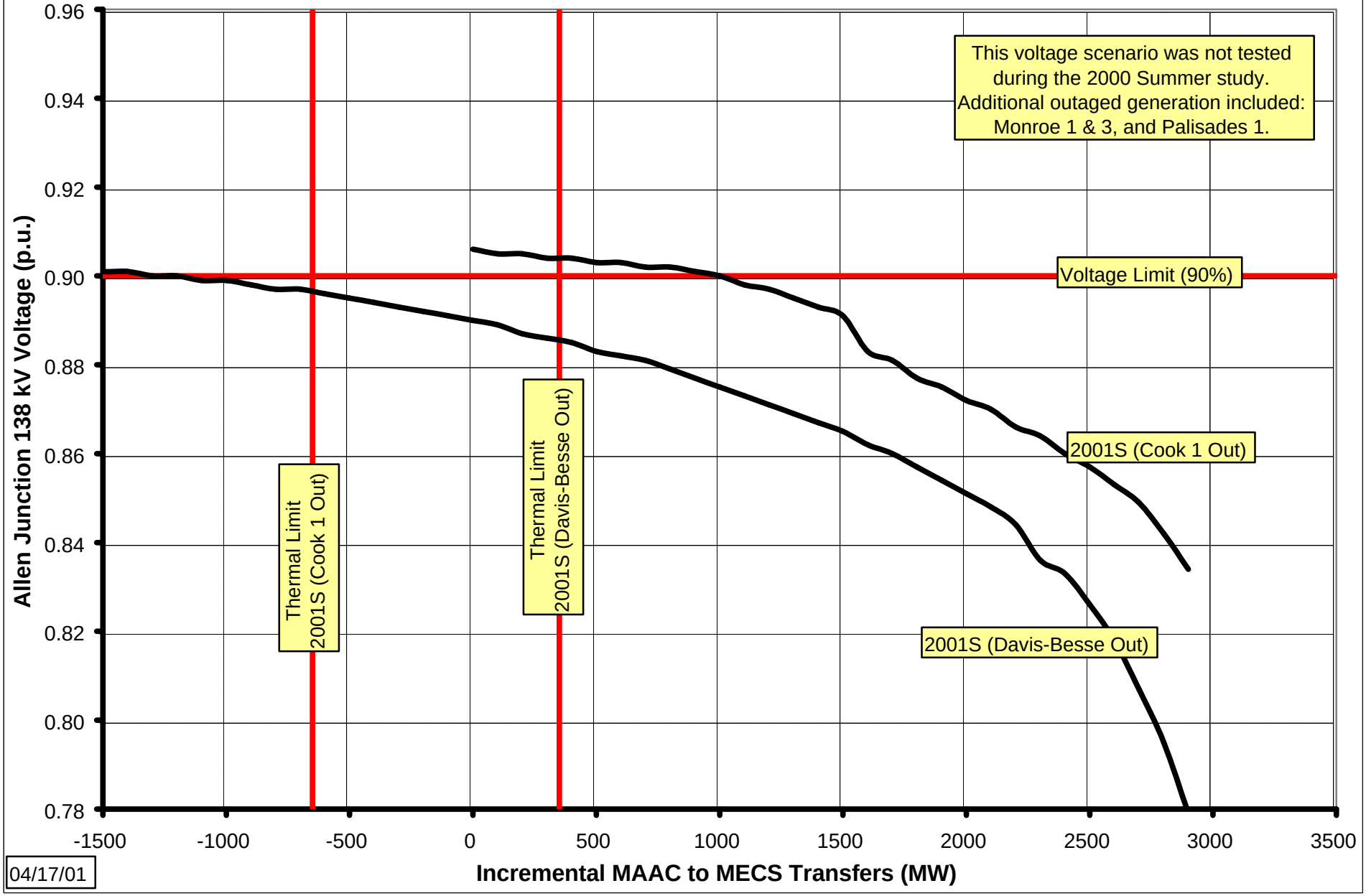
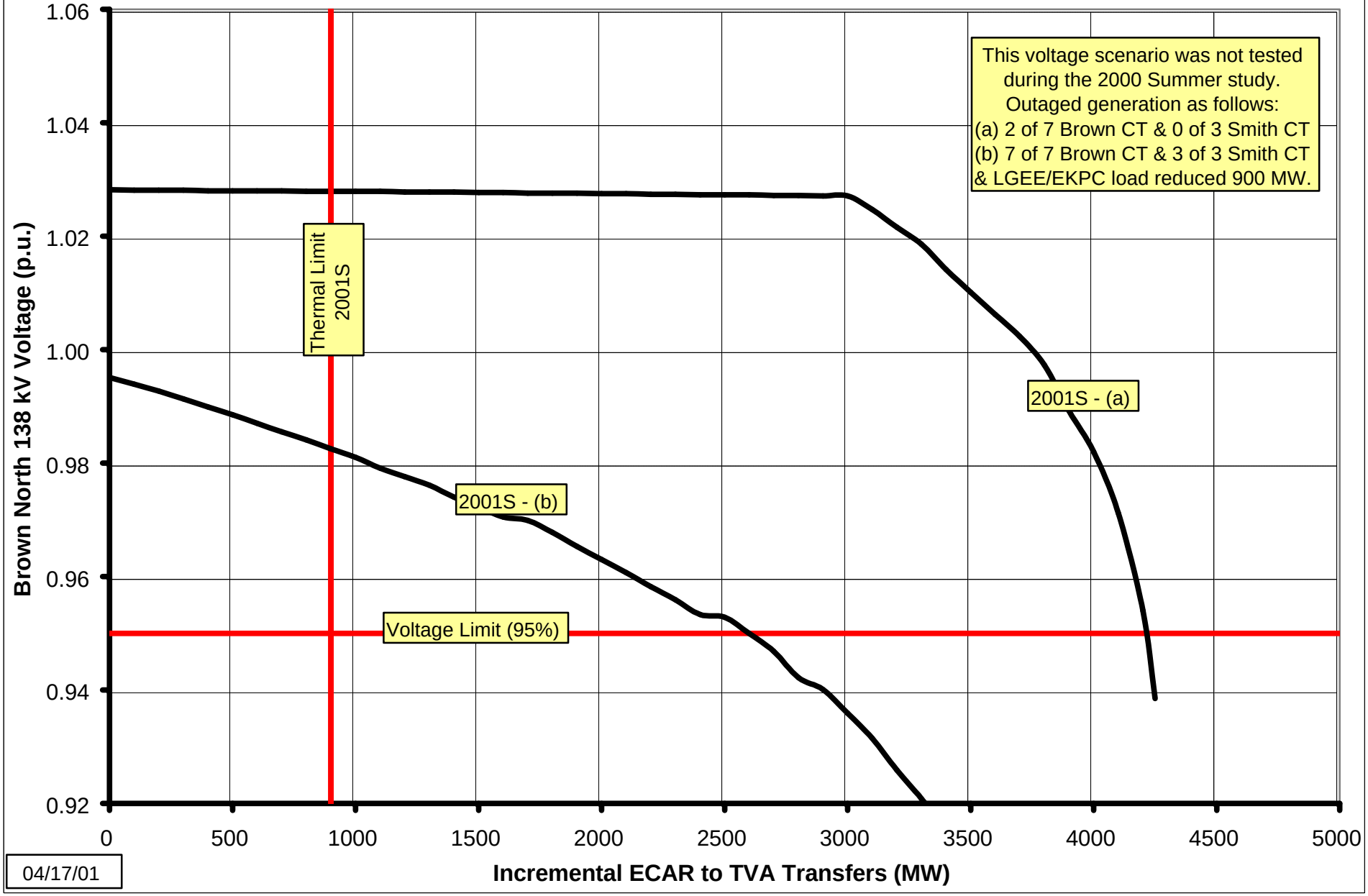


**Figure 4.8**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**North-to-South (E104) Bias, Baker-Broadford 765 kV Outaged, Selected Generation Outaged**

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# BACKGROUND INFORMATION

## System Description

The EHV transmission system in ECAR consists of an extensive 765 kV, 500 kV, and 345 kV network. The 765 kV network interfaces with the 500 kV network in eastern and southeastern ECAR and interconnects with the MAIN Region in the west. The 500 kV system is located in eastern and southeastern ECAR and is the major interface with MAAC, VACAR, and TVA. Extensive 345 kV facilities are located throughout ECAR, interconnecting with MAIN, MAAC, and NPCC. Generation and transmission facilities projected to be added, removed, or modified during the upcoming season, together with any major generation and transmission outages, are listed in Appendix B.

## Study Procedure

The bulk transmission systems in ECAR and selected non-ECAR facilities, are evaluated using linear analysis to calculate changes in power flows resulting from line outages and incremental power transfers. This procedure identifies transmission facilities which might overload during transmission outages under base and transfer conditions. Contingency types studied include: (1) single circuits; (2) single circuit segments of multiple terminal circuits (circuit segments that can be outaged by automatically sectionalizing multiple terminal circuits); (3) multiple terminal circuits (single circuit segments that are outaged together by normal circuit breaker action); and (4) selected double-circuit towers.

Any facility exceeding its emergency rating under transfer conditions, with a transfer response factor (PTDF or OTDF) greater than 2.5%, is listed in Table 2 along with the associated outage condition. Similarly, any facility exceeding its emergency rating under base conditions, is listed in Table 3 along with the associated outage. In addition to the linear analysis, AC analysis was also used to examine the voltage performance of those portions of the ECAR transmission network where potential voltage limitations have been identified through past operating experience or other ECAR assessments.

## Base Case Development (Table 5)

The ECAR primary base case used for this assessment was derived from the operating model developed by the NERC/MMWG. Since this operating model was developed to assess the bulk transmission systems within and outside of ECAR, it reflects limited sub-transmission detail. Consequently, certain localized transmission problems within ECAR may not have been observed in this study. On the other hand, non-ECAR areas, with bulk transmission system modeling detail which was not required for this study, were equivalized.

The total ECAR and individual ECAR member system generation and load levels modeled in this primary base case are tabulated in Appendix C, along with the generation and load levels modeled in the previous seasonal assessment. The ECAR load level represented in the primary base cases is the summation of the forecasted seasonal peak loads of the individual ECAR member systems, which may not be projected to occur coincidentally.

During the upcoming season, many interchange schedules will be in effect between systems in ECAR, and between ECAR members and companies in neighboring Regions. Details on the schedules modeled in this primary power flow base case, in addition to those noted above, are documented in Appendix D. It should be noted that actual interchange schedules might vary significantly in the day-to-day operation of the systems from those modeled in any base case. Similarly, this primary base case may differ from other base cases developed by other Regions or for other study purposes.

In addition to the primary base case developed for this study, labeled E100, seven additional study base cases were also developed to model conditions which would further stress the ECAR bulk transmission network. The first three study base cases, labeled E101a, E101b, and E101c, model a 4000 MW east-to-west transfer bias, which is comprised of a 1,500 MW transfer from NPCC to MECS, a 1,750 MW transfer from MAAC to MAIN, and a 750 MW transfer from VACAR to MAIN. The only difference between these three study base cases pertains to how the four Phase Angle Regulators (PAR) on the Michigan - Ontario interface are modeled. In the E101a study base case, the PARs are fixed at their respective minimum angles, resulting in a total flow from Ontario to Michigan of 2,430 MW. In the E101b study base case, the PARs are set at a fixed angle of zero degrees, resulting in a total flow from Ontario to Michigan of 1,890 MW. In the E101c study base case, the PARs are fixed at their respective maximum angles, resulting in a total flow from Ontario to Michigan of 1,220 MW. These three study base

cases were then used to run sensitivity studies involving the four PARs on the Michigan - Ontario interface.

The fourth study base case, labeled E102, models a 4,000 MW west-to-east transfer bias, which is comprised of a 2,000 MW transfer from MAIN to MAAC, a 1,000 MW transfer from MAIN to VACAR, and a 1,000 MW transfer from MAIN to TVA. The fifth and sixth study base cases, labeled E103a and E103b, model a 4,000 MW south-to-north transfer bias. The E103a study base case models this transfer bias as 2,000 MW transfer from VACAR to MECS, a 1,000 MW transfer from TVA to AEP (Cook Unit 1 outaged), and a 1,000 MW transfer from TVA to MAIN. The E103b study base case models this transfer bias as 2,000 MW transfer from VACAR to MECS, a 900 MW transfer from TVA to FE (Davis-Besse Unit 1 outaged), and a 1,100 MW transfer from TVA to MAIN. The seventh and final study base case, labeled E104, models a 4,000 MW north-to-south transfer bias, which is comprised of a 2,000 MW transfer from NPCC to TVA, and a 2,000 MW transfer from MAIN to Southern. All seven study base cases are documented in Table 5.

## Base Case Changes

Modeling changes were encountered in the course of conducting this seasonal transmission assessment. These changes were identified by, or reported to the TSPWG by the ECAR-member companies after the ECAR 2001 Summer base case was declared final and distributed to the ECAR-member companies. Unless otherwise indicated, the TSPWG study results documented in this report reflect the following changes:

**American Electric Power (AEP):** The summer normal and emergency ratings for the Kanawha River - Matt Funk 345 kV (AEP) circuit were increased from 970 MVA to 1010 MVA, to reflect revised loadability limits.

**Cinergy (CIN):** The following four summer emergency ratings were corrected: (1) Buffington 345-138 kV from 440 MVA to 499 MVA, (2) Cayuga 345-230 kV from 480 MVA to 534 MVA, (3) Gallagher 230-138 kV from 147 MVA to 162 MVA, and (4) Miami Fort 345-138 kV from 440 MVA to 486 MVA.

**Consumers Energy (CONS):** The summer normal rating for the Bullock - Edenville 138 kV (CONS) circuit was increased from 107 MVA to 191 MVA, and the summer emergency rating was increased from 125 MVA to 220 MVA, due to a reconductoring project.

**FirstEnergy (FE):** The summer normal and emergency ratings for the Davis Besse - Bay Shore 345 kV (FE) circuit were increased from 1231 MVA to 1487 MVA, due to circuit improvements made in 2000. This upgrade complemented a similar upgrade to the Davis Besse - Lemoyne 345 kV (FE) circuit made in 1999.

**Indianapolis Power and Light (IPL):** The summer normal and emergency ratings for the Petersburg - Hanna 345 kV (IPL) circuit were increased from 717 MVA to 960 MVA, while those for the Petersburg - Thompson 345 kV circuit were increased from 960 MVA to 1200 MVA, due to the replacement of terminal equipment.

**LG&E Energy (LGEE):** The summer normal and emergency ratings for the Tyrone - Adams 138 kV (LGEE) circuit were increased from 97 MVA to 132 MVA, to reflect terminal equipment upgrades.

**Ohio Valley Electric (OVEC):** The OVEC load is expected to decrease from 600 MW to 35 MW for 2001 Summer. Refer to the OVEC individual company assessment for details. Effective 2001 Summer, the Pierce 345 kV station will be reconfigured, leaving the Dearborn - Pierce #1 345 kV (OVEC) and Pierce - X533 #1 345 kV (OVEC) circuits connected to each other, but isolated from the remainder of the Pierce station. Refer to the OVEC individual company assessment for details.

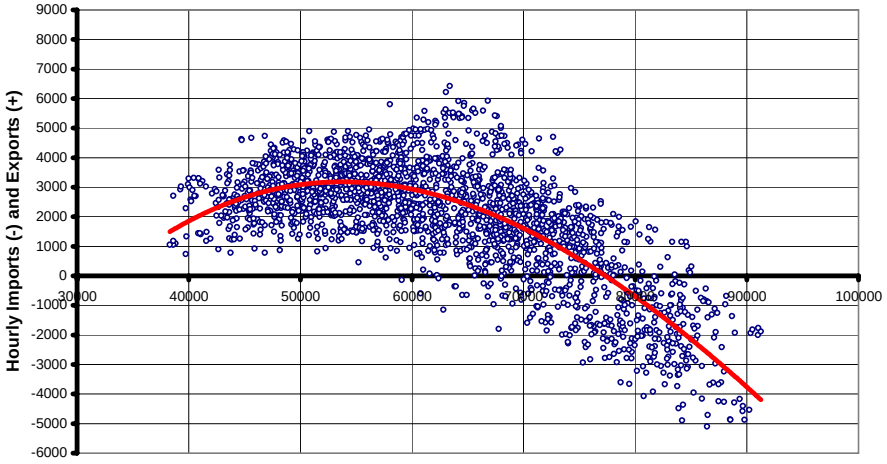
## Historical Tieline Flows (Figure 5)

The ECAR Transmission System Performance Working Group (TSPWG), under the direction of the ECAR Transmission System Performance Panel (TSPP), annually collects and analyzes historical tieline flow data between ECAR companies and their interconnected Non-ECAR neighbors. These data are presented in Figure 5 as scatter plots of net hourly exports/imports versus hourly ECAR load (as defined by ECAR) for the most recent four summer periods for which data are available (June - August 1996 through June - August 1999). To facilitate interpretation of the data, a third-order polynomial trend line is also presented with each scatter plot. These plots help illustrate the historical export/import characteristics of the ECAR Region as a function of ECAR load.

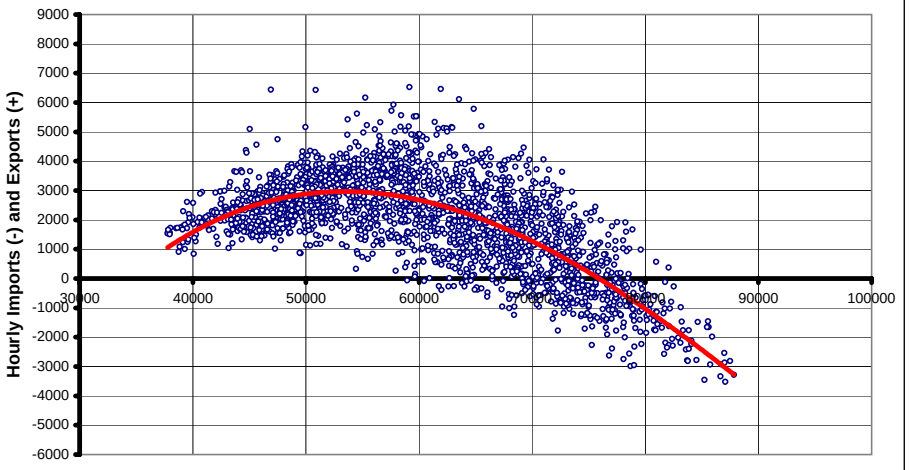
**Table 5**
**ECAR 2001 Summer Assessment of Transmission System Performance**
Date: 04/17/01 **Primary Base Case and Study Base Cases** 

| Base Case | Transfer Bias | Exporter | Importer | Amount (MW) | Significant Generating Unit Outages and Michigan-Ontario Phase Angle Regulator (PAR) Settings |
|---|---|---|---|---|---|
| E100 | None | Base Case | Base Case | Base Case | Units Out = None<br>PARs @ 600 MW Fixed Flow into Michigan<br>Resulting Ontario to Michigan Flow is 600 MW<br>L4D = 200 / L51D = 200 / B3N = 100 / J5D = 100 |
| E101a | EAST<br>to<br>WEST | NPCC (OH)<br>NPCC (NYPP)<br>MAAC<br>VACAR | MECS<br>MECS<br>MAIN<br>MAIN | 500<br>1000<br>1750<br>750 | Units Out = Monroe 1 and Palisades 1<br>PARs @ Minimum Degrees Fixed Angle<br>Resulting Ontario to Michigan Flow is 2430 MW<br>L4D = 870 / L51D = 840 / B3N = 500 / J5D = 220 |
| E101b | EAST<br>to<br>WEST | NPCC (OH)<br>NPCC (NYPP)<br>MAAC<br>VACAR | MECS<br>MECS<br>MAIN<br>MAIN | 500<br>1000<br>1750<br>750 | Units Out = Monroe 1 and Palisades 1<br>PARs @ Zero Degrees Fixed Angle<br>Resulting Ontario to Michigan Flow is 1890 MW<br>L4D = 690 / L51D = 595 / B3N = 435 / J5D = 170 |
| E101c | EAST<br>to<br>WEST | NPCC (OH)<br>NPCC (NYPP)<br>MAAC<br>VACAR | MECS<br>MECS<br>MAIN<br>MAIN | 500<br>1000<br>1750<br>750 | Units Out = Monroe 1 and Palisades 1<br>PARs @ Maximum Degrees Fixed Angle<br>Resulting Ontario to Michigan Flow is 1220 MW<br>L4D = 355 / L51D = 325 / B3N = 345 / J5D = 195 |
| E102 | WEST<br>to<br>EAST | MAIN<br>MAIN<br>MAIN | MAAC<br>VACAR<br>TVA | 2000<br>1000<br>1000 | Units Out = None<br>PARs @ 600 MW Fixed Flow into Michigan<br>Resulting Ontario to Michigan Flow is 600 MW<br>L4D = 200 / L51D = 200 / B3N = 100 / J5D = 100 |
| E103a | SOUTH<br>to<br>NORTH | VACAR<br>TVA<br>TVA | MECS<br>AEP<br>MAIN | 2000<br>1000<br>1000 | Units Out = Monroe 1&3 / Palisades 1 / Cook 1<br>PARs @ 600 MW Fixed Flow into Michigan<br>Resulting Ontario to Michigan Flow is 615 MW<br>L4D = 200 / L51D = 200 / B3N = 115 / J5D = 100 |
| E103b | SOUTH<br>to<br>NORTH | VACAR<br>TVA<br>TVA | MECS<br>FE<br>MAIN | 2000<br>900<br>1100 | Units Out = Monroe 1&3 / Palisades 1 / Davis-Besse 1<br>PARs @ 600 MW Fixed Flow into Michigan<br>Resulting Ontario to Michigan Flow is 625 MW<br>L4D = 200 / L51D = 200 / B3N = 125 / J5D = 100 |
| E104 | NORTH<br>to<br>SOUTH | NPCC (OH)<br>MAIN | TVA (East)<br>Southern | 2000<br>2000 | Units Out = None<br>PARs @ Minimum Degrees Fixed Angle<br>Resulting Ontario to Michigan Flow is 2610 MW<br>L4D = 925 / L51D = 900 / B3N = 520 / J5D = 265 |

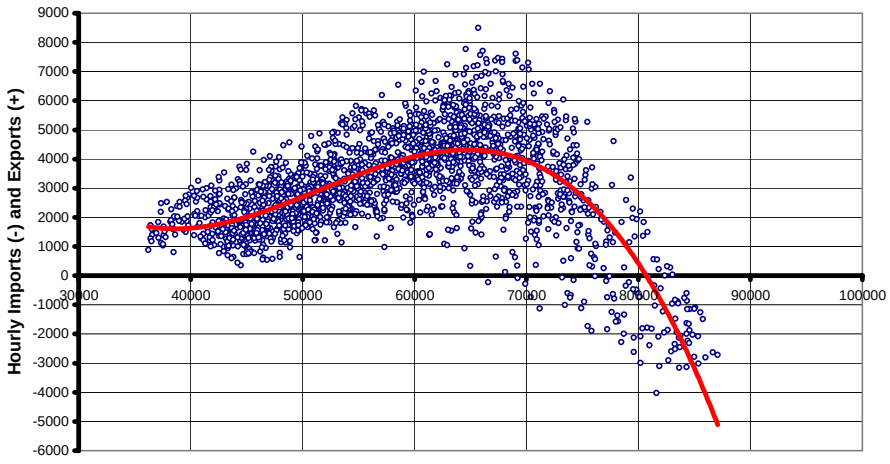
## Figure 5.1
## ECAR to Non-ECAR Tieline Flows for Jun-Aug 1999



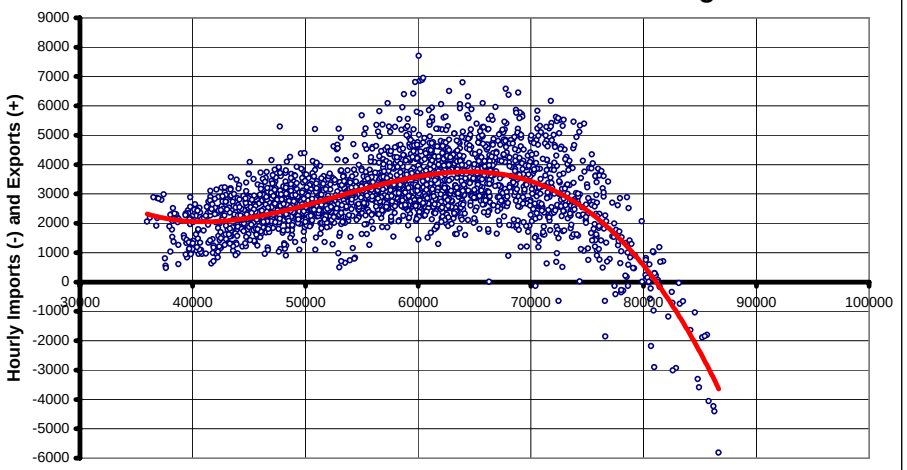

## Figure 5.2
## ECAR to Non-ECAR Tieline Flows for Jun-Aug 1998




## Figure 5.3
## ECAR to Non-ECAR Tieline Flows for Jun-Aug 1997




## Figure 5.4
## ECAR to Non-ECAR Tieline Flows for Jun-Aug 1996



# APPENDIX A

## Key Facilities Index

Table A-1 lists all transfer limiting facilities identified in this and previous seasonal transmission assessments. They are tabulated in alphabetical order by system name and then by facility name. The corresponding critical outages, together with their associated Line Outage Distribution Factors (LODF), are also shown. In addition, all critical transfers identified in this study for each of the limiting facilities are tabulated together with their corresponding Outage Transfer Distribution Factors (OTDF). Table A-1 also includes the NERC Transmission Loading Relief (TLR) history of all ECAR and selected non-ECAR transmission facilities which had a TLR Level 2 or above declared during the most recent eight seasonal quarters (Winter being December - February, Spring being March - May, Summer being June - August, and Fall being September - November).

The NERC Transmission Loading Relief (TLR) Procedure is a step-by-step procedure developed by the NERC Security Coordinator Subcommittee to maintain network security by avoiding or relieving transmission overloads. The TLR identifies the actual transactions (by priority and use) which cause Operating Security Limit violations. The TLR considers the actual paths over which transactions are flowing, not their contract paths, to determine which transactions to freeze or curtail. More information about the TLR procedure can be found in NERC Operating Policy No. 9 (refer to the NERC home page at www.nerc.com).

**TABLE A-1**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Key Facilities Index**

Date: 04/17/01



| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | **Axton 765-138 kV** | 2 | AEP | 792 | Cloverdale - Joshua Falls 765 kV &<br>Joshau Falls 765-138 kV | AEP<br>AEP | 10.9 | MAIN to VACAR | 5.3 | |
| | | | | | | Jacksons Ferry 765-500 kV &<br>Jacksons Ferry - Antioch 500 kV | AEP<br>AEP-DUKE | 16.9 | MAIN to VACAR | 6.1 | |
| X | X | **Central Ohio Voltage Limit (138 kV)**<br><br>Note: Refer to Voltage Analysis section of this report for details on this limitation. | 1 | AEP | ----- | ----- | ----- | ----- | ----- | ----- | Mar - May = 0 / 0<br>Jun - Aug = 0 / 4<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| X | X | **Clinch R - Spring Ck - N Bristol 138 kV** | | AEP | 239 | Broadford 765-500 kV &<br>Broadford - Sullivan 500 kV | AEP<br>AEP-TVA | 7.5 | ECAR to TVA<br>MAAC to TVA | 3.4<br>3.3 | |
| X | X | **Clinch River - Copper Ridge - Hill 138 kV** | | AEP | 269 | Broadford 765-500 kV &<br>Broadford - Sullivan 500 kV | AEP<br>AEP-TVA | 6.2 | MAAC to TVA | 2.8 | |
| X | X | **Cook 765-345 kV** | 1&2 | AEP | 1875 | Base Case | ----- | ----- | MAAC to MECS<br>MAIN to MECS | 15.9<br>15.8 | Mar - May = 0 / 0<br>Jun - Aug = 1 / 1<br>Sep - Nov = 2 / 0<br>Dec - Feb = 0 / 0 |
| | | | | | 2115 | Dumont 765-345 kV | AEP | 42.7 | MAAC to MECS<br>VACAR to MECS<br>TVA to MECS<br>MAIN to MECS<br>MAAC to Indiana | 21.4<br>21.6<br>20.7<br>19.0<br>3.7 | |
| X | X | **Dumont 765-345 kV** | 1&2 | AEP | 2070 | Dumont - Wilton Center 765 kV | AEP-CE | 41.9 | MAAC to MAIN<br>VACAR to MAIN | 15.8<br>14.9 | Mar - May = 0 / 0<br>Jun - Aug = 1 / 2<br>Sep - Nov = 1 / 0<br>Dec - Feb = 0 / 0 |
| | | | | | | Cook 765-345 kV | AEP | 51.9 | MAAC to MECS<br>VACAR to MECS<br>TVA to MECS<br>MAIN to MECS<br>MAAC to Indiana<br>MAAC to MAIN | 19.3<br>19.1<br>17.4<br>13.9<br>6.4<br>4.3 | |

**TABLE A-1**
**ECAR 2001 Summer Assessment of Transmission System Performance**
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| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | **East Danville - Danville 138 kV**<br><br>Note : Overloads possible in both directions. | 2 | AEP | 310 | Base Case | ----- | ----- | VACAR to MAIN | 4.4 | |
| | | | | | 384 | Antioch - Jacksons Ferry 765 kV &<br>Jacksons Ferry 500-765 kV | DUKE-AEP<br>AEP | 15.1 | VACAR to MECS<br>MAIN to VACAR<br>VACAR to MAIN | 7.9<br>6.1<br>7.5 | |
| X | X | **Kammer - West Bellaire 345 kV** | | AEP | 1023 | Kammer - South Canton 765 kV &<br>South Canton 765-345 kV | AEP<br>AEP | 21.8 | TVA to NE<br>MAIN to NE | 10.0<br>10.3 | Mar - May = 1 / 0<br>Jun - Aug = 0 / 0<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| X | X | **Kanawha - Matt Funk 345 kV (Voltage)** | 1&2 | AEP | 1010 | Baker - Broadford 765 kV | AEP | 12.7 | ECAR to TVA<br>MAIN to VACAR<br>MAIN to TVA | 5.5<br>7.7<br>4.6 | Mar - May = 5 / 1<br>Jun - Aug = 35 / 1<br>Sep - Nov = 6 / 7<br>Dec - Feb = 37 / 6 |
| | | | | | 1040 | Broadford - Jacksons Ferry 765 kV &<br>Broadford 138 kV Series Reactor Inserted | AEP<br>AEP | ----- | ECAR to VACAR<br>MAIN to VACAR | 9.6<br>9.1 | |
| X | X | **Marysville - East Lima 345 kV** | | AEP | 923 | Base Case | ----- | ----- | MAAC to MECS<br>VACAR to MECS<br>TVA to MECS<br>MAIN to MECS | 7.6<br>7.5<br>6.7<br>5.8 | Mar - May = 0 / 0<br>Jun - Aug = 0 / 4<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| | | | | | 1220 | Marysville - Southwest Lima 345 kV | AEP | 32.8 | MAAC to MECS<br>MAIN to MECS | 9.2<br>6.7 | |
| X | X | **Mountaineer - Belmont 765 kV** | | AEP | 3313 | Gavin - Marysville 765 kV | AEP | 43.9 | TVA to NE | 24.4 | |
| X | X | **Muskingum River - Ohio Central 345 kV** | | AEP | 938 | Base Case | ----- | ----- | MAAC to MECS<br>VACAR to MECS<br>TVA to MECS<br>MAIN to MECS | 5.2<br>5.4<br>4.8<br>3.9 | |
| | | | | | 1076 | Muskingum - West Millersport 345 kV &<br>West Millersport 345-138 kV | AEP<br>AEP | ----- | MAAC to MECS<br>VACAR to MECS<br>MAIN to MECS | 5.5<br>5.6<br>3.9 | |

**TABLE A-1**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Key Facilities Index**

Date: 04/17/01



| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | **Olive 345-138 kV** | | AEP | 544 | Olive - Cook 345 kV | AEP | 15.3 | MAIN to MECS | 3.5 | |
| X | X | **Olive - Cook 345 kV** | | AEP | 1383 | Cook 765-345 kV | AEP | 35.0 | MAIN to MECS | 19.8 | |
| X | X | **South Canton 765-345 kV** | 2 | AEP | 1660 | Base Case | ----- | ----- | TVA to NE<br>MAIN to NE | 12.5<br>12.3 | |
| | | | | | 1890 | Tidd - Canton Central 345 kV | AEP | 27.5 | TVA to NE<br>MAIN to NE | 12.5<br>12.2 | |
| | | | | | | Kammer 765-500 kV &<br>Kammer - Harrison - Fort Martin 500 kV | AEP-AP<br>AP | ----- | TVA to NE<br>MAIN to NE | 14.0<br>14.2 | |
| X | | **Wolf Hills - Orebank 138 kV** | | AEP | 239 | Broadford 765-500 kV &<br>Broadford - Sullivan 500 kV | AEP<br>AEP-TVA | 6.2 | ECAR to TVA<br>MAAC to TVA | 2.8<br>2.6 | |
| X | X | **Breed - Casey 345 kV** | | AEP-AMRN | 1442 | Rockport - Jefferson 765 kV | AEP | 34.0 | ECAR to MAIN<br>MAAC to MAIN<br>VACAR to MAIN | 11.7<br>10.3<br>8.9 | |
| | | **Belmont 765-500 kV**<br><br>Note: Old bank was replaced with a new higher capability bank in November 1999. | | AEP-AP | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 0 / 0<br>Jun - Aug = 0 / 1<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| X | X | **Kammer 765-500 kV**<br><br>Note: Overloads possible in both the 765-500 kV and 500-765 kV directions. | | AEP-AP | 1700 | Belmont - Harrison 500 kV | AP | 39.8 | TVA to NE<br>MAIN to NE<br>MAIN to MAAC | 11.9<br>14.6<br>23.5 | |
| | | | | | 1700 | Belmont 500-765 kV | AP-AEP | 37.8 | MAAC to MAIN | 21.9 | |
| | X | **Greentown 765-138 kV** | | AEP-CIN | 795 | Greentown 765-230-138 kV | AEP-CIN | 48.6 | MAAC to Indiana | 4.7 | |

**TABLE A-1**
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| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | **Cook - Benton Harbor - Palisades 345 kV** | | AEP-CONS | 1554 | Cook - Palisades 345 kV | AEP-CONS | 65.7 | MAAC to MECS<br>VACAR to MECS<br>TVA to MECS<br>MAIN to MECS | 23.4<br>24.5<br>25.7<br>33.9 | |
| X | X | **Cook - Palisades 345 kV** | | AEP-CONS | 1239 | Base Case | ----- | ----- | MAIN to MECS | 18.5 | |
| | | | | | 1554 | Cook - Benton Harbor - Palisades 345 kV &<br>Benton Harbor 345-138 kV | AEP-CONS<br>AEP | ----- | MAAC to MECS<br>VACAR to MECS<br>TVA to MECS<br>MAIN to MECS | 27.0<br>27.9<br>29.4<br>31.9 | |
| X | X | **Twin Branch - Argenta 345 kV** | | AEP-CONS | 1434 | Cook - Palisades 345 kV &<br>Cook - Benton Harbor - Palisades 345 kV &<br>Benton Harbor 345-138 kV | AEP-CONS<br>AEP-CONS<br>AEP | ----- | MAAC to MECS<br>VACAR to MECS<br>TVA to MECS<br>MAIN to MECS | 23.1<br>25.4<br>26.0<br>28.7 | |
| X | X | **Fostoria Central - Lemoyne 345 kV** | | AEP-FE | 1076 | Davis Besse - Lemoyne 345 kV | FE | 46.2 | MAAC to MECS | 14.4 | |
| | | | | | | Fostoria Central - Bay Shore 345 kV | AEP-FE | 60.4 | MAAC to MECS<br>MAIN to MECS | 17.8<br>17.1 | |
| X | X | **South Canton - Star 345 kV** | | AEP-FE | 1076 | Sammis - Star 345 kV | FE | 39.0 | MAAC to MECS<br>MAIN to MECS | 4.2<br>3.9 | Mar - May = 0 / 0<br>Jun - Aug = 1 / 0<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| X | X | **Eugene - Bunsonville 345 kV** | | AEP-IP | 856 | Breed - Casey 345 kV | AEP-AMRN | 39.0 | ECAR to MAIN<br>MAAC to MAIN<br>VACAR to MAIN | 11.0<br>10.3<br>8.9 | |
| X | X | **Broadford 765-500 kV or**<br>**Broadford - Sullivan 500 kV** | 2 | AEP<br>AEP-TVA | 1710<br>1710 | Base Case | ----- | ----- | MAAC to TVA | 21.3 | |
| | | | | | 1920<br>1920 | Broadford - Jacksons Ferry 765 kV &<br>Broadford 138 kV Series Reactor Inserted | AEP<br>AEP | 28.9 | ECAR to TVA<br>MAAC to TVA<br>MAIN to TVA | 18.5<br>18.6<br>15.0 | |

**TABLE A-1**
**ECAR 2001 Summer Assessment of Transmission System Performance**
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Date: 04/17/01



| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | **North Bristol - North Bristol 138 kV** | | AEP-TVA | 260 | Broadford 765-500 kV &<br>Broadford - Sullivan 500 kV | AEP<br>AEP-TVA | 7.5 | ECAR to TVA<br>MAAC to TVA | 2.7<br>2.7 | |
| | X | **Leesville - Altavista 138 kV** | | AEP-VP | 209 | Base Case | ----- | ----- | ECAR to VACAR | 2.7 | |
| | | **Scottsville - Bremo 138 kV &<br>Greenbrier - Fudge Hollow 138 kV**<br><br>Note: TLR was called after local options were exhausted … Cloverdale - Joshua Falls 765 kV line was outaged at the time. | | AEP-VP | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 0 / 1<br>Jun - Aug = 0 / 0<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| | X | **Albion 345-138 kV** | 2 | AMRM | 448 | Breed - Casey 345 kV | AEP-AMRN | 6.2 | ECAR to MAIN<br>MAAC to MAIN | 3.4<br>2.8 | |
| X | | **Coffeen - Pana 345 kV** | | AMRM | 952 | Rockport - Jefferson 765 kV | AEP | 5.1 | TVA to NE | 4.7 | |
| | | **Rush Island - St. Francois 345 kV**<br><br>Note: This facility was not monitored in the ECAR 2001 and 2000 assessments. | | AMRN | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 0 / ---<br>Jun - Aug = 32 / ---<br>Sep - Nov = 29 / ---<br>Dec - Feb = 29 / --- |
| X | | **Bland - Franks 345 kV**<br><br>Note: This facility was partly monitored in the ECAR 2001 and 2000 assessments. | | AMRN-AECI | 949 | Base Case | ----- | ----- | MAIN to TVA | 7.0 | Mar - May = 21 / 0<br>Jun - Aug = 59 / 9<br>Sep - Nov = 43 / 6<br>Dec - Feb = 12 / 0 |
| | X | **Bedington - Doubs 500 kV (Voltage)** | | AP | 1590 | Pruntytown - Mount Storm 500 kV | AP-VP | 26.1 | ECAR to VACAR | 10.6 | Mar - May = 0 / 0<br>Jun - Aug = 5 / 0<br>Sep - Nov = 4 / 0<br>Dec - Feb = 2 / 0 |
| X | X | **Black Oak 138-500 kV** | 1 | AP | 531 | Hatfield - Black Oak 500 kV | AP | 20.2 | ECAR to MAAC | 3.9 | |

**TABLE A-1**
**ECAR 2001 Summer Assessment of Transmission System Performance**
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| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | **Black Oak - Bedington 500 kV** | | AP | 2783 | Pruntytown - Mount Storm 500 kV | AP-VP | 31.1 | ECAR to MAAC<br>ECAR to VACAR<br>MAIN to MAAC<br>MAIN to VACAR | 16.7<br>13.4<br>15.8<br>12.5 | Mar - May = 2 / 0<br>Jun - Aug = 4 / 0<br>Sep - Nov = 1 / 0<br>Dec - Feb = 1 / 1 |
| X | X | **Doubs #1 or #2 or #3 or #4 500-230 kV**<br><br>Note: Several TLRs were declared under the Doubs - Brighton 500 kV flowgate. | | AP | 488 | Doubs - Brighton 500 kV | AP-PEPCO | 8.7 | ECAR to MAAC<br>MAIN to MAAC | 3.1<br>3.1 | Mar - May = 0 / 0<br>Jun - Aug = 1 / 5<br>Sep - Nov = 3 / 0<br>Dec - Feb = 0 / 0 |
| X | X | **Harrison - Pruntytown 500 kV** | | AP | 2733 | Base Case | ----- | ----- | MAIN to VACAR | 11.8 | |
| | | | | | 3584 | 502 Junction - Fort Martin 500 kV | AP | 67.7 | MAIN to MAAC<br>MAIN to VACAR | 26.1<br>18.5 | |
| X | | **Fort Martin - Pruntytown 500 kV** | | AP | 2654 | Harrison - Pruntytown 500 kV | AP | 68.7 | MAIN to VACAR | 12.7 | |
| X | X | **Hatfield-Black Oak 500 kV (Voltage)** | | AP | 2265 | Pruntytown - Mount Storm 500 kV | AP-VP | 26.8 | ECAR to MAAC<br>ECAR to VACAR<br>MAIN to MAAC<br>MAIN to VACAR | 13.8<br>10.6<br>13.4<br>10.1 | |
| X | X | **Wylie Ridge #1 or #2 500-345 kV**<br><br>Note : Overloads possible in both the 500-345 kV and 345-500 kV directions. | | AP | 942 | Wylie Ridge #2 or #1 500-345 kV | AP | 72.2 | MAAC to MAAC | 13.2 | Mar - May = 0 / 0<br>Jun - Aug = 7 / 0<br>Sep - Nov = 17 / 4<br>Dec - Feb = 0 / 0 |
| X | X | **Yukon - Shepler Hill Junction 138 kV** | 2 | AP | 243 | Keystone - Cabot 500 kV | PENLEC-AP | 4.0 | MAAC to MAIN | 2.7 | |
| | X | **Corner - Wolf Ck - Muskingum R 138 kV** | 1 | AP-AEP | 174 | Kammer-Belmont-Mountaineer 765 kV & Belmont 765-500 kV | AEP<br>AEP-AP | ----- | MAAC to MECS<br>MAAC to Indiana | 2.6<br>2.5 | |
| X | X | **Butler - Krendale - Maple 138 kV** | 1 | AP-FE | 227 | Cabot - Wylie Ridge 500 kV | AP | 7.8 | MAAC to Indiana<br>MAAC to TVA<br>MAAC to MAIN | 3.3<br>2.9<br>3.3 | |

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| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | **Doubs - Aqueduct - Station H 230 kV** | | AP-PEPCO | 629 | Doubs - Station H 230 kV | AP-PEPCO | 60.5 | ECAR to MAAC<br>MAIN to MAAC | 6.1<br>5.7 | |
| | | | | | | Doubs - Brighton 500 kV | AP-PEPCO | 17.1 | MAIN to MAAC | 7.1 | |
| X | X | **Doubs - Station H 230 kV** | | AP-PEPCO | 628 | Doubs - Aqueduct 230 kV | AP | 60.3 | ECAR to MAAC<br>MAIN to MAAC | 6.1<br>5.7 | |
| | | **Doubs - Brighton 500 kV**<br><br>Note: This TLR was declared under the Doubs 500 kV Voltage flowgate to address voltage concerns at Doubs … This line is also part of the PJM Western Interface flowgate appearing elsewhere in this table. | | AP-PEPCO | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 0 / 0<br>Jun - Aug = 0 / 1<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| | | **PJM Western Interface (500 kV)**<br><br>Note: The following comprise this interface. Only the first facility is monitored as part of the ECAR seasonal assessments.<br>a) Doubs - Brighton 500 kV<br>b) Conemaugh - Hunterstown 500 kV<br>c) Conemaugh - Juniata 500 kV<br>d) Keystone - Juniata 500 kV | | AP-PJM | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 0 / 0<br>Jun - Aug = 0 / 1<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| X | X | **Pruntytown - Mount Storm 500 kV** | 2 | AP-VP | 2733 | Base Case | ----- | ----- | MAIN to VACAR | 17.9 | Mar - May = 0 / 0<br>Jun - Aug = 2 / 12<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| | | | | | 3326 | Black Oak - Bedington 500 kV | AP | 44.6 | ECAR to MAAC<br>ECAR to VACAR<br>MAIN to MAAC<br>MAIN to VACAR | 21.3<br>22.6<br>19.7<br>21.0 | |
| | | **Coleman - National Aluminum 161 kV**<br><br>Note: Possible forced and/or scheduled outages at time TLRs were called. | | BREC | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 0 / 0<br>Jun - Aug = 2 / 0<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |

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| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | **New Hardinsburg 161-138 kV**<br><br>Note: One TLR was declared under the BREC-TVA Interface flowgate, another under the LGEE-BREC Interface flowgate. Overloads possible in both the 161-138 kV and 138-161 kV directions. | 2 | BREC | 224 | Coleman - National Aluminum 161 kV | BREC | 77.2 | ECAR to TVA<br>MAAC to TVA | 3.4<br>3.4 | Mar - May = 9 / 0<br>Jun - Aug = 10 / 1<br>Sep - Nov = 11 / 5<br>Dec - Feb = 2 / 2 |
| | | | | | | Volunteer - Phipps Bend 500 kV | TVA | 2.3 | TVA to NE | 3.3 | |
| | | | | | | Coleman - Newtonville - Taswell 161 kV & Newtonville 161-138 kV | BR-SIG-HE<br>SIGE | ----- | TVA to NE<br>TVA to MAIN | 3.0<br>2.8 | |
| | | **McCracken - Marshall 161 kV**<br><br>Note: Possible forced and/or scheduled outages at time TLRs were called. | | BREC-TVA | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 0 / 0<br>Jun - Aug = 1 / 0<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| X | X | **Reid - Hopkins County - Barkley 161 kV** | | BREC-TVA | 265 | Wilson - Green River 161 kV | BREC-LGEE | 23.3 | ECAR to TVA | 3.3 | |
| X | X | **State Line - Wolf Lake - Sheffield 138 kV** | 1&2 | CE-NIPS | 160 | Burnham - Sheffield 345 kV | CE-NIPS | 23.4 | MAIN to MECS | 2.8 | |
| | | | | | | Wilton Center - Dumont 765 kV | CE-AEP | 3.6 | MAIN to NE | 2.5 | |
| X | X | **Buffington 345-138 kV** | 2 | CIN | 499 | Red Bank - Silver Grove - Zimmer 345 kV & Silver Grove 345-138 kV | CIN<br>CIN | ----- | MAIN to Kentucky | 3.6 | |
| X | X | **Cayuga 345-230 kV** | 2 | CIN | 534 | Cayuga - Nucor 345 kV | CIN | 31.4 | MAAC to Indiana | 3.4 | |
| X | X | **Gallagher 230-138 kV** | | CIN | 162 | Clifty Creek - Trimble County 345 kV | OVEC-LGEE | 11.3 | MAIN to Kentucky | 4.3 | Mar - May = 0 / 0<br>Jun - Aug = 9 / 0<br>Sep - Nov = 1 / 0<br>Dec - Feb = 0 / 0 |
| | X | **Kokomo East - Webster Street 230 kV** | | CIN | 416 | Greentown - Dumont 765 kV | AEP | 14.1 | MAAC to Indiana | 3.2 | |
| | X | **Miami Fort 345-138 kV** | | CIN | 486 | East Bent - Terminal 345 kV | CIN | 19.4 | MAIN to Kentucky | 3.1 | |

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| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | **New London - Webster 230 kV** | | CIN | 495 | Jefferson - Greentown 765 kV | AEP | 10.7 | TVA to MECS | 3.2 | |
| | X | **Walton 230-345 kV** | | CIN | 644 | Greentown - Dumont 765 kV | AEP | 12.9 | VACAR to MAIN<br>TVA to MAIN | 3.1<br>3.0 | |
| | X | **Foster - Sugarcreek 345 kV**<br><br>Note: Loadings reduced by the addition of the Foster - Bath 345 kV (CIN-DPL) circuit scheduled for completion by June 2001. | 2 | CIN-DPL | 1315 | Stuart - Clinton - Greene 345 kV &<br>Clinton 345-69 kV | DPL<br>DPL | ----- | TVA to MECS<br>TVA to NE | 2.9<br>2.9 | Mar - May = 0 / 0<br>Jun - Aug = 1 / 3<br>Sep - Nov = 0 / 10<br>Dec - Feb = 0 / 0 |
| | | | | | | Miami Fort - West Milton 345 kV | CIN-DPL | 36.0 | MAIN to MECS<br>MAIN to NE | 2.7<br>2.7 | |
| X | X | **Gallagher - Paddys West 138 kV** | | CIN-LGEE | 382 | Clifty Creek - Trimble County 345 kV | OVEC-LGEE | 27.0 | MAIN to Kentucky | 8.1 | Mar - May = 2 / 0<br>Jun - Aug = 2 / 0<br>Sep - Nov = 1 / 0<br>Dec - Feb = 0 / 0 |
| | | **Speed - Northside 138 kV**<br><br>Note: Possible forced and/or scheduled outages at time TLRs were called. | | CIN-LGEE | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 3 / 0<br>Jun - Aug = 3 / 0<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| | | **Oakland City - Toyota 138 kV**<br><br>Note: Possible forced and/or scheduled outages at time TLRs were called. | | CIN-SIGE | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 0 / 0<br>Jun - Aug = 1 / 0<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| X | X | **Morrow - Battle Creek 138 kV** | | CONS | 253 | Argenta - Battle Creek 345 kV &<br>Argenta - Tompkins 345 kV | CONS<br>CONS | ----- | MAIN to MECS | 2.7 | |
| | X | **Coventry 345-120 kV** | 2 | DECO | 670 | Monroe 12 - Browstown South 345 kV &<br>Monroe 34 - Browstown North 345 kV | DECO<br>DECO | ----- | MAAC to MECS<br>VACAR to MECS<br>TVA to MECS<br>MAIN to MECS | 4.8<br>4.7<br>4.7<br>4.6 | |
| | X | **Boone - Renaker 138 kV** | | EKPC | 67 | Clifty Creek - Trimble County 345 kV | OVEC-LGEE | 1.4 | MAIN to Kentucky | 2.6 | |

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| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | **Ashtabula 345-138 kV** | | FE | 304 | Ashtabula - Perry 345 kV | FE | 39.2 | MAAC to Indiana<br>MAAC to MAIN | 4.1<br>4.1 | |
| X | X | **Bay Shore 345-138 kV** | 2 | FE | 650 | Allen Junction 345-138 kV | FE | 31.8 | TVA to NE<br>MAIN to NE | 4.2<br>4.3 | |
| X | X | **Beaver - Davis Besse 345 kV** | 2 | FE | 950 | Base Case | ----- | ----- | MAAC to MECS<br>MAAC to Indiana<br>MAAC to MAIN | 18.9<br>8.1<br>8.5 | |
| | | | | | 984 | Galion - Fostoria Central 345 kV | AEP | 20.0 | MAAC to MECS | 20.9 | |
| | | | | | | East Lima - Fostoria Central 345 kV | AEP | 15.0 | MAIN to MECS | 12.2 | |
| | | | | | | Kammer - Orange 765 kV | AEP | 6.8 | MAAC to Indiana<br>MAAC to MAIN | 9.4<br>9.8 | |
| X | | **Carlisle 345-138 kV** | | FE | 505 | Carlisle - Beaver 345 kV | FE | 37.6 | MAAC to MECS | 3.2 | |
| X | X | **Greenfield - Lakeview 138 kV** | | FE | 184 | Base Case | ----- | ----- | MAAC to MECS | 3.5 | |
| | | | | | 248 | Beaver - Davis Besse 345 kV | FE | 12.6 | MAAC to MECS<br>MAIN to MECS<br>MAAC to Indiana<br>MAAC to MAIN | 5.7<br>3.2<br>2.5<br>2.6 | |
| | X | **Lemoyne - Midway 345 kV** | | FE | 1231 | Bay Shore - Monroe 345 kV &<br>Lemoyne - Majestic 345 kV | FE-DECO<br>FE-DECO | ----- | MAAC to MECS<br>VACAR to MECS | 20.2<br>19.0 | |
| X | | **Lorain - Johnson 138 kV** | | FE | 215 | Star - Carlisle 345 kV | FE | 9.2 | MAAC to MECS | 2.5 | |
| | X | **Bay Shore - Monroe 345 kV** | | FE-DECO | 1523 | Allen Jct - Monroe - Majestic 345 kV &<br>Lemoyne - Majestic 345 kV | FE-DECO<br>FE-DECO | ----- | MAAC to MECS | 38.7 | |

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| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | | **Allanburg Jct - Middleport (Q30M) 220 kV** | | HONI | 408 | Base Case | ----- | ----- | VACAR to MECS | 2.6 | Refer to QFW Interface flowgate for TLR information |
| X | | **Beck - Hannon Jct (Q24HM) 220 kV** | 2 | HONI | 465 | Base Case | ----- | ----- | VACAR to MECS | 2.7 | Refer to QFW Interface flowgate for TLR information |
| | | | | | 616 | Beck - Neale Jct (Q25BM) 220 kV &<br>Beck - Hannon Jct (Q29HM) 220 kV | HONI<br>HONI | ----- | VACAR to MECS<br>MAAC to MAIN | 4.0<br>2.5 | |
| X | | **Beck - Hannon Jct (Q29HM) 220 kV** | | HONI | 530 | Base Case | ----- | ----- | VACAR to MECS | 2.7 | Refer to QFW Interface flowgate for TLR information |
| X | | **Packard - Beck (PA27) 220 kV** | | HONI | 400 | Base Case | ----- | ----- | VACAR to MECS | 2.9 | Refer to QFW Interface flowgate for TLR information |
| X | | **QFW Interface (220 kV)**<br><br>Note: This interface includes the above four HONI facilities. | | HONI | ----- | ----- | ----- | ----- | ----- | ----- | Mar - May = 0 / 0<br>Jun - Aug = 0 / 7<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| | | **IMO-MECS Interface (west-to-east Flow)**<br><br>Note: Includes the following four facilities:<br>a) Lambton - Saint Clair (L4D) 345 kV<br>b) Lambton - Saint Clair (L51D) 345 kV<br>c) Scott - Bunce Creek (B3N) 230 kV<br>d) Keith - Waterman (J5D) 230 kV | | HONI-DECO | 2580 | ----- | ----- | ----- | ----- | ----- | Mar - May = 0 / 1<br>Jun - Aug = 0 / 0<br>Sep - Nov = 5 / 6<br>Dec - Feb = 11 / 0 |
| X | X | **IMO-MECS Interface (east-to-west flow)**<br><br>Note: Includes the following four facilities:<br>a) Lambton - Saint Clair (L4D) 345 kV<br>b) Lambton - Saint Clair (L51D) 345 kV<br>c) Scott - Bunce Creek (B3N) 230 kV<br>d) Keith - Waterman (J5D) 230 kV | | HONI-DECO | 2580 | ----- | ----- | ----- | ----- | ----- | Mar - May = 0 / 0<br>Jun - Aug = 0 / 12<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |

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| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | **Lambton - Saint Clair (L4D) 345 kV** | 1&2 | HONI-DECO | 845 | Base Case | ----- | ----- | VACAR to MECS<br>MAAC to Indiana<br>MAAC to MAIN | 6.0<br>2.6<br>2.7 | Refer to IMO-MECS Interface flowgate for TLR information |
| | | | | | 1170 | Lambton - Saint Clair (L51D) 345 kV &<br>Saint Clair Unit 6 &<br>Lambton Generation Rejection | HONI-DECO<br>DECO<br>HONI | ----- | MAAC to Indiana<br>MAAC to TVA<br>MAAC to MAIN | 4.0<br>3.2<br>4.2 | |
| | | | | | 1170 | Lambton - Saint Clair (L51D) 345 kV &<br>Lambton - Chatham (L29C) 230 kV &<br>Lambton Generation Rejection | HONI-DECO<br>HONI<br>HONI | ----- | VACAR to MECS | 9.0 | |
| X | X | **Lambton - Saint Clair (L51D) 345 kV** | 1&2 | HONI-DECO | 845 | Base Case | ----- | ----- | VACAR to MECS | 5.3 | Refer to IMO-MECS Interface flowgate for TLR information |
| | | | | | 1170 | Lambton - Saint Clair (L4D) 345 kV &<br>Saint Clair Unit 6 &<br>Lambton Generation Rejection | HONI-DECO<br>DECO<br>HONI | ----- | MAAC to Indiana<br>MAAC to TVA<br>MAAC to MAIN | 3.8<br>3.1<br>4.0 | |
| | | | | | 1170 | Lambton - Saint Clair (L4D) 345 kV &<br>Lambton Generation Rejection | HONI-DECO<br>HONI | 59.0 | VACAR to MECS | 9.0 | |
| X | X | **Scott - Bunce Creek (B3N) 230 kV** | 1&2 | HONI-DECO | 482 | Lambton - Saint Clair (L4D) 345 kV &<br>Saint Clair - Belle River 345 kV &<br>Lambton Generation Rejection | HONI-DECO<br>DECO<br>HONI | ----- | VACAR to MECS | 3.2 | Refer to IMO-MECS Interface flowgate for TLR information |
| X | X | **Sidney 345-138 kV** | | IP | 560 | Dumont - Wilton Center 765 kV | AEP-CE | 3.9 | ECAR to MAIN<br>MAAC to MAIN<br>VACAR to MAIN | 2.7<br>2.7<br>2.6 | |
| | X | **Wheatland - Breed 345 kV** | 2 | IPL-AEP | 1200 | Rockport - Sullivan 765 kV | AEP | 33.7 | ECAR to MAIN<br>MAAC to MAIN<br>VACAR to MAIN | 9.6<br>7.8<br>7.3 | |

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| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | **Brown 138-345 kV** | | LGEE | 515 | Ghent - West Lexington - Brown 345 kV & West Lexington 345-138 kV | LGEE<br>LGEE | ----- | ECAR to TVA | 5.6 | |
| X | X | **Brown - Alcalde - Pineville 345 kV** | 2 | LGEE | 956 | Baker - Broadford 765 kV | AEP | 6.9 | ECAR to TVA<br>MAIN to VACAR<br>MAAC to TVA<br>MAIN to TVA | 7.6<br>4.6<br>4.1<br>5.9 | |
| | X | **Brown - Danville North - Lebanon 138 kV**<br><br>Note: TLRs declared under the LGEE-TVA Interface flowgate. | 2 | LGEE | 182 | Brown - Alcalde - Pineville 345 kV & Alcalde 345-138 kV | LGEE<br>LGEE | ----- | ECAR to TVA | 2.8 | Mar - May = 0 / 0<br>Jun - Aug = 0 / 3<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| | | **Ghent 345-138 kV**<br><br>Note: No TLRs called during the summer. | | LGEE | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 2 / 0<br>Jun - Aug = 0 / 0<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| X | X | **Ghent - West Lexington - Brown 345 kV** | | LGEE | 717 | Base Case | ----- | ----- | MAIN to TVA | 4.3 | Mar - May = 0 / 0<br>Jun - Aug = 4 / 2<br>Sep - Nov = 6 / 0<br>Dec - Feb = 9 / 2 |
| X | X | **Grahamville-Paducah-Livingston 161 kV** | | LGEE | 223 | Shawnee - Marshall 500 kV | TVA | 9.1 | MAIN to Kentucky | 2.9 | |
| X | | **Livingston Co - Earlington North 161 kV** | | LGEE | 193 | Livingston-Crittenden-Morgenfield 161 kV & Crittenden 161-69 kV | LGEE<br>LGEE | ----- | MAIN to Kentucky | 5.3 | |
| X | | **Pineville - Pocket 500 kV or**<br>**Pineville 345-500 kV** | | LGEE<br>LGEE | 550<br>580 | Baker - Broadford 765 kV | AEP | 7.1 | ECAR to TVA<br>MAIN to VACAR | 5.4<br>4.3 | |
| | X | **River Queen - Earlington North 161 kV** | 2 | LGEE | 184 | Green R - Corydon - Morganfield 161 kV & Corydon 161-69 kV | LGEE<br>LGEE | ----- | ECAR to TVA | 2.8 | |

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| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Trimble County - Centerfield 138 kV**<br><br>Note: Due to construction outages to build 2nd Trimble Co - Middletown 345 kV. | | LGEE | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 2 / 0<br>Jun - Aug = 11 / 0<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| | | **Blue Lick 345-161 kV or**<br>**Blue Lick - Bullitt County 161 kV**<br><br>Note: These facilities are not responsive (<2.5%) to the ECAR transfers scenarios. This interconnection is not a problem at peak load when LGEE generators in the Louisville area are supplying load in the immediate area. Loading problems occur at shoulder peak, when LGEE generation is serving remote load, but still in the LGEE control area. | | LGEE<br>LGEE-EKPC | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 6 / 0<br>Jun - Aug = 53 / 1<br>Sep - Nov = 40 / 1<br>Dec - Feb = 27 / 0 |
| | X | **Lebanon - Marion County 161 kV or**<br>**Marion County 138-161 kV** | | LGEE-EKPC<br>EKPC | 167<br>167 | Brown - Alcalde - Pineville 345 kV &<br>Alcalde 345-138 kV | LGEE<br>LGEE | ----- | ECAR to TVA | 2.6 | |
| | | **LGEE-EKPC Interface (138 kV)**<br><br>Note: This flowgate was used to address numerous flowgates that were operating at or above their emergency ratings. | | LGEE-EKPC | ----- | ----- | ----- | ----- | ----- | ----- | Mar - May = 0 / 0<br>Jun - Aug = 0 / 2<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| X | | **Cloverport - Newtonville 138 kV** | 1 | LGEE-SIGE | 143 | Coleman - Newtonville - Taswell 161 kV &<br>Newtonville 161-138 kV | BR-SIG-HE<br>SIGE | ----- | MAIN to Indiana | 2.9 | Mar - May = 3 / 0<br>Jun - Aug = 4 / 0<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| | | **Paddys Run - Summershade 161 kV**<br><br>Note: TLRs associated with operating procedures to relieve Blue Lick facilities. | | LGEE-TVA | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 3 / 0<br>Jun - Aug = 37 / 0<br>Sep - Nov = 40 / 0<br>Dec - Feb = 27 / 0 |
| X | X | **Pineville - Pineville 161 kV** | 2 | LGEE-TVA | 187 | Pocket - Phipps Bend 500 kV | LGEE-TVA | 30.1 | ECAR to TVA | 2.9 | |

**TABLE A-1**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Key Facilities Index**

Date: 04/17/01



| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | **Dune Acres - Michigan City 138 kV** | 2 | NIPS | 157 | Wilton Center - Dumont 765 kV | CE-AEP | 3.2 | MAIN to MECS | 2.5 | |
| X | X | **Clifty Creek #1A 345-138 kV** | | OVEC | 193 | Clifty Creek - Trimble County 345 kV | OVEC-LGEE | 9.6 | MAIN to Kentucky | 4.0 | |
| X | X | **Clifty Creek #1B 345-138 kV** | | OVEC | 155 | Clifty Creek - Trimble County 345 kV | OVEC-LGEE | 8.6 | MAIN to Kentucky | 3.6 | |
| X | X | **Kyger Creek - Sporn 345 kV** | 3 | OVEC-AEP | 1100 | Amos 765-345 kV | AEP | 28.7 | MAIN to NE | 6.4 | Mar - May = 0 / 0<br>Jun - Aug = 0 / 2<br>Sep - Nov = 0 / 3<br>Dec - Feb = 0 / 0 |
| X | X | **Clifty Creek - Carrollton 138 kV** | 2 | OVEC-LGEE | 191 | Baker - Broadford 765 kV | AEP | 1.3 | MAIN to Kentucky | 3.8 | |
| X | X | **Clifty Creek - Northside 138 kV** | | OVEC-LGEE | 113 | Clifty Creek - Trimble County 345 kV | OVEC-LGEE | 13.4 | MAIN to Kentucky | 3.5 | |
| X | X | **Newtonville 161-138 kV** | 2 | SIGE | 179 | Cloverport - Newtonville 138 kV | LGEE-SIGE | 76.0 | MAAC to Indiana | 3.4 | |
| | | **Henderson County 138-161 kV**<br>**AB Brown - Henderson County 138 kV**<br>Note: Possible forced and/or scheduled outages at time TLRs were called. | | SIGE-BREC | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 0 / 1<br>Jun - Aug = 1 / 0<br>Sep - Nov = 16 / 2<br>Dec - Feb = 9 / 1 |
| X | X | **Newtonville - Coleman 161 kV** | | SIGE-BREC | 265 | AB Brown - Henderson County 138 kV | SIGE-BREC | 4.8 | MAAC to TVA | 2.7 | Mar - May = 1 / 0<br>Jun - Aug = 0 / 0<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| X | X | **Renshaw - Livingston County 161 kV** | | SIPC-BREC | 250 | Shawnee - Marshall 500 kV | TVA | 5.8 | MAIN to TVA | 3.0 | |
| X | X | **Bull Run - Volunteer 500 kV** | | TVA | 1732 | Watts Barr - Volunteer 500 kV | TVA | 75.6 | TVA to MECS<br>TVA to NE<br>TVA to MAIN | 17.1<br>18.6<br>12.3 | |

**TABLE A-1**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Key Facilities Index**

Date: 04/17/01



| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | **Cumberland - Davidson 500 kV** | | TVA | 2597 | Cumberland - Johnsonville 500 kV | TVA | 75.7 | MAIN to MECS<br>MAIN to NE<br>MAIN to Kentucky<br>MAIN to MAAC<br>MAIN to VACAR | 3.5<br>4.8<br>2.6<br>5.9<br>8.0 | Mar - May = 1 / 0<br>Jun - Aug = 5 / 0<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 0 |
| X | X | **Cumberland - Johnsonville 500 kV** | | TVA | 2597 | Cumberland - Davidson 500 kV | TVA | 77.3 | MAIN to MECS<br>MAIN to NE<br>MAIN to MAAC<br>MAIN to VACAR | 2.8<br>3.9<br>4.8<br>6.7 | |
| | X | **Gallatin - Hartsville 161 kV** | | TVA | 206 | Volunteer - Phipps Bend 500 kV | TVA | 2.1 | TVA to MECS | 2.7 | |
| X | X | **Norris - La Follette 161 kV** | 2 | TVA | 234 | Volunteer - Phipps Bend 500 kV | TVA | 6.2 | TVA to MECS<br>TVA to NE | 2.9<br>2.9 | |
| | | **Volunteer - Phipps Bend 500 kV**<br><br>Note: These TLRs were declared under this flowgate to address voltage concerns in TVA during the summer. Only selected thermal limitations in TVA are considered in the ECAR seasonal assessments. | | TVA | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 4 / 0<br>Jun - Aug = 37 / 2<br>Sep - Nov = 1 / 0<br>Dec - Feb = 0 / 0 |
| X | X | **Paradise - New Hardinsburg 161 kV** | | TVA-BREC | 265 | Base Case | ----- | ----- | TVA to NE<br>TVA to MAIN | 3.2<br>3.0 | |
| | | | | | 265 | Volunteer - Phipps Bend 500 kV | TVA | 2.3 | TVA to MECS<br>TVA to NE<br>TVA to MAIN | 3.9<br>3.7<br>3.3 | |
| X | X | **Summershade-Summershade Tap 161 kV** | | TVA-EKPC | 240 | Summershade - Summershade 161 kV | TVA-EKPC | 99.7 | TVA to MECS<br>TVA to NE<br>TVA to MAIN | 3.7<br>3.5<br>3.1 | |
| X | X | **Summershade-Summershade 161 kV** | | TVA-EKPC | 327 | Summershade-Summershade Tap 161 kV | TVA-EKPC | 99.6 | TVA to NE<br>TVA to MAIN | 3.5<br>3.1 | |

**TABLE A-1**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Key Facilities Index**

Date: 04/17/01



| 2001 | 2000 | Limiting Facility | Notes | System | Rating (MVA) | Outaged Facility | System | LODF (%) | Limiting Transfers | OTDF (%) | TLR Level 2 & Above For 2000 / 1999 (3) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | X | **Shawnee - East West Frankfort 345 kV** | | TVA-IP | 1195 | Lutesville - St. Francois 345 kV &<br>St. Francois 345-138 kV | AMRN<br>AMRN | ----- | TVA to MAIN | 15.6 | |
| | X | **Phipps Bend - Pocket 500 kV** | | TVA-LGEE | 693 | Sullivan - Broadford 500 kV &<br>Broadford 500-765 kV | TVA-AEP<br>AEP | 18.0 | TVA to NE<br>TVA to MAIN | 6.5<br>7.0 | |
| X | X | **Mount Storm - Doubs 500 kV** | 2 | VP-AP | 2271 | Mount Storm - Meadow Brook 500 kV | VP-AP | 35.0 | ECAR to MAAC<br>MAIN to MAAC<br>MAIN to VACAR | 14.5<br>14.6<br>2.6 | |
| | | **Mount Storm - Meadow Brook 500 kV**<br><br>Note: No TLRs called during the summer. | | VP-AP | ----- | Although this facility has a TLR history, it was not identified as a limit in the ECAR 2001 nor 2000 Summer assessments for the reasons noted in the left column. | ----- | ----- | ----- | ----- | Mar - May = 0 / 0<br>Jun - Aug = 0 / 0<br>Sep - Nov = 0 / 0<br>Dec - Feb = 0 / 1 |

(1) This facility has an established operating procedure to relieve overloads (refer to Appendix H).
(2) This facility may overload at higher transfer levels (but below the transfer level tested in the respective interregional studies) for other single contingencies which are not shown in this table for brevity.
(3) Number of days limiting facility was under TLR Level 2 and above (based on NERC logs) during March 1999 through February 2001.

# APPENDIX B

## Facility Additions, Removals, and Modifications, and Abnormal System Conditions

The following three tables document the generation and transmission facility additions, removals, and modifications, and abnormal system conditions which have occurred on the ECAR network since the beginning of last year, and which are expected to occur through the end of this year.

Table B-1 lists the ECAR Generation Additions, Removals, and Modifications.
Table B-2 lists the ECAR Transmission Additions, Removals, and Modifications.
Table B-3 lists the ECAR Abnormal System Conditions.

# TABLE B-1
## ECAR 2001 Summer Assessment of Transmission System Performance
## Generation Additions, Removals, and Modifications (25 MW and Above)

Date: 04/17/01

***January 2000 through December 2001***



### Generation Additions

| Connected System | Generating Unit Name/Number | Merchant Plant | Unit Type | Fuel Type | NDC (MW) | Summer NSC (MW) | Winter NSC (MW) | Modeled in Base Case | Study Area |
|---|---|---|---|---|---|---|---|---|---|
| **June 2000** | | | | | | | | | |
| CIN | Madison 1 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN | Madison 2 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN | Madison 3 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN | Madison 4 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN | Madison 5 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN | Madison 6 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN | Madison 7 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN | Madison 8 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN | Vermillion 1 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN | Vermillion 2 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN | Vermillion 3 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN | Vermillion 4 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN | Vermillion 5 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN | Vermillion 6 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN | Vermillion 7 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN | Vermillion 8 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| CIN-ENWC | Wheatland 3 | Yes | CT | Nat Gas | 125 | 125 | 125 | Yes | SW |
| CIN-ENWC | Wheatland 4 | Yes | CT | Nat Gas | 125 | 125 | 125 | Yes | SW |
| DECO | River Rouge 1 | Yes | CT | Nat Gas | 240 | 240 | 240 | Yes | MECS |
| DPL | Greenville 1 | Yes | CT | Nat Gas | 56 | 56 | 56 | Yes | SW |
| DPL | Greenville 2 | Yes | CT | Nat Gas | 56 | 56 | 56 | Yes | SW |
| DPL | Greenville 3 | Yes | CT | Nat Gas | 56 | 56 | 56 | Yes | SW |
| DPL | Greenville 4 | Yes | CT | Nat Gas | 56 | 56 | 56 | Yes | SW |
| FE | Richland CT 4 | Yes | CT | Nat Gas | 130 | 130 | 130 | Yes | NE |
| FE | Richland CT 5 | Yes | CT | Nat Gas | 130 | 130 | 130 | Yes | NE |
| FE | Richland CT 6 | Yes | CT | Nat Gas | 130 | 130 | 130 | Yes | NE |
| HE | Worthington 1 | No | CT | Nat Gas | 170 | 170 | 170 | Yes | SW |
| IPL | Georgetown 1 | No | CT | Nat Gas | 100 | 75 | 75 | Yes | SW |
| IPL | Georgetown 2 | Yes | CT | Nat Gas | 100 | 75 | 75 | Yes | SW |
| IPL | Georgetown 3 | Yes | CT | Nat Gas | 100 | 75 | 75 | Yes | SW |
| IPL-ENWI | Wheatland 1 | Yes | CT | Nat Gas | 125 | 125 | 125 | Yes | SW |
| IPL-ENWI | Wheatland 2 | Yes | CT | Nat Gas | 125 | 125 | 125 | Yes | SW |
| **December 2000** | | | | | | | | | |
| AP | Allegheny Energy 8 | Yes | CT | Nat Gas | 48 | 44 | 48 | Yes | SW |
| AP | Allegheny Energy 9 | Yes | CT | Nat Gas | 48 | 44 | 48 | Yes | SW |

# TABLE B-1
## ECAR 2001 Summer Assessment of Transmission System Performance
## Generation Additions, Removals, and Modifications (25 MW and Above)

Date: 04/17/01

***January 2000 through December 2001***



### Generation Additions (Continued)

| Connected System | Generating Unit Name/Number | Merchant Plant | Unit Type | Fuel Type | NDC (MW) | Summer NSC (MW) | Winter NSC (MW) | Modeled in Base Case | Study Area |
|---|---|---|---|---|---|---|---|---|---|
| **April 2001** | | | | | | | | | |
| BREC | Willamette Ind. (a) | Co-Gen | Steam | Waste | 58 | 58 | 58 | Yes | SW |
| Note (a): Co-generation facility added by industrial customer is modeled as reduced load at Skillman. | | | | | | | | | |
| DECO | DIG STG 1 | Yes | STG | Nat Gas | 250 | 200 | 250 | Yes | MECS |
| **May 2001** | | | | | | | | | |
| LGEE | Brown CT 5 | No | CT | Nat Gas | 135 | 135 | 135 | Yes | SW |
| LGEE | Paddys Run 13 | No | CT | Nat Gas | 185 | 160 | 185 | Yes | SW |
| **June 2001** | | | | | | | | | |
| AEP | Twelve Pole Ck 1 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| AEP | Twelve Pole Ck 2 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| AEP | Twelve Pole Ck 3 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| AEP | Twelve Pole Ck 4 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| AEP | Twelve Pole Ck 5 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| AEP | Twelve Pole Ck 6 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| AEP | Grangston 1 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Grangston 2 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Grangston 3 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Grangston 4 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Grangston 5 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Grangston 6 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Keystone 1 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Keystone 2 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Keystone 3 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Keystone 4 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Keystone 5 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Keystone 6 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Keystone 7 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Keystone 8 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Wolf Hills 1 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Wolf Hills 2 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Wolf Hills 3 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Wolf Hills 4 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Wolf Hills 5 | Yes | CT | Nat Gas | 50 | 50 | 50 | Yes | SW |
| AEP | Zelda 1 | Yes | CT | Nat Gas | 167 | 167 | 167 | Yes | SW |
| AEP | Zelda 2 | Yes | CT | Nat Gas | 167 | 167 | 167 | Yes | SW |
| AEP | Zelda 3 | Yes | CT | Nat Gas | 167 | 167 | 167 | Yes | SW |

# TABLE B-1
## ECAR 2001 Summer Assessment of Transmission System Performance
## Generation Additions, Removals, and Modifications (25 MW and Above)

Date: 04/17/01

***January 2000 through December 2001***



### Generation Additions (Continued)

| Connected System | Generating Unit Name/Number | Merchant Plant | Unit Type | Fuel Type | NDC (MW) | Summer NSC (MW) | Winter NSC (MW) | Modeled in Base Case | Study Area |
|---|---|---|---|---|---|---|---|---|---|
| **June 2001 (Continued)** | | | | | | | | | |
| CIN | Henry 1 | Yes | CT | Nat Gas | 61 | 61 | 61 | Yes | SW |
| CIN | Henry 2 | Yes | CT | Nat Gas | 61 | 61 | 61 | Yes | SW |
| CIN | Henry 3 | Yes | CT | Nat Gas | 61 | 61 | 61 | Yes | SW |
| CONS | Zeeland 1 | Yes | CT | Nat Gas | 185 | 185 | 185 | Yes | MECS |
| CONS | Zeeland 2 | Yes | CT | Nat Gas | 185 | 185 | 185 | Yes | MECS |
| CONS | Various Plants | Yes | ----- | ----- | 75 | 75 | 75 | Yes | MECS |
| DECO | DIG GTG 2 | Yes | CT | Nat Gas | 183 | 170 | 183 | Yes | MECS |
| DECO | DIG GTG 3 | Yes | CT | Nat Gas | 183 | 170 | 183 | Yes | MECS |
| DPL | Adkins 1 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| DPL | Adkins 2 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| DPL | Adkins 3 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| DPL | Adkins 4 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| DPL | Adkins 5 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| DPL | Adkins 6 | Yes | CT | Nat Gas | 80 | 80 | 80 | Yes | SW |
| FE | West Lorain 1 | Yes | CT | Nat Gas | 85 | 85 | 85 | No | NE |
| FE | West Lorain 2 | Yes | CT | Nat Gas | 85 | 85 | 85 | No | NE |
| FE | West Lorain 3 | Yes | CT | Nat Gas | 85 | 85 | 85 | No | NE |
| FE | West Lorain 4 | Yes | CT | Nat Gas | 85 | 85 | 85 | No | NE |
| FE | West Lorain 5 | Yes | CT | Nat Gas | 85 | 85 | 85 | No | NE |
| IPL | Georgetown 4 | Yes | CT | Nat Gas | 100 | 75 | 75 | No | SW |
| **September 2001** | | | | | | | | | |
| NIPS | WCEP 1 | Yes | CC-CT | Nat Gas | 150 | 150 | 150 | Yes | SW |
| NIPS | WCEP 2 | Yes | CC-CT | Nat Gas | 150 | 150 | 150 | Yes | SW |
| NIPS | WCEP 3 | Yes | CC-STM | Waste Heat | 150 | 150 | 150 | Yes | SW |
| **October 2001** | | | | | | | | | |
| AP | Oak Grove 1 | Yes | CT | Nat Gas | 190 | 150 | 190 | No | NE |
| AP | Oak Grove 2 | Yes | CT | Nat Gas | 190 | 150 | 190 | No | NE |
| **December 2001** | | | | | | | | | |
| AP | Allegheny Energy 6 | Yes | CT | Nat Gas | 48 | 44 | 48 | Yes | NE |
| AP | Allegheny Energy 7 | Yes | CT | Nat Gas | 48 | 44 | 48 | Yes | NE |

# TABLE B-1
## ECAR 2001 Summer Assessment of Transmission System Performance
## Generation Additions, Removals, and Modifications (25 MW and Above)

Date: 04/17/01

***January 2000 through December 2001***



### Generation Removals

| Connected System | Generating Unit Name/Number | Merchant Plant | Unit Type | Fuel Type | NDC (MW) | Summer NSC (MW) | Winter NSC (MW) | Modeled in Base Case | Study Area |
|---|---|---|---|---|---|---|---|---|---|

None

### Generation Modifications

| Connected System | Generating Unit Name/Number | Merchant Plant | Unit Type | Fuel Type | NDC (MW) | Summer NSC (MW) | Winter NSC (MW) | Modeled in Base Case | Study Area |
|---|---|---|---|---|---|---|---|---|---|
| **May 2000** | | | | | | | | | |
| LGEE | Brown CT 8 (b) | No | CT | Gas / Oil | 135 | 135 | 135 | Yes | SW |
| LGEE | Brown CT 9 (b) | No | CT | Gas / Oil | 135 | 135 | 135 | Yes | SW |
| LGEE | Brown CT 10 (b) | No | CT | Gas / Oil | 135 | 135 | 135 | Yes | SW |
| LGEE | Brown CT 11 (b) | No | CT | Gas / Oil | 135 | 135 | 135 | Yes | SW |
| Note (b): Added inlet-air cooling to increase capability from 110 MW to 135 MW. | | | | | | | | | |
| **June 2000** | | | | | | | | | |
| CONS | Various Plants (c) | No | ----- | ----- | 57 | 57 | 57 | Yes | MECS |
| Note (c): Reflects total increase in capacity due to various modifications at existing generating units. | | | | | | | | | |
| **November 2000** | | | | | | | | | |
| CONS | Cobb 1 (d) | No | Steam | Nat Gas | 61 | 61 | 15 | Yes | MECS |
| CONS | Cobb 2 (d) | No | Steam | Nat Gas | 61 | 61 | 14 | Yes | MECS |
| CONS | Cobb 3 (d) | No | Steam | Nat Gas | 61 | 61 | 14 | Yes | MECS |
| Note (d): Reduced winter capability due to gas availability. | | | | | | | | | |
| **June 2001** | | | | | | | | | |
| CONS | Various Plants (e) | No | ----- | ----- | 24 | 24 | 24 | Yes | MECS |
| Note (e): Reflects total increase in capacity due to various modifications at existing generating units. | | | | | | | | | |

# TABLE B-2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Transmission Additions, Removals, and Modifications (230 kV and Above)

Date: 04/17/01

***January 2000 through December 2001***



| Transmission Additions | | | | | | | |
|---|---|---|---|---|---|---|---|
| **System** | **Transmission Facility** | **Voltage (kV)** | **Summer N/E (MVA)** | **Winter N/E (MVA)** | **Line Mileage** | **Modeled in Base Case** | **Study Area** |
| **February 2000** | | | | | | | |
| AP | New Market / Monocacy - Mt. Airy | 230 | (Loop) | (Loop) | 4 | Yes | SW |
| **May 2000** | | | | | | | |
| DECO | Belle River - Madrid - Pontiac | 345 | 1756 / 2007 | 1756 / 2007 | 42 | Yes | MECS |
| **June 2000** | | | | | | | |
| AEP | Ohio/Indiana Reactive Correction | (Various) | 1100 MVAR | 1100 MVAR | ----- | Yes | SW |
| CIN | Madison - Woodsdale (radial connection to merchant plant) | 345 | 1200 / 1200 | 1200 / 1200 | 0 | Yes | SW |
| CIN | Vermilion / Cayuga - Eugene (loop connection to merchant plant) | 345 | (Loop) | (Loop) | 0 | Yes | SW |
| CIN | Wheatland / Gibson - Qualitech (loop connection to merchant plant) | 345 | (Loop) | (Loop) | 0 | Yes | SW |
| CONS | Battle Creek # 1 (Battle Creek # 2 has been in service) | 345-138 | 563 / 595 | 563 / 595 | ----- | Yes | MECS |
| DECO | Bunce Creek (B3N) PAR | 230-230 | 675 / 1100 | 675 / 1100 | ----- | Yes | MECS |
| DECO | Saint Clair (L51D) # 9 | 345-230 | 1000 / 1300 | 1000 / 1300 | ----- | Yes | MECS |
| HE | Bloomington # 2 | 345-230 | 500 / 750 | 500 / 750 | ----- | Yes | SW |
| HONI | Lambton (L51D) PAR | 230-230 | 845 / 1170 | 845 / 1170 | ----- | Yes | MECS |
| IPL | Wheatland / Breed - Petersburg (loop connection to merchant plant) | 345 | (Loop) | (Loop) | 0 | Yes | SW |
| LGEE | Middletown - Trimble County # 2 | 345 | 1207 / 1207 | 1207 / 1207 | 28 | Yes | SW |
| LGEE | Middletown # 3 | 345-138 | 448 / 478 | 448 / 478 | ----- | Yes | SW |
| **February 2001** | | | | | | | |
| DECO | DIG / Waterman - Navarre (loop connection to merchant plant) | 230 | (Loop) | (Loop) | 1 | Yes | MECS |
| **March 2001** | | | | | | | |
| CONS | Roosevelt / Palisades - Talmadge | 345 | (Loop) | (Loop) | 0 | Yes | MECS |
| CONS | Roosevelt - Zeeland (radial connection to merchant plant) | 345 | 1933 / 2732 | 2303 / 2963 | 1.5 | No | MECS |

# TABLE B-2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Transmission Additions, Removals, and Modifications (230 kV and Above)

Date: 04/17/01

***January 2000 through December 2001***



| Transmission Additions (Continued) | | | | | | | |
|---|---|---|---|---|---|---|---|
| System | Transmission Facility | Voltage (kV) | Summer N/E (MVA) | Winter N/E (MVA) | Line Mileage | Modeled in Base Case | Study Area |
| **April 2001** | | | | | | | |
| DECO | DIG / Baxter - Navarre - Warren (loop connection to merchant plant) | 230 | (Loop) | (Loop) | 1 | Yes | MECS |
| **May 2001** | | | | | | | |
| AEP | Orange / Kammer - Marysville | 765 | (Loop) | (Loop) | 0 | Yes | SW |
| AEP | Orange # 1 | 765-138 | 801 / 960 | 915 / 1050 | ----- | Yes | SW |
| DECO | Bismarck # 1 | 345-120 | 600 / 625 | 600 / 625 | ----- | Yes | MECS |
| DECO | Blackfoot / Belle R - Madrid - Pontiac | 345 | (Loop) | (Loop) | 0 | Yes | MECS |
| FE | Highland # 3 | 345-138 | 448 / 490 | 485 / 535 | ----- | No | NE |
| FE | Hoytdale # 2 | 345-138 | 448 / 490 | 485 / 535 | ----- | No | NE |
| **June 2001** | | | | | | | |
| AEP | Baker - Zelda (radial connection to merchant plant) | 345 | 800 / 800 | 800 / 800 | 0.1 | Yes | SW |
| AEP | Keystone / DeSoto-Sorenson # 1 (loop connection to merchant plant) | 345 | (Loop) | (Loop) | 0.4 | Yes | SW |
| AEP | South Canton # 2 (West # 1) | 345-138 | 786 / 888 | 876 / 966 | ----- | Yes | SW |
| AEP | TriState # 3 (operated normally open) | 345-138 | 500 / 550 | 560 / 600 | ----- | Yes | SW |
| CIN - DPL | Foster - Bath | 345 | 1258 / 1556 | 1258 / 1556 | 40 | Yes | SW |
| CONS | Oneida / Battle Creek - Majestic | 345 | (Loop) | (Loop) | 20 | Yes | MECS |
| DPL - AEP | Adkins / Atlanta - Beatty (loop connection to merchant plant) | 345 | (Loop) | (Loop) | 0 | Yes | SW |
| **August 2001** | | | | | | | |
| HONI | Lambton (L4D) PAR | 230-230 | 845 / 1170 | 845 / 1170 | ----- | Yes | MECS |
| **December 2001** | | | | | | | |
| AEP | Meridian / Sorenson - Twin Branch | 345 | (Loop) | (Loop) | 0 | No | SW |
| AEP | Meridian - Whitely (radial connection to industrial load) | 345 | 200 / 200 | 200 / 200 | 7 | No | SW |

# TABLE B-2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Transmission Additions, Removals, and Modifications (230 kV and Above)

Date: 04/17/01

***January 2000 through December 2001***



### Transmission Additions (Continued)

| System | Transmission Facility | Voltage (kV) | Summer N/E (MVA) | Winter N/E (MVA) | Line Mileage | Modeled in Base Case | Study Area |
|---|---|---|---|---|---|---|---|
| **December 2001 (Continued)** | | | | | | | |
| AP | South Bend / Yukon - Keystone (loop connection to merchant plant) | 500 | (Loop) | (Loop) | 0.1 | No | NE |

### Transmission Removals

| System | Transmission Facility | Voltage (kV) | Summer N/E (MVA) | Winter N/E (MVA) | Line Mileage | Modeled in Base Case | Study Area |
|---|---|---|---|---|---|---|---|

None

### Transmission Modifications

| System | Transmission Facility | Voltage (kV) | Summer N/E (MVA) | Winter N/E (MVA) | Line Mileage | Modeled in Base Case | Study Area |
|---|---|---|---|---|---|---|---|
| **May 2000** | | | | | | | |
| DECO | Belle River - Greenwood - Pontiac (re-terminate bypassing Jewell) | 345 | ----- | ----- | ----- | Yes | MECS |
| **June 2000** | | | | | | | |
| AEP | Cloverdale # 3 (replacement with higher capability bank) | 345-138 | 722 / 817 | 803 / 884 | ----- | Yes | SW |
| OVEC | Sargents # 1 (replacement with higher capability bank) | 345-138 | 322 / 368 | 368 / 411 | ----- | Yes | SW |
| **September 2000** | | | | | | | |
| OVEC | Clifty Creek # 1A (replacement with higher capability bank) | 345-138 | 169 / 193 | 193 / 214 | ----- | Yes | SW |
| **December 2000** | | | | | | | |
| AEP | Cloverdale # 1B (replacement with higher capability bank) | 345-138 | 550 / 600 | 550 / 600 | ----- | Yes | SW |
| FE | Star # 2 (replacement with higher capability bank) | 345-138 | 448 / 490 | 485 / 535 | ----- | Yes | NE |
| **January 2001** | | | | | | | |
| AEP | Sporn B # 4 (replacement with similar capability bank) | 345-138 | 550 / 600 | 550 / 600 | ----- | Yes | SW |

# TABLE B-2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Transmission Additions, Removals, and Modifications (230 kV and Above)

Date: 04/17/01

***January 2000 through December 2001***



| Transmission Modifications (Continued) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **System** | **Transmission Facility** | **Voltage (kV)** | **Summer N/E (MVA)** | **Winter N/E (MVA)** | **Line Mileage** | **Modeled in Base Case** | **Study Area** |
| **April 2001** | | | | | | | |
| DPL | Clinton # 1<br>(replacement with higher capability bank) | 345-69 | 250 / 275 | 250 / 275 | ----- | Yes | SW |
| **June 2001** | | | | | | | |
| AEP | Bixby # 1<br>(replacement with higher capability bank) | 345-138 | 717 / 754 | 717 / 933 | ----- | Yes | SW |
| **December 2001** | | | | | | | |
| FE - AP | Maple - Krendale - Butler 138 kV<br>(increase circuit capacity) | 138 | 308 / 364 | 374 / 480 | 13.0 | No | NE |

# TABLE B-3
## ECAR 2001 Summer Assessment of Transmission System Performance
## Abnormal System Conditions (Generation 200 MW and Above - Transmission 230 kV and Above)

Date: 04/17/01

***January 2000 through December 2001***



### Abnormal Generation Conditions

| System | Generating Unit Name/Number | NDC (MW) | Summer NSC (MW) | Winter NSC (MW) | Date Out | Date Back | Reason | Modeled in Base Case | Study Area |
|---|---|---|---|---|---|---|---|---|---|
| AEP | Cook 1 | 1020 | 1000 | 1020 | 09/08/97 | 12/21/00 | Forced | In Service | SW |
| AEP | Cook 2 | 1090 | 1060 | 1090 | 09/08/97 | 07/04/00 | Forced | In Service | SW |

### Abnormal Transmission Conditions

| System | Transmission Facility | Voltage (kV) | Summer N/E (MVA) | Winter N/E (MVA) | Date Out | Date Back | Reason | Modeled in Base Case | Study Area |
|---|---|---|---|---|---|---|---|---|---|
| CIN | Terminal # 11 | 345-138 | 400 / 400 | 400 / 400 | 10/23/98 | 06/01/01 | Forced | Outaged | SW |
| HE | Worthington # 1 | 345-138 | 300 / 450 | 300 / 450 | 06/01/00<br>06/01/01 | 08/31/00<br>08/31/01 | Procedure | Outaged | SW |
| LGEE | Blue Lick # 1 | 345-138 | 448 / 515 | 448 / 515 | 01/03/00 | 06/01/01 | Forced | In Service | SW |

# APPENDIX C

## Comparison of Data Reported in Primary Base Cases

Table C-1 provides a means of comparing the area generation and load levels represented in the primary base cases used in this and previous seasonal transmission assessments. In addition, for each ECAR company represented in the primary base case used for this seasonal assessment, load power factors, losses, scheduled interchange (where positive quantities represent exports and negative quantities represent imports), bus and line shunts (where positive quantities represent capacitive sources and negative quantities represent reactive sinks), and line charging (where positive quantities represent capacitive sources) are tabulated.

Date: 04/17/01

# Table C-1
## ECAR 2001 Summer Assessment of Transmission System Performance
## Comparison of Data Reported in Primary Base Cases (E100)



| | COMPARISON OF SEASONAL GENERATION (MW) | | | COMPARISON OF SEASONAL BUS LOADS (MW) | | | BUS LOADS | | AREA LOSSES | | INTERCHANGE | | BUS SHUNTS | LINE SHUNTS | LINE CHARGE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AREA | 2001S | 2000S | DELTA | 2001S | 2000S | DELTA | (MVAR) | (P.F.) | (MW) | (MVAR) | (MW) | (MVAR) | (MVAR) | (MVAR) | (MVAR) |
| AEP | 24275 | 22837 | 1438 | 23013 | 22696 | 317 | 4666 | 0.9795 | 657 | 7745 | 605 | 256 | 4890 | -5852 | 12732 |
| AP | 7322 | 7439 | -117 | 7828 | 7671 | 157 | 2422 | 0.9525 | 166 | 3216 | -671 | -381 | 2000 | 0 | 1708 |
| BREC | 1455 | 1526 | -71 | 1539 | 1544 | -5 | 703 | 0.8975 | 6 | 59 | -90 | -31 | 293 | 0 | 109 |
| CIN | 11918 | 12651 | -733 | 11335 | 11727 | -392 | 1848 | 0.9867 | 354 | 4583 | 161 | -1035 | 297 | 0 | 1640 |
| CONS | 9262 | 8783 | 479 | 8889 | 8431 | 458 | 1654 | 0.9827 | 216 | 2494 | 157 | 155 | 527 | 224 | 1767 |
| DECO | 10934 | 10589 | 345 | 11185 | 11100 | 85 | 2522 | 0.9747 | 214 | 3092 | -465 | 213 | 918 | 0 | 1628 |
| DLCO | 2979 | 2959 | 20 | 2639 | 2693 | -54 | 815 | 0.9527 | 21 | 268 | 319 | 92 | 242 | 0 | 466 |
| DPL | 3446 | 3467 | -21 | 3261 | 3236 | 25 | 677 | 0.9785 | 100 | 1167 | 84 | 413 | 1416 | 0 | 391 |
| EKPC | 1829 | 1712 | 117 | 1683 | 1591 | 92 | 636 | 0.9294 | 64 | 490 | 80 | 47 | 429 | -10 | 194 |
| ENWC | 110 | 0 | 110 | 0 | 0 | 0 | 0 | ----- | 0 | 5 | 110 | -1 | 0 | 0 | 0 |
| ENWI | 110 | 0 | 110 | 0 | 0 | 0 | 0 | ----- | 0 | 5 | 110 | -2 | 0 | 0 | 0 |
| FE | 11579 | 11352 | 227 | 13130 | 12922 | 208 | 4163 | 0.9502 | 308 | 3172 | -1859 | -436 | 2611 | 0 | 1513 |
| HE | 1395 | 1418 | -23 | 484 | 515 | -31 | 143 | 0.9567 | 25 | 187 | 886 | -43 | 0 | 0 | 125 |
| IPL | 3232 | 3497 | -265 | 3160 | 3021 | 139 | 427 | 0.9909 | 67 | 999 | 0 | -147 | 99 | -29 | 318 |
| LGEE | 6681 | 6394 | 287 | 7112 | 6813 | 299 | 1910 | 0.9642 | 151 | 1267 | -589 | 106 | 336 | 38 | 846 |
| NIPS | 2872 | 3233 | -361 | 3211 | 3344 | -133 | 1478 | 0.8959 | 37 | 395 | -376 | -215 | 160 | 0 | 313 |
| OVEC | 2001 | 2161 | -160 | 600 | 600 | 0 | 285 | 0.8893 | 12 | 162 | 1389 | -83 | 0 | 0 | 536 |
| SIGE | 1667 | 1723 | -56 | 1714 | 1771 | -57 | 520 | 0.9543 | 23 | 287 | -70 | -61 | 143 | 0 | 24 |
| **ECAR** | **103067** | **101741** | **1326** | **100783** | **99675** | **1108** | **24869** | **0.9697** | **2421** | **29593** | **-219** | **-1153** | **14361** | **-5629** | **24310** |

# APPENDIX D

## Scheduled Interchange

Table D-1 lists the firm and non-firm transactions represented in the ECAR primary base case (E100) used for this seasonal transmission assessment. As many of the schedules shown are dependent on the availability of sufficient transmission capacity and the relative generation costs of the parties involved, the actual interchanges scheduled at any given time during the period covered by this seasonal assessment may be substantially different.

Imbedded in the company-to-company scheduled interchange documented in Table D-1 are some virtual transactions which were modeled to facilitate the development of the ECAR primary base case (E100) used for this transmission assessment. Due to uncertainties associated with actual sources of power needed to meet some of the power requirements within ECAR at the time the primary base case was developed, these virtual transactions were modeled to reflect the exchange of power between those ECAR areas with available generation resources in the primary base case and those ECAR areas in need of generation resources in the primary base case. This power exchange ensured that none of the ECAR areas reduced their modeled load from forecasted peak levels. Table D-2 documents all of the non-firm and virtual transactions modeled in the primary base case used for this seasonal transmission assessment.

ECAR 2001 SUMMER ASSESSMENT OF TRANSMISSION SYSTEM PERFORMANCE
SCHEDULED INTERCHANGE FOR PRIMARY BASE CASE (E100)

| REGION | FROM | TO | 2001S |
|---|---|---|---|
| MAAC | PJM500 | ** | 10762 |
| | PJM500 | NYISO | -94 |
| | PJM500 | TOTALS | 10668 |
| MAAC | PENELEC | ** | 370 |
| | PENELEC | FE | 332 |
| | PENELEC | NYISO | 486 |
| | PENELEC | TOTALS | 1188 |
| MAAC | METED | ** | 57 |
| | METED | TOTALS | 57 |
| MAAC | JCP&L | ** | -2129 |
| | JCP&L | TOTALS | -2129 |
| MAAC | PP&L | ** | 1559 |
| | PP&L | TOTALS | 1559 |
| MAAC | PECO | ** | -2258 |
| | PECO | CPLE | 300 |
| | PECO | HE | -400 |
| | PECO | DLCO | -100 |
| | PECO | TOTALS | -2458 |
| MAAC | PSE&G | ** | -3535 |
| | PSE&G | TOTALS | -3535 |
| MAAC | BG&E | ** | -3296 |
| | BG&E | TOTALS | -3296 |
| MAAC | PEPCO | ** | -285 |
| | PEPCO | FE | -450 |
| | PEPCO | TOTALS | -735 |
| MAAC | AE | ** | -565 |
| | AE | TOTALS | -565 |
| MAAC | DP&L | ** | -680 |
| | DP&L | TOTALS | -680 |

| REGION | FROM | TO | 2001S |
|---|---|---|---|
| MAAC | MAAC | TOTALS | 74 |
| SERC | CPLE | PECO | -300 |
| | CPLE | DUKE | -3 |
| | CPLE | VP | 41 |
| | CPLE | EQ-SERC | 341 |
| | CPLE | AEP | -275 |
| | CPLE | EQ-FRCC | -50 |
| | CPLE | TOTALS | -246 |
| SERC | CPLW | TVA | -14 |
| | CPLW | AEP | -180 |
| | CPLW | TOTALS | -194 |
| SERC | DUKE | CPLE | 3 |
| | DUKE | EQ-SERC | -438 |
| | DUKE | CIN | -58 |
| | DUKE | TOTALS | -493 |
| SERC | VP | CPLE | -41 |
| | VP | AP | 560 |
| | VP | AEP | -17 |
| | VP | TOTALS | 502 |
| SERC | TVA | CPLW | 14 |
| | TVA | DOE | 164 |
| | TVA | EES | 674 |
| | TVA | EQ-SERC | 350 |
| | TVA | CIN | -107 |
| | TVA | LGEE | 126 |
| | TVA | BREC | 190 |
| | TVA | EKPC | 118 |
| | TVA | SIPC | 28 |
| | TVA | TOTALS | 1557 |
| SERC | DOE | TVA | -164 |
| | DOE | ENNA | -136 |
| | DOE | EEI | -150 |
| | DOE | TOTALS | -450 |

| REGION | FROM | TO | 2001S |
|---|---|---|---|
| SERC | EES | TVA | -674 |
| | EES | EQ-SERC | -23 |
| | EES | AMRN | 160 |
| | EES | EQ-SPP | 460 |
| | EES | TOTALS | -77 |
| SERC | ENNA | DOE | 136 |
| | ENNA | TOTALS | 136 |
| SERC | EQ-SERC | CPLE | -341 |
| | EQ-SERC | DUKE | 438 |
| | EQ-SERC | TVA | -350 |
| | EQ-SERC | EES | 23 |
| | EQ-SERC | BREC | -100 |
| | EQ-SERC | AMRN | 34 |
| | EQ-SERC | EQ-FRCC | 2273 |
| | EQ-SERC | EQ-SPP | -295 |
| | EQ-SERC | EQ-MAPP | 95 |
| | EQ-SERC | TOTALS | 1777 |
| SERC | SERC | TOTALS | 2512 |
| ECAR | AP | VP | -560 |
| | AP | FE | 194 |
| | AP | AEP | -16 |
| | AP | OVEC | -169 |
| | AP | DLCO | -120 |
| | AP | TOTALS | -671 |
| ECAR | FE | PENELEC | -332 |
| | FE | PEPCO | 450 |
| | FE | AP | -194 |
| | FE | AEP | -774 |
| | FE | OVEC | -316 |
| | FE | DLCO | -322 |
| | FE | CONS | -312 |
| | FE | NYISO | -59 |
| | FE | TOTALS | -1859 |

ECAR 2001 SUMMER ASSESSMENT OF TRANSMISSION SYSTEM PERFORMANCE
SCHEDULED INTERCHANGE FOR PRIMARY BASE CASE (E100)

| REGION | FROM | TO | 2001S |
|---|---|---|---|
| ECAR | AEP | CPLE | 275 |
| | AEP | CPLW | 180 |
| | AEP | VP | 17 |
| | AEP | AP | 16 |
| | AEP | FE | 774 |
| | AEP | OVEC | -568 |
| | AEP | CIN | -350 |
| | AEP | DPL | -236 |
| | AEP | SIGE | 50 |
| | AEP | LGEE | -66 |
| | AEP | DLCO | 223 |
| | AEP | EKPC | 53 |
| | AEP | EQ-SPP | 250 |
| | AEP | NYISO | -13 |
| | AEP | TOTALS | 605 |
| ECAR | OVEC | AP | 169 |
| | OVEC | FE | 316 |
| | OVEC | AEP | 568 |
| | OVEC | CIN | 122 |
| | OVEC | DPL | 66 |
| | OVEC | SIGE | 20 |
| | OVEC | LGEE | 128 |
| | OVEC | TOTALS | 1389 |
| ECAR | HE | PECO | 400 |
| | HE | CIN | 656 |
| | HE | ENWC | -110 |
| | HE | ENWI | -110 |
| | HE | EKPC | 50 |
| | HE | TOTALS | 886 |
| ECAR | CIN | DUKE | 58 |
| | CIN | TVA | 107 |
| | CIN | AEP | 350 |
| | CIN | OVEC | -122 |
| | CIN | HE | -656 |
| | CIN | DPL | 81 |
| | CIN | LGEE | -79 |
| | CIN | NIPS | 376 |
| | CIN | EKPC | -38 |
| | CIN | AMRN | -40 |
| | CIN | IP | 129 |
| | CIN | NYISO | -5 |
| | CIN | TOTALS | 161 |
| ECAR | DPL | AEP | 236 |
| | DPL | OVEC | -66 |
| | DPL | CIN | -81 |
| | DPL | NYISO | -5 |
| | DPL | TOTALS | 84 |
| ECAR | SIGE | AEP | -50 |
| | SIGE | OVEC | -20 |
| | SIGE | TOTALS | -70 |
| ECAR | LGEE | TVA | -126 |
| | LGEE | AEP | 66 |
| | LGEE | OVEC | -128 |
| | LGEE | CIN | 79 |
| | LGEE | EKPC | -263 |
| | LGEE | EEI | -217 |
| | LGEE | TOTALS | -589 |
| ECAR | BREC | TVA | -190 |
| | BREC | EQ-SERC | 100 |
| | BREC | TOTALS | -90 |
| ECAR | DLCO | PECO | 100 |
| | DLCO | AP | 120 |
| | DLCO | FE | 322 |
| | DLCO | AEP | -223 |
| | DLCO | TOTALS | 319 |
| ECAR | NIPS | CIN | -376 |
| | NIPS | TOTALS | -376 |
| ECAR | CONS | FE | 312 |
| | CONS | DECO | 165 |
| | CONS | WEC | -20 |
| | CONS | IMO | -300 |
| | CONS | TOTALS | 157 |
| ECAR | DECO | CONS | -165 |
| | DECO | IMO | -300 |
| | DECO | TOTALS | -465 |
| ECAR | EKPC | TVA | -118 |
| | EKPC | AEP | -53 |
| | EKPC | HE | -50 |
| | EKPC | CIN | 38 |
| | EKPC | LGEE | 263 |
| | EKPC | TOTALS | 80 |
| ECAR | ENWC | HE | 110 |
| | ENWC | TOTALS | 110 |
| ECAR | ENWI | HE | 110 |
| | ENWI | TOTALS | 110 |
| ECAR | ECAR | TOTALS | -219 |
| MAIN | ENLC | CE | 600 |
| | ENLC | TOTALS | 600 |
| MAIN | AMRN | EES | -160 |
| | AMRN | EQ-SERC | -34 |
| | AMRN | CIN | 40 |
| | AMRN | CE | 30 |
| | AMRN | EQ-MAIN | 180 |
| | AMRN | IP | 41 |
| | AMRN | EEI | -720 |
| | AMRN | EQ-SPP | -16 |
| | AMRN | TOTALS | -639 |
| MAIN | IP | CIN | -129 |
| | IP | AMRN | -41 |
| | IP | SIPC | -20 |
| | IP | EEI | -164 |
| | IP | CE | 65 |
| | IP | TOTALS | -289 |
| MAIN | SIPC | TVA | -28 |
| | SIPC | IP | 20 |
| | SIPC | TOTALS | -8 |

ECAR 2001 SUMMER ASSESSMENT OF TRANSMISSION SYSTEM PERFORMANCE
SCHEDULED INTERCHANGE FOR PRIMARY BASE CASE (E100)

| REGION | FROM | TO | 2001S |
|---|---|---|---|
| MAIN | EEI | DOE | 150 |
| | EEI | LGEE | 217 |
| | EEI | AMRN | 720 |
| | EEI | IP | 164 |
| | EEI | TOTALS | 1251 |
| MAIN | CE | ENLC | -600 |
| | CE | AMRN | -30 |
| | CE | IP | -65 |
| | CE | ALTE | 185 |
| | CE | WEC | 25 |
| | CE | MGE | 15 |
| | CE | EQ-MAPP | 634 |
| | CE | TOTALS | 164 |
| MAIN | ALTE | CE | -185 |
| | ALTE | WEC | 276 |
| | ALTE | WPS | 219 |
| | ALTE | MGE | 225 |
| | ALTE | EQ-MAPP | -346 |
| | ALTE | TOTALS | 189 |
| MAIN | WEC | CONS | 20 |
| | WEC | CE | -25 |
| | WEC | ALTE | -276 |
| | WEC | EQ-MAPP | -62 |
| | WEC | TOTALS | -343 |
| MAIN | WPS | ALTE | -219 |
| | WPS | MGE | 100 |
| | WPS | UPP | 95 |
| | WPS | EQ-MAPP | -176 |
| | WPS | TOTALS | -200 |
| MAIN | MGE | CE | -15 |
| | MGE | ALTE | -225 |
| | MGE | WPS | -100 |
| | MGE | TOTALS | -340 |
| MAIN | UPP | WPS | -95 |
| | UPP | TOTALS | -95 |
| MAIN | MAIN | TOTALS | 11 |
| FRCC | EQ-FRCC | CPLE | 50 |
| | EQ-FRCC | EQ-SERC | -2273 |
| | EQ-FRCC | TOTALS | -2223 |
| FRCC | FRCC | TOTALS | -2223 |
| SPP | EQ-SPP | EES | -460 |
| | EQ-SPP | EQ-SERC | 295 |
| | EQ-SPP | AEP | -250 |
| | EQ-SPP | AMRN | 16 |
| | EQ-SPP | EQ-MAIN | 99 |
| | EQ-SPP | EQ-MAPP | 117 |
| | EQ-SPP | TOTALS | -183 |
| SPP | SPP | TOTALS | -183 |
| MAPP | EQ-MAPP | EQ-SERC | -95 |
| | EQ-MAPP | CE | -634 |
| | EQ-MAPP | ALTE | 346 |
| | EQ-MAPP | WEC | 62 |
| | EQ-MAPP | WPS | 176 |
| | EQ-MAPP | EQ-SPP | -117 |
| | EQ-MAPP | IMO | 200 |
| | EQ-MAPP | TOTALS | -62 |
| MAPP | MAPP | TOTALS | -62 |
| MAIN | EQ-MAIN | AMRN | -180 |
| | EQ-MAIN | EQ-SPP | -99 |
| | EQ-MAIN | TOTALS | -279 |
| NPCC | NYISO | PJM500 | 94 |
| | NYISO | PENELEC | -486 |
| | NYISO | FE | 59 |
| | NYISO | AEP | 13 |
| | NYISO | CIN | 5 |
| | NYISO | DPL | 5 |
| | NYISO | EQ-NPCC | -719 |
| | NYISO | TOTALS | -1029 |
| NPCC | IMO | CONS | 300 |
| | IMO | DECO | 300 |
| | IMO | EQ-MAPP | -200 |
| | IMO | TOTALS | 400 |
| NPCC | EQ-NPCC | NYISO | 719 |
| | EQ-NPCC | TOTALS | 719 |
| NPCC | NPCC | TOTALS | 90 |

SUMMATION 0

** -- FREE FLOW OF POWER WITHIN REGION.

ECAR 2001 SUMMER ASSESSMENT OF TRANSMISSION SYSTEM PERFORMANCE

ECAR NON-FIRM/VIRTUAL TRANSACTIONS IN SCHEDULED INTERCHANGE FOR PRIMARY BASE CASE (E100)

| REGION | FROM | TO | 2001S |
|---|---|---|---|
| MAAC | PECO | HE | -400 |
| | PECO | DLCO | -100 |
| | PECO | TOTALS | -500 |
| MAAC | MAAC | TOTALS | -500 |
| ECAR | FE | AEP | -150 |
| | FE | TOTALS | -150 |
| ECAR | AEP | FE | 150 |
| | AEP | SIGE | 50 |
| | AEP | DLCO | 223 |
| | AEP | EKPC | 100 |
| | AEP | TOTALS | 523 |
| ECAR | HE | PECO | 400 |
| | HE | ENWC | -110 |
| | HE | ENWI | -110 |
| | HE | TOTALS | 180 |
| ECAR | SIGE | AEP | -50 |
| | SIGE | TOTALS | -50 |
| ECAR | DLCO | AEP | -223 |
| | DLCO | PECO | 100 |
| | DLCO | TOTALS | -123 |
| ECAR | CONS | IMO | -300 |
| | CONS | TOTALS | -300 |
| ECAR | DECO | IMO | -300 |
| | DECO | TOTALS | -300 |
| ECAR | EKPC | AEP | -100 |
| | EKPC | TOTALS | -100 |
| ECAR | ENWC | HE | 110 |
| | ENWC | TOTALS | 110 |
| ECAR | ENWI | HE | 110 |
| | ENWI | TOTALS | 110 |
| ECAR | ECAR | TOTALS | -100 |
| NPCC | IMO | CONS | 300 |
| | IMO | DECO | 300 |
| | IMO | TOTALS | 600 |
| NPCC | NPCC | TOTALS | 600 |
| SUMMATION | | | 0 |

** -- FREE FLOW OF POWER WITHIN REGION.

# APPENDIX E

## Scheduled Interchange Comparisons

Table E-1 lists the net scheduled interchange for each area modeled in the ECAR primary base case (E100) used for this seasonal transmission assessment. This table also includes a comparison of this season's net scheduled interchange amounts with those modeled in the previous seasonal assessment.

Whereas Table D-1 lists all of the power transfers represented in the ECAR primary base case (E100) used for this seasonal transmission assessment, Table E-2 lists only those power transfers which cross the geographic boundaries between the ECAR Region and its neighboring regions. This facilitates the identification of all inter-regional power transfers modeled in this study involving ECAR. This table also includes a comparison of these power transfers with those represented during the previous seasonal assessment.

# Table E-1
## ECAR 2001 Summer Assessment of Transmission System Performance
## Comparison of Scheduled Interchange in Primary Base Cases (E100)

Date: 04/17/01



| SYSTEM | 2001S | 2000S | DELTA |
|---|---|---|---|
| PJM500 | 10668 | 10636 | 32 |
| PENELEC | 1188 | 1305 | -117 |
| METED | 57 | 207 | -150 |
| JCP&L | -2129 | -2134 | 5 |
| PP&L | 1559 | 988 | 571 |
| PECO | -2458 | -2224 | -234 |
| PSE&G | -3535 | -3607 | 72 |
| BG&E | -3296 | -2771 | -525 |
| PEPCO | -735 | -769 | 34 |
| AE | -565 | -638 | 73 |
| DP&L | -680 | -869 | 189 |
| **MAAC** | **74** | **124** | **-50** |
| CPLE | -246 | -404 | 158 |
| CPLW | -194 | -183 | -11 |
| DUKE | -493 | 144 | -637 |
| VP | 502 | 352 | 150 |
| TVA | 1557 | -27 | 1584 |
| DOE | -450 | -150 | -300 |
| EES | -77 | 0 | -77 |
| ENSE | 0 | 455 | -455 |
| ENCE | 0 | 445 | -445 |
| ENNA | 136 | 300 | -164 |
| ENGL | 0 | 0 | 0 |
| EQ-SERC | 1777 | 1985 | -208 |
| **SERC** | **2512** | **2917** | **-405** |
| AP | -671 | -387 | -284 |
| FE | -1859 | -1815 | -44 |
| AEP | 605 | -543 | 1148 |
| OVEC | 1389 | 1550 | -161 |
| HE | 886 | 870 | 16 |
| CIN | 161 | 489 | -328 |
| DPL | 84 | 120 | -36 |
| SIGE | -70 | -73 | 3 |
| LGEE | -589 | -570 | -19 |
| BREC | -90 | -25 | -65 |
| DLCO | 319 | 244 | 75 |
| IPL | 0 | 400 | -400 |
| NIPS | -376 | -154 | -222 |
| CONS | 157 | 157 | 0 |
| DECO | -465 | -665 | 200 |
| EKPC | 80 | 58 | 22 |
| ENWC | 110 | 0 | 110 |
| ENWI | 110 | 0 | 110 |
| **ECAR** | **-219** | **-344** | **125** |

**Table E-1**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Comparison of Scheduled Interchange in Primary Base Cases (E100)**

Date: 04/17/01



| SYSTEM | 2001S | 2000S | DELTA |
|---|---|---|---|
| ENLC | 600 | 0 | 600 |
| AMRN | -639 | -711 | 72 |
| IP | -289 | -214 | -75 |
| SIPC | -8 | 0 | -8 |
| EEI | 1251 | 1010 | 241 |
| CE | 164 | 173 | -9 |
| ALTE | 189 | 0 | 189 |
| WEC | -343 | 0 | -343 |
| WPS | -200 | 0 | -200 |
| MGE | -340 | 0 | -340 |
| UPP | -95 | 0 | -95 |
| EQ-MAIN | -279 | -846 | 567 |
| **MAIN** | **11** | **-588** | **599** |
| EQ-FRCC | -2223 | -2268 | 45 |
| **FRCC** | **-2223** | **-2268** | **45** |
| EQ-SPP | -183 | -136 | -47 |
| **SPP** | **-183** | **-136** | **-47** |
| EQ-MAPP | -62 | 255 | -317 |
| **MAPP** | **-62** | **255** | **-317** |
| NYISO | -1029 | -1584 | 555 |
| IMO | 400 | -400 | 800 |
| EQ-NPCC | 719 | 2024 | -1305 |
| **NPCC** | **90** | **40** | **50** |
| | | | |
| **TOTAL** | **0** | **0** | **0** |

# Table E-2

## ECAR 2001 Summer Assessment of Transmission System Performance

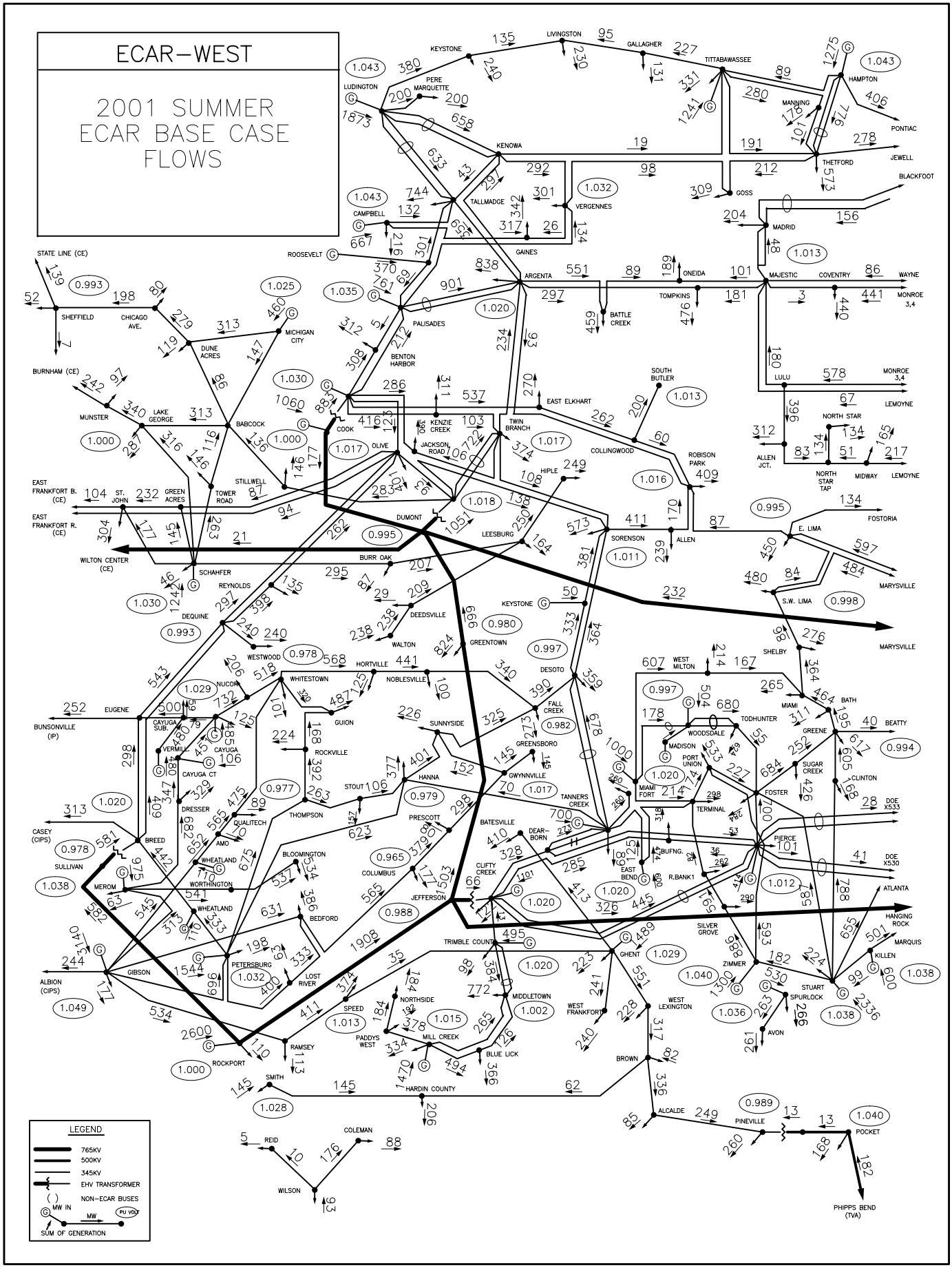
### Comparison of Scheduled Interchange Between ECAR and Non-ECAR Systems

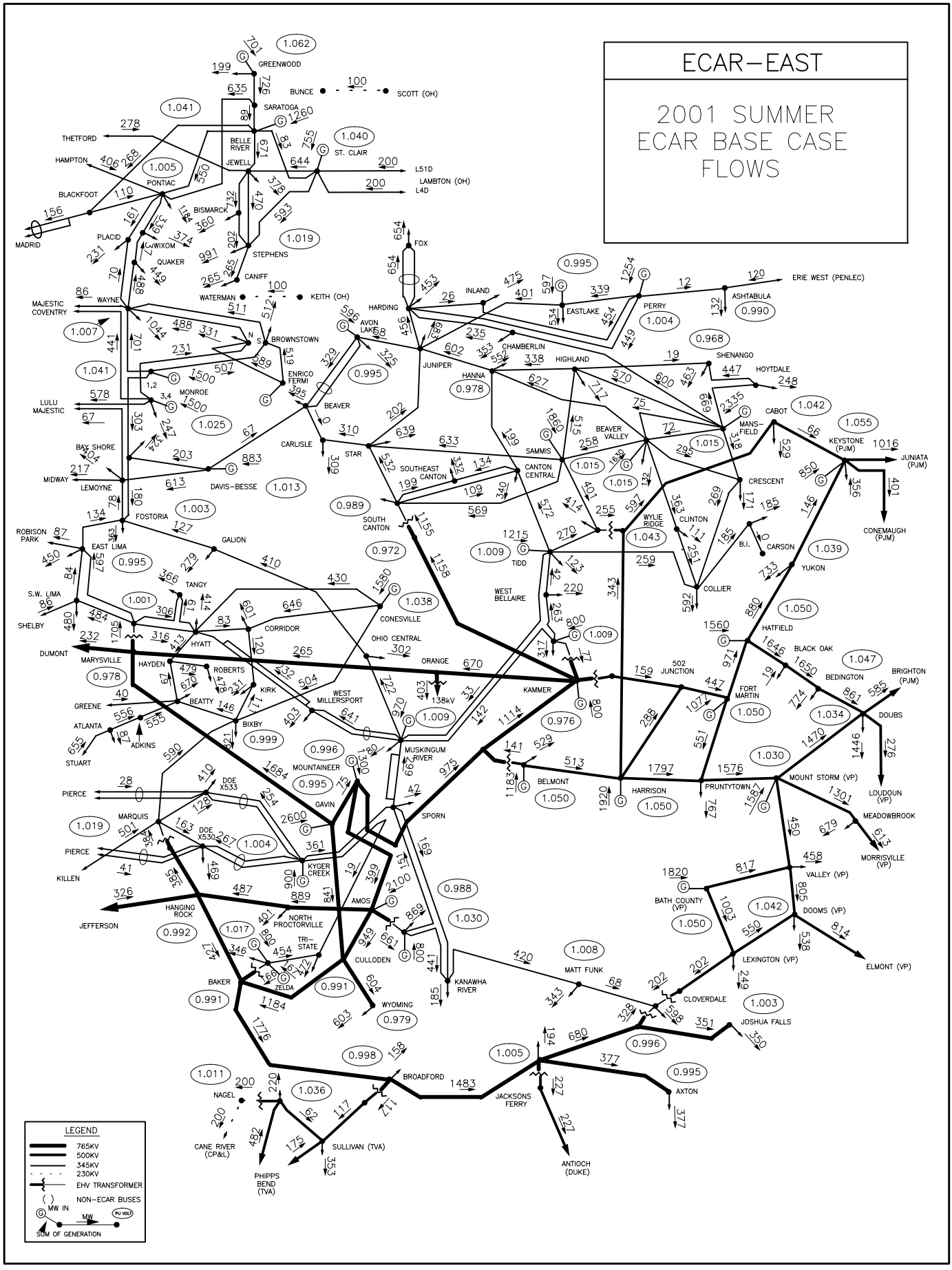
| REGION | FROM SYSTEM | TO SYSTEM | TYPE OF TRANSACTION | 2001S | 2000S | DELTA |
|---|---|---|---|---|---|---|
| **MAAC** | FE | PENELEC | Seneca | -352 | -352 | 0 |
| | FE | PENELEC | Wellsboro | 20 | 20 | 0 |
| | FE | PEPCO | Firm Sale | 450 | 450 | 0 |
| | HE | PECO | Interchange | 400 | 400 | 0 |
| | DLCO | PECO | Interchange | 100 | 100 | 0 |
| | | | **Total MAAC** | **618** | **618** | **0** |
| **SERC** | AP | VP | Bath County | -560 | -560 | 0 |
| | AP | VP | Diversity | 0 | 150 | -150 |
| | AEP | CPL | NCEMC | 205 | 205 | 0 |
| | AEP | CPL | Rockport | 250 | 250 | 0 |
| | AEP | VP | Miscellaneous | 17 | 17 | 0 |
| | CIN | DUKE | Greenwood | 58 | 59 | -1 |
| | DECO | DUKE | Interchange | 0 | -200 | 200 |
| | | | Subtotal | -30 | -79 | 49 |
| | CIN | TVA | Bristol | 107 | 104 | 3 |
| | LGEE | TVA | Interchange | -126 | -125 | -1 |
| | BREC | TVA | Oglethorpe | 100 | 100 | 0 |
| | BREC | TVA | SEPA | -190 | -190 | 0 |
| | EKPC | TVA | Peaking | 0 | -100 | 100 |
| | EKPC | TVA | SEPA | -100 | -100 | 0 |
| | EKPC | TVA | TVA Load | -18 | -20 | 2 |
| | | | Subtotal | -227 | -331 | 104 |
| | | | **Total SERC** | **-257** | **-410** | **153** |
| **MAIN** | CIN | AMRN | Edgar | 17 | 15 | 2 |
| | CIN | AMRN | SWEC | 8 | 8 | 0 |
| | CIN | AMRN | WVPA | -65 | -65 | 0 |
| | CIN | IP | IMEA | 60 | 60 | 0 |
| | CIN | IP | SWEC | 69 | 62 | 7 |
| | CONS | WEC | Edison Sault | -20 | 0 | -20 |
| | LGEE | EEI | Interchange | -217 | -200 | -17 |
| | | | **Total MAIN** | **-148** | **-120** | **-28** |
| **SPP** | AEP | CESW | Interchange | 250 | 250 | 0 |
| | | | **Total SPP** | **250** | **250** | **0** |
| **NPCC** | FE | NYISO | AMPO-NYPA | -59 | -59 | 0 |
| | AEP | NYISO | AMPO-NYPA | -13 | -13 | 0 |
| | CIN | NYISO | AMPO-NYPA | -5 | -5 | 0 |
| | DPL | NYISO | AMPO-NYPA | -5 | -5 | 0 |
| | | | Subtotal | -82 | -82 | 0 |
| | CONS | IMO | Interchange | -300 | -300 | 0 |
| | DECO | IMO | Interchange | -300 | -300 | 0 |
| | | | Subtotal | -600 | -600 | 0 |
| | | | **Total NPCC** | **-682** | **-682** | **0** |
| **TOTAL** | **ECAR** | **NON-ECAR** | **GRAND TOTAL** | **-219** | **-344** | **125** |

# APPENDIX F

## Transcription Diagrams

This section of the Appendix includes flow and rating transcription diagrams of the ECAR bulk transmission network as modeled in the primary base case (E100) used for this seasonal assessment. It should be noted that actual power flows may significantly vary in the day-to-day operation of the ECAR system from those represented in this base case model. Similarly, this base case model may differ from other base case models developed and used in other regional and inter-regional studies. The ECAR primary base case and the transcription diagrams, reflect the generation and transmission conditions documented in Appendix B.


ECAR–WEST
2001 SUMMER
ECAR BASE CASE
FLOWS
KEYSTONE
LIVINGSTON
GALLAGHER
TITTABAWASSEE
HAMPTON
LUDINGTON
PERE MARQUETTE
MANNING
PONTIAC
KENOWA
THETFORD
JEWELL
BLACKFOOT
TALLMADGE
VERGENNES
GOSS
CAMPBELL
MADRID
GAINES
ROOSEVELT
STATE LINE (CE)
ARGENTA
ONEIDA
MAJESTIC
COVENTRY
WAYNE
SHEFFIELD
CHICAGO AVE.
DUNE ACRES
MICHIGAN CITY
PALISADES
TOMPKINS
BATTLE CREEK
MONROE 3,4
BENTON HARBOR
BURNHAM (CE)
SOUTH BUTLER
LULU
LEMOYNE
MUNSTER
LAKE GEORGE
BABCOCK
COOK
EAST ELKHART
KENZIE CREEK
TWIN BRANCH
NORTH STAR
OLIVE
JACKSON ROAD
COLLINGWOOD
ROBISON PARK
ALLEN JCT.
NORTH STAR TAP
MIDWAY
EAST FRANKFORT B. (CE)
ST. JOHN
GREEN ACRES
TOWER ROAD
STILLWELL
HIPLE
EAST FRANKFORT R. (CE)
DUMONT
LEESBURG
SORENSON
ALLEN
E. LIMA
FOSTORIA
WILTON CENTER (CE)
SCHAHFER
BURR OAK
REYNOLDS
DEQUINE
DEEDSVILLE
KEYSTONE
S.W. LIMA
MARYSVILLE
WALTON
GREENTOWN
SHELBY
WESTWOOD
HORTVILLE
NOBLESVILLE
DESOTO
WEST MILTON
BATH
EUGENE
WHITESTOWN
NUCOR
GUION
SUNNYSIDE
FALL CREEK
TODHUNTER
MIAMI
BEATTY
BUNSONVILLE (IP)
CAYUGA SUB.
VERMILL
CAYUGA
CAYUGA CT
ROCKVILLE
GREENSBORO
WOODSDALE
GREENE
MADISON
PORT UNION
SUGAR CREEK
CLINTON
STOUT
HANNA
GWYNNVILLE
MIAMI FORT
FOSTER
TERMINAL
DOE X533
DRESSER
THOMPSON
QUALITECH
PRESCOTT
TANNERS CREEK
CASEY (CIPS)
BREED
AMO
BATESVILLE
DEAR-BORN
BUFNG.
PIERCE
DOE X530
SULLIVAN
WHEATLAND
BLOOMINGTON
CLIFTY CREEK
EAST BEND
R.BANK1
MEROM
WORTHINGTON
COLUMBUS
JEFFERSON
ATLANTA
WHEATLAND
BEDFORD
SILVER GROVE
HANGING ROCK
TRIMBLE COUNTY
GHENT
ZIMMER
MARQUIS
PETERSBURG
LOST RIVER
KILLEN
ALBION (CIPS)
GIBSON
SPEED
NORTHSIDE
MIDDLETOWN
WEST FRANKFORT
WEST LEXINGTON
STUART
SPURLOCK
PADDYS WEST
MILL CREEK
BLUE LICK
AVON
RAMSEY
BROWN
ROCKPORT
SMITH
HARDIN COUNTY
ALCALDE
PINEVILLE
POCKET
COLEMAN
REID
WILSON
PHIPPS BEND (TVA)
LEGEND
765KV
500KV
345KV
EHV TRANSFORMER
NON–ECAR BUSES
MW IN
MW
PU VOLT
SUM OF GENERATION


ECAR–EAST
2001 SUMMER
ECAR BASE CASE
FLOWS
GREENWOOD
BUNCE
SCOTT (OH)
SARATOGA
THETFORD
BELLE RIVER
ST. CLAIR
HAMPTON
JEWELL
L51D
LAMBTON (OH)
L4D
PONTIAC
BLACKFOOT
BISMARCK
MADRID
PLACID
C.W/IXOM
QUAKER
STEPHENS
CANIFF
WATERMAN
KEITH (OH)
FOX
HARDING
AVON LAKE
INLAND
EASTLAKE
PERRY
ERIE WEST (PENLEC)
ASHTABULA
MAJESTIC
COVENTRY
WAYNE
BROWNSTOWN
ENRICO FERMI
JUNIPER
CHAMBERLIN
HIGHLAND
SHENANGO
HOYTDALE
LULU
MAJESTIC
MONROE
BEAVER
HANNA
CABOT
MANS–FIELD
KEYSTONE (PJM)
JUNIATA (PJM)
BAY SHORE
CARLISLE
STAR
SAMMIS
BEAVER VALLEY
CRESCENT
MIDWAY
LEMOYNE
DAVIS–BESSE
SOUTHEAST CANTON
CANTON CENTRAL
WYLIE RIDGE
CLINTON
CONEMAUGH (PJM)
ROBISON PARK
FOSTORIA
SOUTH CANTON
TIDD
CARSON
YUKON
EAST LIMA
GALION
S.W. LIMA
TANGY
CONESVILLE
WEST BELLAIRE
COLLIER
SHELBY
CORRIDOR
OHIO CENTRAL
HATFIELD
DUMONT
MARYSVILLE
HYATT
ORANGE
502 JUNCTION
BLACK OAK
BRIGHTON (PJM)
HAYDEN
ROBERTS
KIRK
WEST MILLERSPORT
KAMMER
FORT MARTIN
BEDINGTON
GREENE
BEATTY
ATLANTA
ADKINS
BIXBY
MUSKINGUM RIVER
DOUBS
STUART
MOUNTAINEER
BELMONT
HARRISON
PRUNTYTOWN
MOUNT STORM (VP)
LOUDOUN (VP)
PIERCE
DOE X533
GAVIN
SPORN
MARQUIS
MEADOWBROOK
DOE X530
KYGER CREEK
MORRISVILLE (VP)
KILLEN
VALLEY (VP)
BATH COUNTY (VP)
HANGING ROCK
AMOS
DOOMS (VP)
JEFFERSON
NORTH PROCTORVILLE
TRI–STATE
CULLODEN
LEXINGTON (VP)
ELMONT (VP)
BAKER
ZELDA
KANAWHA RIVER
MATT FUNK
CLOVERDALE
JOSHUA FALLS
WYOMING
BROADFORD
JACKSONS FERRY
AXTON
NAGEL
SULLIVAN (TVA)
CANE RIVER (CP&L)
PHIPPS BEND (TVA)
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765KV
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MW IN
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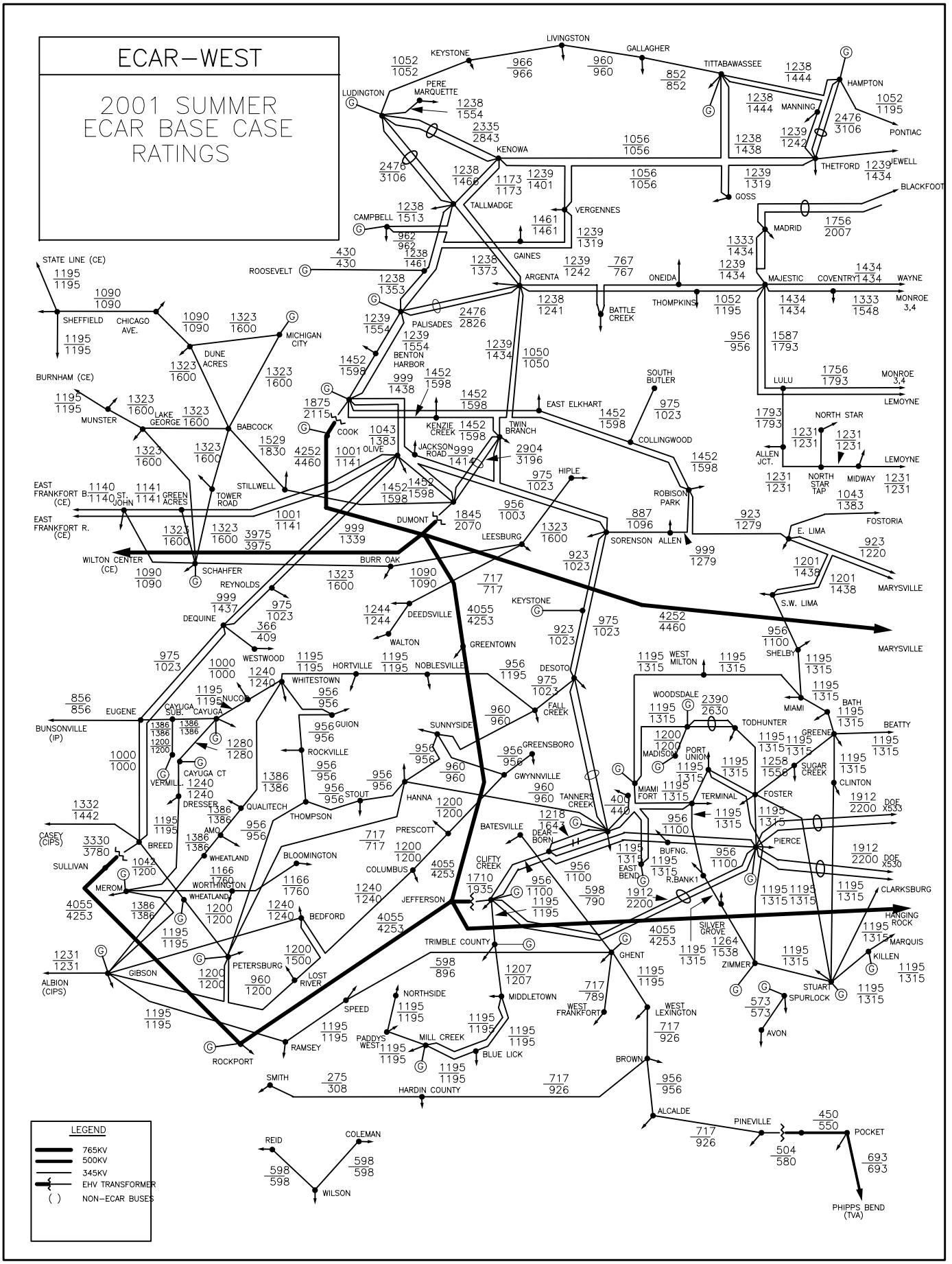
PU VOLT
SUM OF GENERATION


ECAR–WEST
2001 SUMMER
ECAR BASE CASE
RATINGS
LIVINGSTON
KEYSTONE
GALLAGHER
TITTABAWASSEE
HAMPTON
LUDINGTON
PERE MARQUETTE
MANNING
PONTIAC
KENOWA
THETFORD
JEWELL
GOSS
BLACKFOOT
CAMPBELL
TALLMADGE
VERGENNES
MADRID
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MONROE 3,4
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BURNHAM (CE)
SOUTH BUTLER
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LAKE GEORGE
BABCOCK
COOK
KENZIE CREEK
TWIN BRANCH
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SCHAHFER
BURR OAK
REYNOLDS
DEQUINE
DEEDSVILLE
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WALTON
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SHELBY
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HORTVILLE
NOBLESVILLE
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WHITESTOWN
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NUCOR
CAYUGA SUB.
CAYUGA
FALL CREEK
TODHUNTER
BEATTY
BUNSONVILLE (IP)
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SUNNYSIDE
GREENSBORO
GREENE
ROCKVILLE
GWYNNVILLE
MADISON
PORT UNION
SUGAR CREEK
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VERMILL.
STOUT
HANNA
TANNERS CREEK
MIAMI FORT
TERMINAL
FOSTER
DOE X533
DRESSER
QUALITECH
THOMPSON
BATESVILLE
DEARBORN
PIERCE
DOE X530
CASEY (CIPS)
BREED
AMO
PRESCOTT
BUFNG.
EAST BEND
R.BANK1
CLARKSBURG
SULLIVAN
WHEATLAND
BLOOMINGTON
CLIFTY CREEK
COLUMBUS
MEROM
WORTHINGTON
WHEATLAND
JEFFERSON
BEDFORD
HANGING ROCK
SILVER GROVE
MARQUIS
TRIMBLE COUNTY
GHENT
ZIMMER
KILLEN
GIBSON
PETERSBURG
LOST RIVER
NORTHSIDE
MIDDLETOWN
WEST FRANKFORT
WEST LEXINGTON
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HARDIN COUNTY
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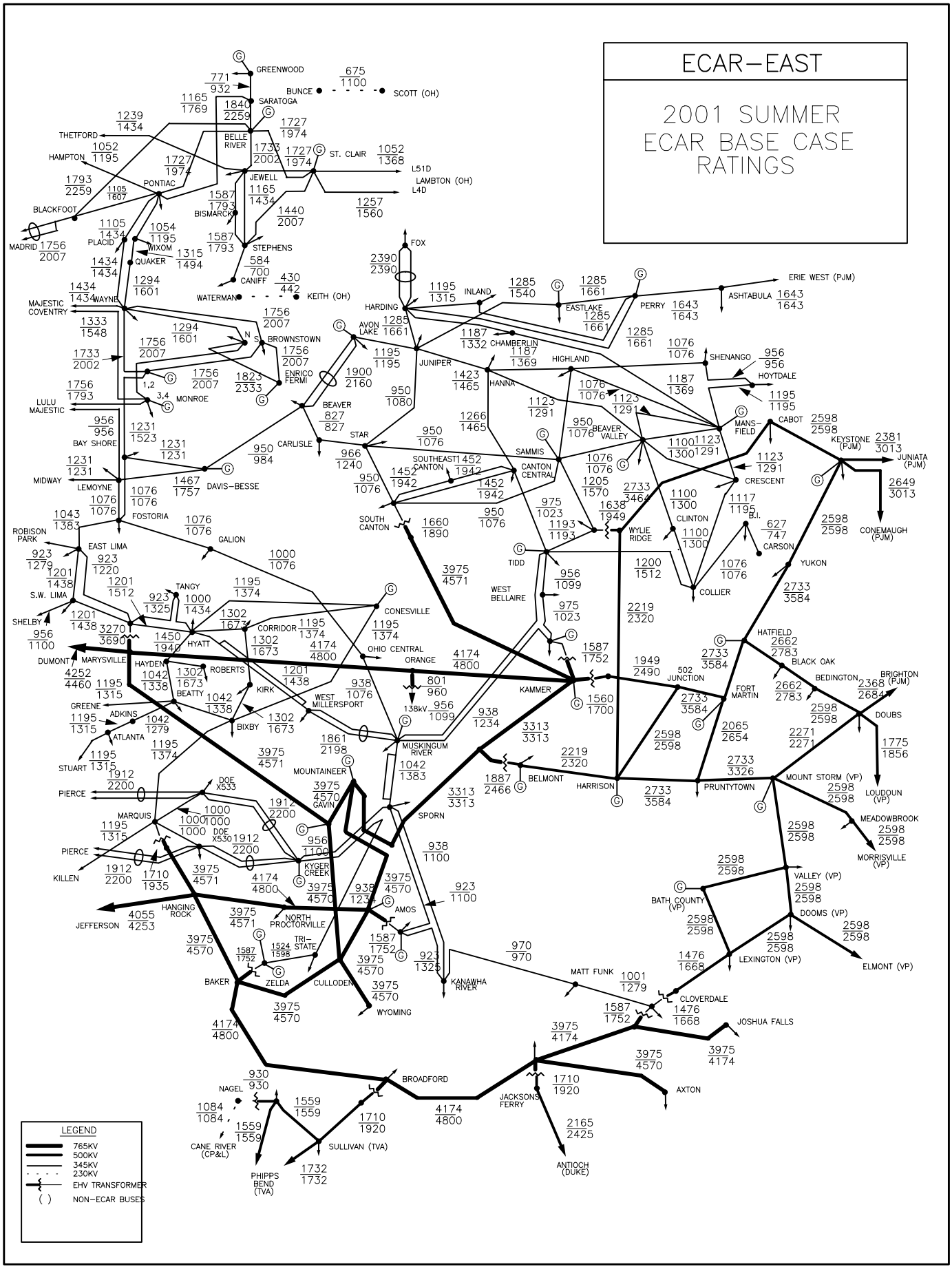
ECAR–EAST
2001 SUMMER
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PONTIAC
BLACKFOOT
BISMARCK
MADRID
PLACID
WIXOM
QUAKER
STEPHENS
CANIFF
WATERMAN
KEITH (OH)
FOX
HARDING
INLAND
EASTLAKE
PERRY
ASHTABULA
ERIE WEST (PJM)
MAJESTIC
COVENTRY
WAYNE
AVON LAKE
BROWNSTOWN
JUNIPER
CHAMBERLIN
HIGHLAND
SHENANGO
HOYTDALE
LULU
MAJESTIC
ENRICO FERMI
MONROE
HANNA
BEAVER
BAY SHORE
CARLISLE
STAR
SAMMIS
BEAVER VALLEY
MANS–FIELD
CABOT
KEYSTONE (PJM)
JUNIATA (PJM)
MIDWAY
LEMOYNE
DAVIS–BESSE
SOUTHEAST CANTON
CANTON CENTRAL
CRESCENT
SOUTH CANTON
WYLIE RIDGE
CLINTON
B.I.
CARSON
CONEMAUGH (PJM)
ROBISON PARK
FOSTORIA
GALION
EAST LIMA
TIDD
YUKON
S.W. LIMA
TANGY
CONESVILLE
WEST BELLAIRE
COLLIER
SHELBY
CORRIDOR
HYATT
OHIO CENTRAL
ORANGE
HATFIELD
DUMONT
MARYSVILLE
HAYDEN
ROBERTS
KIRK
BEATTY
WEST MILLERSPORT
KAMMER
502 JUNCTION
BLACK OAK
BEDINGTON
BRIGHTON (PJM)
FORT MARTIN
GREENE
ADKINS
ATLANTA
BIXBY
MUSKINGUM RIVER
DOUBS
STUART
MOUNTAINEER
BELMONT
HARRISON
PRUNTYTOWN
MOUNT STORM (VP)
LOUDOUN (VP)
PIERCE
DOE X533
GAVIN
SPORN
MEADOWBROOK
MORRISVILLE (VP)
MARQUIS
DOE X530
KILLEN
KYGER CREEK
AMOS
VALLEY (VP)
BATH COUNTY (VP)
DOOMS (VP)
ELMONT (VP)
HANGING ROCK
JEFFERSON
NORTH PROCTORVILLE
TRI–STATE
BAKER
ZELDA
CULLODEN
WYOMING
KANAWHA RIVER
MATT FUNK
CLOVERDALE
LEXINGTON (VP)
JOSHUA FALLS
AXTON
BROADFORD
NAGEL
CANE RIVER (CP&L)
SULLIVAN (TVA)
PHIPPS BEND (TVA)
JACKSONS FERRY
ANTIOCH (DUKE)
LEGEND
765KV
500KV
345KV
230KV
EHV TRANSFORMER
( ) NON–ECAR BUSES

# APPENDIX G

## Generation Dispatch Tables

This section of the Appendix documents the Generation Deficiency Import Levels (Table G-1), the Generation Dispatch for Study Base Cases (Table G-2), and the Generation Dispatch for Transfer Scenarios (Table G-3) used in this seasonal transmission assessment.

# Table G-1
## ECAR 2001 Summer Assessment of Transmission System Performance
## Generation Deficiency Import Levels

Date: 04/17/01



| Study Area | System | (1) Load (A) | (2) Losses and Shunts (A) | (3) Interchange Export (+) Import (-) (A) | (4) Non-Dispatched (Available) Generation (A) | (5) Deficiency (30% Load) (B) (1) x (0.30) | (6) Adjusted Deficiency Transfer Export (+) Import (-) (5) + (4) | (7) Share of Study-Area Deficiency (5) / (5) | (8) Target Deficiency Transfer Export (+) Import (-) (7) x (8) | (9) Target Deficiency Transfer as % of Load (8) / (1) |
|---|---|---|---|---|---|---|---|---|---|---|
| MECS | CONS | 8889 | 216 | 157 | 559 | -2667 | -2108 | 44% | -2210 | |
| | DECO | 11185 | 214 | -465 | 1177 | -3356 | -2179 | 56% | -2790 | |
| | Total | 20074 | 430 | -308 | 1736 | -6022 | -4286 | 100% | -5000 | 25% |
| NE | AP | 7828 | 166 | -671 | 962 | -2348 | -1386 | 33% | -1990 | |
| | DLCO | 2639 | 21 | 319 | 71 | -792 | -721 | 11% | -670 | |
| | FE | 13130 | 308 | -1859 | 24 | -3939 | -3915 | 56% | -3340 | |
| | Total | 23597 | 495 | -2211 | 1057 | -7079 | -6022 | 100% | -6000 | 25% |
| SW | AEP | 23013 | 657 | 605 | 1972 | -6904 | -4932 | 40% | -6040 | |
| | BREC | 1539 | 6 | -90 | 319 | -462 | -143 | 3% | -400 | |
| | CIN | 11335 | 422 | 161 | 1070 | -3401 | -2331 | 20% | -2980 | |
| | DPL | 3261 | 101 | 84 | 960 | -978 | -18 | 6% | -860 | |
| | EKPC | 1683 | 66 | 80 | 0 | -505 | -505 | 3% | -440 | |
| | ENWC | 0 | 0 | 110 | 158 | 0 | 158 | 0% | 0 | |
| | ENWI | 0 | 0 | 110 | 158 | 0 | 158 | 0% | 0 | |
| | HE | 484 | 25 | 886 | 26 | -145 | -119 | 1% | -130 | |
| | IPL | 3160 | 72 | 0 | 89 | -948 | -859 | 6% | -830 | |
| | LGEE | 7112 | 158 | -589 | 700 | -2134 | -1434 | 12% | -1870 | |
| | NIPS | 3211 | 37 | -376 | 425 | -963 | -538 | 6% | -840 | |
| | OVEC | 600 | 12 | 1389 | 267 | -180 | 87 | 1% | -160 | |
| | SIGE | 1714 | 23 | -70 | 165 | -514 | -349 | 3% | -450 | |
| | Total | 57112 | 1579 | 2300 | 6309 | -17134 | -10825 | 100% | -15000 | 26% |
| ECAR | Total | 100783 | 2504 | -219 | 9102 | -30235 | -21133 | 100% | -25000 | 25% |
| Kentucky | BREC | 1539 | 6 | -90 | 319 | -462 | -143 | 15% | -370 | |
| | EKPC | 1683 | 66 | 80 | 0 | -505 | -505 | 16% | -410 | |
| | LGEE | 7112 | 158 | -589 | 700 | -2134 | -1434 | 69% | -1720 | |
| | Total | 10334 | 230 | -599 | 1019 | -3100 | -2081 | 100% | -2500 | 24% |
| Indiana | AEP (IM) | 4874 | 186 | 870 | 350 | -1462 | -1112 | 25% | -1240 | |
| | CIN (PSI) | 6203 | 289 | -289 | 259 | -1861 | -1602 | 32% | -1580 | |
| | ENWC | 0 | 0 | 110 | 158 | 0 | 158 | 0% | 0 | |
| | ENWI | 0 | 0 | 110 | 158 | 0 | 158 | 0% | 0 | |
| | HE | 484 | 25 | 886 | 26 | -145 | -119 | 2% | -120 | |
| | IPL | 3160 | 72 | 0 | 89 | -948 | -859 | 16% | -800 | |
| | NIPS | 3211 | 37 | -376 | 425 | -963 | -538 | 16% | -820 | |
| | SIGE | 1714 | 23 | -70 | 165 | -514 | -349 | 9% | -440 | |
| | Total | 19646 | 632 | 1241 | 1630 | -5894 | -4264 | 100% | -5000 | 25% |

(A) As modeled in the ECAR 2001 Summer primary base case (E100).
(B) Based on established ECAR TSPP testing criteria.

# Table G-2
## ECAR 2001 Summer Assessment of Transmission System Performance
Date: 04/17/01 **Generation Dispatch for Study Base Cases** 

| ========== E101 ========== NPCC (OH/NYPP) to MECS 1500 MW MAAC to MAIN 1750 MW VACAR to MAIN 750 MW<br>Bus (Number/Unit/Name/System) | | | | E100 Primary Base Case Dispatch (MW) | Incre-mental Export Dispatch (MW) | Incre-mental Import Dispatch (MW) | E101 Study Base Case Dispatch (MW) |
|---|---|---|---|---|---|---|---|
| 81423 | 1 | Lennox 1 | IMO | 0 | 500 | | 500 |
| 703 | | Net Interchange | IMO | 400 | 500 | 0 | 900 |
| 79528 | 2 | Gilboa 2 | NYISO | 0 | 250 | | 250 |
| 79530 | 4 | Gilboa 4 | NYISO | 0 | 171 | | 171 |
| 77953 | 6 | Oswego 6 | NYISO | 271 | 579 | | 850 |
| 702 | | Net Interchange | NYISO | -1029 | 1000 | 0 | -29 |
| 33 | H | Keystone 2H | PJM500 | 0 | 375 | | 375 |
| 33 | L | Keystone 2L | PJM500 | 0 | 375 | | 375 |
| 36 | 1 | Salem 1 | PJM500 | 0 | 1000 | | 1000 |
| 25 | | Net Interchange | PJM500 | 10668 | 1750 | 0 | 12418 |
| 142 | | Scale Load | DUKE | -18288 | 375 | | -17913 |
| 142 | | Net Interchange | DUKE | -493 | 375 | 0 | -118 |
| 145 | | Scale Load | VP | -16276 | 375 | | -15901 |
| 145 | | Net Interchange | VP | 502 | 375 | 0 | 877 |
| 28339 | 3 | Campbell 3 | CONS | 667 | | 10 | 677 |
| 28356 | 1 | Palisades 1 | CONS | 760 | | -760 | 0 |
| 218 | | Net Interchange | CONS | 157 | 0 | -750 | -593 |
| 29031 | 1 | Monroe 1 | DECO | 750 | | -750 | 0 |
| 219 | | Net Interchange | DECO | -465 | 0 | -750 | -1215 |
| 32346 | 1 | Clinton 1 | IP | 930 | | -930 | 0 |
| 357 | | Net Interchange | IP | -289 | 0 | -930 | -1219 |
| 37616 | 3 | Cordova 3 | CE | 0 | | 56 | 56 |
| 37545 | 2 | Kincaid 2 | CE | 539 | | -539 | 0 |
| 37548 | 2 | LaSalle 2 | CE | 1087 | | -1087 | 0 |
| 363 | | Net Interchange | CE | 164 | 0 | -1570 | -1406 |
| **Total** | | | | | **4000** | **-4000** | |

# Table G-2
## ECAR 2001 Summer Assessment of Transmission System Performance
Date: 04/17/01 **Generation Dispatch for Study Base Cases** 

| ========== E102 ========== MAIN to MAAC 2000 MW MAIN to VACAR 1000 MW MAIN to TVA 1000 MW<br>Bus (Number/Unit/Name/System) | | | | E100 Primary Base Case Dispatch (MW) | Incre-mental Export Dispatch (MW) | Incre-mental Import Dispatch (MW) | E102 Study Base Case Dispatch (MW) |
|---|---|---|---|---|---|---|---|
| 356 | | Scale Load | AMRN | -11252 | 1300 | | -9952 |
| 356 | | Net Interchange | AMRN | -639 | 1300 | 0 | 661 |
| 357 | | Scale Load | IP | -3900 | 400 | | -3500 |
| 357 | | Net Interchange | IP | -289 | 400 | 0 | 111 |
| 363 | | Scale Load | CE | -20628 | 2300 | | -18328 |
| 363 | | Net Interchange | CE | 164 | 2300 | 0 | 2464 |
| 34 | 1 | Peach Bottom 2 | PJM500 | 1090 | | 203 | 1293 |
| 35 | 1 | Peach Bottom 3 | PJM500 | 1093 | | -1093 | 0 |
| 38 | 1 | Susquehanna 2 | PJM500 | 1110 | | -1110 | 0 |
| 25 | | Net Interchange | PJM500 | 10668 | 0 | -2000 | 8668 |
| 11052 | B | Lincoln 11 | DUKE | 0 | | 50 | 50 |
| 11053 | C | Lincoln 12 | DUKE | 0 | | 50 | 50 |
| 11002 | 2 | McGuire 2 | DUKE | 1100 | | -1100 | 0 |
| 142 | | Net Interchange | DUKE | -493 | 0 | -1000 | -1493 |
| 18137 | 1 | Browns Ferry 3 | TVA | 1143 | | 99 | 1242 |
| 18184 | 1 | Gallatin 4 | TVA | 182 | | 100 | 282 |
| 18275 | 1 | Sequoyah 1 | TVA | 1199 | | -1199 | 0 |
| 147 | | Net Interchange | TVA | 1557 | 0 | -1000 | 557 |
| **Total** | | | | | **4000** | **-4000** | |

# Table G-2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Generation Dispatch for Study Base Cases



| ========== E103a ========== VACAR to MECS 2000 MW TVA to AEP 1000 MW TVA to MAIN 1000 MW<br>Bus (Number/Unit/Name/System) | | | | E100 Primary Base Case Dispatch (MW) | Incre-mental Export Dispatch (MW) | Incre-mental Import Dispatch (MW) | E103 Study Base Case Dispatch (MW) |
|---|---|---|---|---|---|---|---|
| 142 | | Scale Load | DUKE | -18288 | 1050 | | -17238 |
| 142 | | Net Interchange | DUKE | -493 | 1050 | 0 | 557 |
| 145 | | Scale Load | VP | -16276 | 950 | | -15326 |
| 145 | | Net Interchange | VP | 502 | 950 | 0 | 1452 |
| 147 | | Scale Load | TVA | -29666 | 2000 | | -27666 |
| 147 | | Net Interchange | TVA | 1557 | 2000 | 0 | 3557 |
| 28339 | 3 | Campbell 3 | CONS | 667 | | 150 | 817 |
| 28356 | 1 | Palisades 1 | CONS | 760 | | -760 | 0 |
| 218 | | Net Interchange | CONS | 157 | 0 | -610 | -453 |
| 29023 | 1 | Greenwood 1 | DECO | 701 | | 80 | 781 |
| 29031 | 1 | Monroe 1 | DECO | 750 | | -750 | 0 |
| 29033 | 3 | Monroe 3 | DECO | 750 | | -750 | 0 |
| 29015 | 7 | St. Clair 7 | DECO | 435 | | 30 | 465 |
| 219 | | Net Interchange | DECO | -465 | 0 | -1390 | -1855 |
| 22654 | 1 | Cook 1 | AEP | 1000 | | -1000 | 0 |
| 205 | | Net Interchange | AEP | 605 | 0 | -1000 | -395 |
| 32346 | 1 | Clinton 1 | IP | 930 | | -500 | 430 |
| 357 | | Net Interchange | IP | -289 | 0 | -500 | -789 |
| 37548 | 2 | LaSalle 2 | CE | 1087 | | -500 | 587 |
| 363 | | Net Interchange | CE | 164 | 0 | -500 | -336 |
| **Total** | | | | | **4000** | **-4000** | |

# Table G-2
## ECAR 2001 Summer Assessment of Transmission System Performance
## Generation Dispatch for Study Base Cases



| ========== E103b ========== VACAR to MECS 2000 MW TVA to FE 900 MW TVA to MAIN 1100 MW<br>Bus (Number/Unit/Name/System) | | | | E100 Primary Base Case Dispatch (MW) | Incre-mental Export Dispatch (MW) | Incre-mental Import Dispatch (MW) | E103 Study Base Case Dispatch (MW) |
|---|---|---|---|---|---|---|---|
| 142 | | Scale Load | DUKE | -18288 | 1050 | | -17238 |
| 142 | | Net Interchange | DUKE | -493 | 1050 | 0 | 557 |
| 145 | | Scale Load | VP | -16276 | 950 | | -15326 |
| 145 | | Net Interchange | VP | 502 | 950 | 0 | 1452 |
| 147 | | Scale Load | TVA | -29666 | 2000 | | -27666 |
| 147 | | Net Interchange | TVA | 1557 | 2000 | 0 | 3557 |
| 28339 | 3 | Campbell 3 | CONS | 667 | | 150 | 817 |
| 28356 | 1 | Palisades 1 | CONS | 760 | | -760 | 0 |
| 218 | | Net Interchange | CONS | 157 | 0 | -610 | -453 |
| 29023 | 1 | Greenwood 1 | DECO | 701 | | 80 | 781 |
| 29031 | 1 | Monroe 1 | DECO | 750 | | -750 | 0 |
| 29033 | 3 | Monroe 3 | DECO | 750 | | -750 | 0 |
| 29015 | 7 | St. Clair 7 | DECO | 435 | | 30 | 465 |
| 219 | | Net Interchange | DECO | -465 | 0 | -1390 | -1855 |
| 21630 | 1 | Davis-Besse 1 | FE | 883 | | -883 | 0 |
| 21310 | 1 | Mansfield 1 | FE | 772 | | -17 | 755 |
| 202 | | Net Interchange | FE | -1859 | 0 | -900 | -2759 |
| 32346 | 1 | Clinton 1 | IP | 930 | | -500 | 430 |
| 357 | | Net Interchange | IP | -289 | 0 | -500 | -789 |
| 37548 | 2 | LaSalle 2 | CE | 1087 | | -600 | 487 |
| 363 | | Net Interchange | CE | 164 | 0 | -600 | -436 |
| **Total** | | | | | **4000** | **-4000** | |

# Table G-2
## ECAR 2001 Summer Assessment of Transmission System Performance
Date: 04/17/01 **Generation Dispatch for Study Base Cases** 

| ========== E104 ========== NPCC (OH) to TVA (East) 2000 MW MAIN to Southern 2000 MW | | | | E100 Primary Base Case Dispatch (MW) | Incre-mental Export Dispatch (MW) | Incre-mental Import Dispatch (MW) | E104 Study Base Case Dispatch (MW) |
|---|---|---|---|---|---|---|---|
| **Bus (Number/Unit/Name/System)** | | | | | | | |
| 80903 | 1 | Lakeview 6 | IMO | 0 | 300 | | 300 |
| 80902 | 1 | Lakeview 7 | IMO | 0 | 300 | | 300 |
| 80896 | 1 | Lakeview 8 | IMO | 0 | 300 | | 300 |
| 81424 | 1 | Lennox 3 | IMO | 0 | 550 | | 550 |
| 81425 | 1 | Lennox 4 | IMO | 0 | 550 | | 550 |
| 703 | | Net Interchange | IMO | 400 | 2000 | 0 | 2400 |
| 356 | | Scale Load | AMRN | -11252 | 650 | | -10602 |
| 356 | | Net Interchange | AMRN | -639 | 650 | 0 | 11 |
| 357 | | Scale Load | IP | -3900 | 200 | | -3700 |
| 357 | | Net Interchange | IP | -289 | 200 | 0 | -89 |
| 363 | | Scale Load | CE | -20628 | 1150 | | -19478 |
| 363 | | Net Interchange | CE | 164 | 1150 | 0 | 1314 |
| 18137 | 1 | Browns Ferry 3 | TVA | 1143 | | 44 | 1187 |
| 18139 | 1 | Bull Run 1H | TVA | 482 | | -482 | 0 |
| 18138 | 1 | Bull Run 1L | TVA | 459 | | -459 | 0 |
| 18184 | 1 | Gallatin 4 | TVA | 182 | | 100 | 282 |
| 18297 | 1 | Watts Bar 1 | TVA | 1203 | | -1203 | 0 |
| 147 | | Net Interchange | TVA | 1557 | 0 | -2000 | -443 |
| 15109 | 4 | Bowen 4 | Southern | 929 | | -929 | 0 |
| 15134 | 4 | Scherer 4 | Southern | 845 | | -845 | 0 |
| 15118 | 6 | Yates 6 | Southern | 355 | | -226 | 129 |
| 199 | | Net Interchange | Southern | 1777 | 0 | -2000 | -223 |
| **Total** | | | | | **4000** | **-4000** | |

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**

Date: 04/17/01



| ECAR Exports ( Page 1 of 2 ) | | | | | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | | | | ECAR to MAAC | | --- | | --- | | --- | | --- | |
| | | | | | ECAR to VACAR | | --- | | --- | | --- | | --- | |
| | | | | | ECAR to TVA | | --- | | --- | | --- | | ECAR to TVA | |
| | | | | E100 | ECAR to MAIN | | --- | | --- | | ECAR to MAIN | | --- | |
| | | | | Base | --- | | --- | | --- | | --- | | --- | |
| | | | | Case | --- | | --- | | --- | | --- | | --- | |
| Bus (Number/Unit/Name/System) | | | | Dispatch | Export = | 5000 | | | | | Export = | 5000 | Export = | 5000 |
| | | | | (MW) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| 20564 | 1 | Albright 1 | AP | 0 | 74 | 1.5 | | | | | 74 | 1.5 | 74 | 1.5 |
| 20566 | 1 | Albright 3 | AP | 120 | 20 | 0.4 | | | | | 20 | 0.4 | 20 | 0.4 |
| 20584 | 1 | Fort Martin 2 | AP | 525 | 30 | 0.6 | | | | | 30 | 0.6 | 30 | 0.6 |
| 20580 | 1 | Hatfield 1 | AP | 520 | 30 | 0.6 | | | | | 30 | 0.6 | 30 | 0.6 |
| 20581 | 1 | Hatfield 2 | AP | 520 | 30 | 0.6 | | | | | 30 | 0.6 | 30 | 0.6 |
| 20574 | 1 | Mitchell 3 | AP | 228 | 48 | 1.0 | | | | | 48 | 1.0 | 48 | 1.0 |
| 20590 | 1 | Pleasants 1 | AP | 584 | 36 | 0.7 | | | | | 36 | 0.7 | 36 | 0.7 |
| 20591 | 1 | Pleasants 2 | AP | 600 | 20 | 0.4 | | | | | 20 | 0.4 | 20 | 0.4 |
| 20576 | 1 | Rivesville 6 | AP | 0 | 93 | 1.9 | | | | | 93 | 1.9 | 93 | 1.9 |
| 20579 | 1 | Smith 4 | AP | 0 | 86 | 1.7 | | | | | 86 | 1.7 | 86 | 1.7 |
| 20578 | 1 | Willow Island 2 | AP | 120 | 61 | 1.2 | | | | | 61 | 1.2 | 61 | 1.2 |
| 201 | | Total | AP | | 528 | | | | | | 528 | | 528 | |
| 21310 | --- | Mansfield 345 | FE | 2336 | 24 | 0.5 | | | | | 24 | 0.5 | 24 | 0.5 |
| 202 | | Total | FE | | 24 | | | | | | 24 | | 24 | |
| 23050 | --- | Ceredo 138 | AEP | 80 | 292 | 5.8 | | | | | 292 | 5.8 | 292 | 5.8 |
| 23100 | --- | Grangston 138 | AEP | 50 | 183 | 3.7 | | | | | 183 | 3.7 | 183 | 3.7 |
| 22679 | --- | Keystone 345 | AEP | 50 | 256 | 5.1 | | | | | 256 | 5.1 | 256 | 5.1 |
| 24516 | --- | Wolf Hills 1 138 | AEP | 50 | 73 | 1.5 | | | | | 73 | 1.5 | 73 | 1.5 |
| 24517 | --- | Wolf Hills 2 138 | AEP | 50 | 37 | 0.7 | | | | | 37 | 0.7 | 37 | 0.7 |
| 22600 | --- | Zelda 345 | AEP | 167 | 244 | 4.9 | | | | | 244 | 4.9 | 244 | 4.9 |
| 205 | | Total | AEP | | 1085 | | | | | | 1085 | | 1085 | |
| 24952 | --- | Clifty Ck 345 | OVEC | 1101 | 81 | 1.6 | | | | | 81 | 1.6 | 81 | 1.6 |
| 24951 | --- | Kyger Ck 345 | OVEC | 899 | 66 | 1.3 | | | | | 66 | 1.3 | 66 | 1.3 |
| 206 | | Total | OVEC | | 147 | | | | | | 147 | | 147 | |
| 25143 | --- | Merom 345 | HE | 974 | 14 | 0.3 | | | | | 14 | 0.3 | 14 | 0.3 |
| 207 | | Total | HE | | 14 | | | | | | 14 | | 14 | |
| 25904 | 5 | Beckjord 5 | CIN | 162 | 76 | 1.5 | | | | | 76 | 1.5 | 76 | 1.5 |
| 26209 | 2 | Cayuga 2 | CIN | 485 | 10 | 0.2 | | | | | 10 | 0.2 | 10 | 0.2 |
| 26233 | 1 | Henry 1 | CIN | 50 | 11 | 0.2 | | | | | 11 | 0.2 | 11 | 0.2 |
| 26234 | 2 | Henry 2 | CIN | 50 | 11 | 0.2 | | | | | 11 | 0.2 | 11 | 0.2 |
| 26235 | 3 | Henry 3 | CIN | 50 | 11 | 0.2 | | | | | 11 | 0.2 | 11 | 0.2 |
| 25927 | 1 | Madison 1 | CIN | 0 | 87 | 1.7 | | | | | 87 | 1.7 | 87 | 1.7 |
| 25928 | 2 | Madison 2 | CIN | 0 | 87 | 1.7 | | | | | 87 | 1.7 | 87 | 1.7 |
| 25929 | 3 | Madison 3 | CIN | 0 | 87 | 1.7 | | | | | 87 | 1.7 | 87 | 1.7 |
| 25930 | 4 | Madison 4 | CIN | 0 | 87 | 1.7 | | | | | 87 | 1.7 | 87 | 1.7 |
| 25931 | 5 | Madison 5 | CIN | 0 | 87 | 1.7 | | | | | 87 | 1.7 | 87 | 1.7 |
| 26231 | 7 | Vermillion 7 | CIN | 0 | 32 | 0.6 | | | | | 32 | 0.6 | 32 | 0.6 |
| 208 | | Total | CIN | | 586 | | | | | | 586 | | 586 | |
| 26681 | --- | Adkins 345 | DPL | 0 | 275 | 5.5 | | | | | 275 | 5.5 | 275 | 5.5 |
| 26631 | --- | OHH West 69 | DPL | 126 | 26 | 0.5 | | | | | 26 | 0.5 | 26 | 0.5 |
| 26676 | --- | Tait 69 | DPL | 145 | 115 | 2.3 | | | | | 115 | 2.3 | 115 | 2.3 |
| 26668 | --- | Yankee 69 | DPL | 0 | 111 | 2.2 | | | | | 111 | 2.2 | 111 | 2.2 |
| 209 | | Total | DPL | | 527 | | | | | | 527 | | 527 | |
| 26860 | 1 | AB Brown 1 | SIGE | 110 | 91 | 1.8 | | | | | 91 | 1.8 | 91 | 1.8 |
| 210 | | Total | SIGE | | 91 | | | | | | 91 | | 91 | |
| 27063 | --- | Brown CT 138 | LGEE | 511 | 385 | 7.7 | | | | | 385 | 7.7 | 385 | 7.7 |
| 211 | | Total | LGEE | | 385 | | | | | | 385 | | 385 | |

**(Continued on next page)**

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**



| ECAR Exports ( Page 2 of 2 ) | | | | E100 Base Case Dispatch | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | | | | ECAR to MAAC | | --- | | --- | | --- | | --- | |
| | | | | | ECAR to VACAR | | --- | | --- | | --- | | --- | |
| | | | | | ECAR to TVA | | --- | | --- | | --- | | ECAR to TVA | |
| | | | | | ECAR to MAIN | | --- | | --- | | ECAR to MAIN | | --- | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| Bus (Number/Unit/Name/System) | | | | | Export = | 5000 | | | | | Export = | 5000 | Export = | 5000 |
| | | | | (MW) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| 27552 | --- | Coleman 161 | BREC | 415 | 40 | 0.8 | | | | | 40 | 0.8 | 40 | 0.8 |
| 27551 | --- | Reid 161 | BREC | 620 | 135 | 2.7 | | | | | 135 | 2.7 | 135 | 2.7 |
| 214 | | Total | BREC | | 175 | | | | | | 175 | | 175 | |
| 27685 | 1 | St Joe 1 | DLCO | 50 | 70 | 1.4 | | | | | 70 | 1.4 | 70 | 1.4 |
| 215 | | Total | DLCO | | 70 | | | | | | 70 | | 70 | |
| 27961 | 1 | Petersburg 1 | IPL | 189 | 49 | 1.0 | | | | | 49 | 1.0 | 49 | 1.0 |
| 216 | | Total | IPL | | 49 | | | | | | 49 | | 49 | |
| 28021 | --- | Dune Acres 138 | NIPS | 450 | 30 | 0.6 | | | | | 30 | 0.6 | 30 | 0.6 |
| 28011 | --- | Schahfer 345 | NIPS | 1242 | 200 | 4.0 | | | | | 200 | 4.0 | 200 | 4.0 |
| 217 | | Total | NIPS | | 230 | | | | | | 230 | | 230 | |
| 28512 | 1 | Cobb 1 | CONS | 0 | 61 | 1.2 | | | | | 61 | 1.2 | 61 | 1.2 |
| 28513 | 3 | Cobb 3 | CONS | 0 | 24 | 0.5 | | | | | 24 | 0.5 | 24 | 0.5 |
| 28469 | C | Livingston C | CONS | 0 | 34 | 0.7 | | | | | 34 | 0.7 | 34 | 0.7 |
| 28470 | D | Livingston D | CONS | 0 | 34 | 0.7 | | | | | 34 | 0.7 | 34 | 0.7 |
| 28275 | 1 | MCV Cogen 1 | CONS | 486 | 42 | 0.8 | | | | | 42 | 0.8 | 42 | 0.8 |
| 28276 | 2 | MCV Cogen 2 | CONS | 486 | 42 | 0.8 | | | | | 42 | 0.8 | 42 | 0.8 |
| 28354 | 1 | MCV ST Gen | CONS | 268 | 24 | 0.5 | | | | | 24 | 0.5 | 24 | 0.5 |
| 28362 | --- | Thetford 569 | CONS | 0 | 44 | 0.9 | | | | | 44 | 0.9 | 44 | 0.9 |
| 218 | | Total | CONS | | 305 | | | | | | 305 | | 305 | |
| 29013 | 1 | Belle River 1 | DECO | 625 | 25 | 0.5 | | | | | 25 | 0.5 | 25 | 0.5 |
| 29014 | 2 | Belle River 2 | DECO | 635 | 15 | 0.3 | | | | | 15 | 0.3 | 15 | 0.3 |
| 28752 | --- | DIG 230 | DECO | 371 | 602 | 12.0 | | | | | 602 | 12.0 | 602 | 12.0 |
| 219 | | Total | DECO | | 642 | | | | | | 642 | | 642 | |
| 220 | | Total | EKPC | | 0 | | | | | | 0 | | 0 | |
| 29701 | 1 | Wheatland 3 | ENWC | 55 | 42 | 0.8 | | | | | 42 | 0.8 | 42 | 0.8 |
| 29702 | 1 | Wheatland 4 | ENWC | 55 | 42 | 0.8 | | | | | 42 | 0.8 | 42 | 0.8 |
| 221 | | Total | ENWC | | 84 | | | | | | 84 | | 84 | |
| 29711 | 1 | Wheatland 1 | ENWI | 55 | 42 | 0.8 | | | | | 42 | 0.8 | 42 | 0.8 |
| 29712 | 1 | Wheatland 2 | ENWI | 55 | 42 | 0.8 | | | | | 42 | 0.8 | 42 | 0.8 |
| 222 | | Total | ENWI | | 84 | | | | | | 84 | | 84 | |
| **Grand Total** | | | | | **5000** | **100.0** | | | | | **5000** | **100.0** | **5000** | **100.0** |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**

Date: 04/17/01



| MECS Imports | | | | | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | | | | MAAC to MECS | | --- | | --- | | MAAC to MECS | | --- | |
| | | | | | VACAR to MECS | | VACAR to MECS | | --- | | --- | | --- | |
| | | | | | TVA to MECS | | --- | | --- | | --- | | --- | |
| | | | | E100 | MAIN to MECS | | --- | | MAIN to MECS | | MAIN to MECS | | --- | |
| | | | | Base | --- | | --- | | --- | | --- | | --- | |
| | | | | Case | --- | | --- | | --- | | --- | | --- | |
| Bus (Number/Unit/Name/System) | | | | Dispatch | Import = | 5000 | Import = | 3500 | Import = | 5000 | Import = | 3000 | | |
| | | | | (MW) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| 28339 | 3 | Campbell 3 | CONS | 667 | -64 | -1.3 | -76 | -2.2 | -64 | -1.3 | | 0.0 | | |
| 28349 | 3 | Karn 3 | CONS | 638 | -638 | -12.8 | -638 | -18.2 | -638 | -12.8 | -638 | -21.3 | | |
| 28350 | 4 | Karn 4 | CONS | 638 | -638 | -12.8 | -638 | -18.2 | -638 | -12.8 | -333 | -11.1 | | |
| 28351 | 1 | Ludington 1 | CONS | 312 | -312 | -6.2 | -312 | -8.9 | -312 | -6.2 | -312 | -10.4 | | |
| 28351 | 2 | Ludington 2 | CONS | 312 | -312 | -6.2 | -312 | -8.9 | -312 | -6.2 | -312 | -10.4 | | |
| 28356 | 1 | Palisades 1 | CONS | 760 | -760 | -15.2 | | 0.0 | -760 | -15.2 | | 0.0 | | |
| 218 | | Total | CONS | | -2724 | | -1976 | | -2724 | | -1595 | | | |
| 29013 | 1 | Belle River 1 | DECO | 625 | -625 | -12.5 | -625 | -17.9 | -625 | -12.5 | -625 | -20.8 | | |
| 29023 | 1 | Greenwood 1 | DECO | 701 | -701 | -14.0 | -701 | -20.0 | -701 | -14.0 | -781 | -26.0 | | |
| 29033 | 3 | Monroe 3 | DECO | 750 | -750 | -15.0 | | 0.0 | -750 | -15.0 | | 0.0 | | |
| 29037 | 1 | River Rouge 1 | DECO | 200 | -200 | -4.0 | -200 | -5.7 | -200 | -4.0 | | 0.0 | | |
| 219 | | Total | DECO | | -2276 | | -1526 | | -2276 | | -1406 | | | |
| **Grand Total** | | | | | **5000** | **-100.0** | **3500** | **-100.0** | **5000** | **-100.0** | **3000** | **-100.0** | | |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**

Date: 04/17/01



| NE Imports | | | | | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | | | | TVA to NE | | TVA to NE | | TVA to NE | | --- | | --- | |
| | | | | | MAIN to NE | | --- | | MAIN to NE | | --- | | --- | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| | | | | E100 | --- | | --- | | --- | | --- | | --- | |
| | | | | Base | --- | | --- | | --- | | --- | | --- | |
| | | | | Case | --- | | --- | | --- | | --- | | --- | |
| Bus (Number/Unit/Name/System) | | | | Dispatch | Import = | 6000 | Import = | 6000 | Import = | 6000 | | | | |
| | | | | (MW) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| 20566 | 1 | Albright 3 | AP | 120 | -120 | -2.0 | -120 | -2.0 | -120 | -2.0 | | | | |
| 20569 | 1 | Armstrong 2 | AP | 172 | -172 | -2.9 | -172 | -2.9 | -172 | -2.9 | | | | |
| 20584 | 1 | Fort Martin 2 | AP | 525 | -525 | -8.8 | -525 | -8.8 | -525 | -8.8 | | | | |
| 20587 | 1 | Harrison 3 | AP | 640 | -405 | -6.8 | -405 | -6.8 | -405 | -6.8 | | | | |
| 20580 | 1 | Hatfield 1 | AP | 520 | -520 | -8.7 | -520 | -8.7 | -520 | -8.7 | | | | |
| 20574 | 1 | Mitchell 3 | AP | 228 | -228 | -3.8 | -228 | -3.8 | -228 | -3.8 | | | | |
| 20578 | 1 | Willow 2 | AP | 120 | -120 | -2.0 | -120 | -2.0 | -120 | -2.0 | | | | |
| 201 | | Total | AP | | -2090 | | -2090 | | -2090 | | | | | |
| 27623 | 1 | Cheswick 1 | DLCO | 562 | -280 | -4.7 | -280 | -4.7 | -280 | -4.7 | | | | |
| 27624 | 1 | Elrama 1 | DLCO | 97 | -97 | -1.6 | -97 | -1.6 | -97 | -1.6 | | | | |
| 27625 | 3 | Elrama 3 | DLCO | 109 | -109 | -1.8 | -109 | -1.8 | -109 | -1.8 | | | | |
| 27626 | 4 | Elrama 4 | DLCO | 171 | -171 | -2.9 | -171 | -2.9 | -171 | -2.9 | | | | |
| 215 | | Total | DLCO | | -657 | | -657 | | -657 | | | | | |
| 21640 | --- | Bay Shore 138 | FE | 647 | -505 | -8.4 | -505 | -8.4 | -505 | -8.4 | | | | |
| 21685 | --- | Eastlake 138 | FE | 636 | -504 | -8.4 | -504 | -8.4 | -504 | -8.4 | | | | |
| 21680 | 5 | Eastlake 5 | FE | 597 | -597 | -10.0 | -597 | -10.0 | -597 | -10.0 | | | | |
| 21310 | --- | Mansfield 345 | FE | 2336 | -772 | -12.9 | -772 | -12.9 | -772 | -12.9 | | | | |
| 21450 | --- | Richland 138 | FE | 423 | -260 | -4.3 | -260 | -4.3 | -260 | -4.3 | | | | |
| 21320 | --- | Sammis 345 | FE | 600 | -600 | -10.0 | -600 | -10.0 | -600 | -10.0 | | | | |
| 202 | | Total | FE | | -3238 | | -3238 | | -3238 | | | | | |
| **Grand Total** | | | | | **6000** | **-100.0** | **6000** | **-100.0** | **6000** | **-100.0** | | | | |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**



| KENTUCKY Imports | | | | | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | | | | MAIN to Kentucky | | --- | | MAIN to Kentucky | | --- | | MAIN to Kentucky | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| | | | | E100 | --- | | --- | | --- | | --- | | --- | |
| | | | | Base | --- | | --- | | --- | | --- | | --- | |
| | | | | Case | --- | | --- | | --- | | --- | | --- | |
| Bus (Number/Unit/Name/System) | | | | Dispatch | Import = | 2500 | | | Import = | 2500 | | | Import = | 2500 |
| | | | | (MW) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| 27553 | 1 | Wilson 161 | BREC | 420 | -420 | -16.8 | | | -420 | -16.8 | | | -420 | -16.8 |
| 214 | | Total | BREC | | -420 | | | | -420 | | | | -420 | |
| 29382 | 1 | JK Smith 1 | EKPC | 110 | -65 | -2.6 | | | -65 | -2.6 | | | -65 | -2.6 |
| 29560 | 1 | Spurlock 1 | EKPC | 325 | -325 | -13.0 | | | -325 | -13.0 | | | -325 | -13.0 |
| 220 | | Total | EKPC | | -390 | | | | -390 | | | | -390 | |
| 27064 | 3 | Brown North 3 | LGEE | 441 | -441 | -17.6 | | | -441 | -17.6 | | | -441 | -17.6 |
| 27005 | --- | Ghent 345 | LGEE | 1489 | -500 | -20.0 | | | -500 | -20.0 | | | -500 | -20.0 |
| 27008 | --- | Mill Creek 345 | LGEE | 1470 | -500 | -20.0 | | | -500 | -20.0 | | | -500 | -20.0 |
| 27142 | --- | Smith 138 | LGEE | 400 | -250 | -10.0 | | | -250 | -10.0 | | | -250 | -10.0 |
| 211 | | Total | LGEE | | -1691 | | | | -1691 | | | | -1691 | |
| **Grand Total** | | | | | **2500** | **-100.0** | | | **2500** | **-100.0** | | | **2500** | **-100.0** |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**



| INDIANA Imports | | | | E100 Base Case Dispatch | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | | | | MAAC to Indiana | | MAAC to Indiana | | --- | | MAAC to Indiana | | --- | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| Bus (Number/Unit/Name/System) | | | | | Import = 5000 | | Import = 5000 | | | | Import = 5000 | | | |
| | | | | (MW) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| 22671 | --- | Rockport 765 | AEP | 2600 | -700 | -14.0 | -700 | -14.0 | | | -700 | -14.0 | | |
| 22674 | --- | Tanners 345 | AEP | 700 | -500 | -10.0 | -500 | -10.0 | | | -500 | -10.0 | | |
| 205 | | Total | AEP | | -1200 | | -1200 | | | | -1200 | | | |
| 26208 | 1 | Cayuga 1 | CIN | 500 | -500 | -10.0 | -500 | -10.0 | | | -500 | -10.0 | | |
| 26200 | 4 | Cayuga CT 345 | CIN | 106 | -12 | -0.2 | -12 | -0.2 | | | -12 | -0.2 | | |
| 26218 | 3 | Gallagher 3 | CIN | 140 | -140 | -2.8 | -140 | -2.8 | | | -140 | -2.8 | | |
| 26203 | 1 | Gibson 1 | CIN | 630 | -630 | -12.6 | -630 | -12.6 | | | -630 | -12.6 | | |
| 26215 | 6 | Wabash River 6 | CIN | 318 | -318 | -6.4 | -318 | -6.4 | | | -318 | -6.4 | | |
| 208 | | Total | CIN | | -1600 | | -1600 | | | | -1600 | | | |
| 25143 | --- | Merom 345 | HE | 974 | -100 | -2.0 | -100 | -2.0 | | | -100 | -2.0 | | |
| 207 | | Total | HE | | -100 | | -100 | | | | -100 | | | |
| 27964 | 4 | Petersburg 4 | IPL | 524 | -524 | -10.5 | -524 | -10.5 | | | -524 | -10.5 | | |
| 27987 | 7 | Stout 7 | IPL | 440 | -240 | -4.8 | -240 | -4.8 | | | -240 | -4.8 | | |
| 216 | | Total | IPL | | -764 | | -764 | | | | -764 | | | |
| 28009 | C | Michigan C 345 | NIPS | 460 | -460 | -9.2 | -460 | -9.2 | | | -460 | -9.2 | | |
| 28011 | --- | Schahfer 345 | NIPS | 1242 | -380 | -7.6 | -380 | -7.6 | | | -380 | -7.6 | | |
| 217 | | Total | NIPS | | -840 | | -840 | | | | -840 | | | |
| 26862 | 1 | AB Brown 2 | SIGE | 225 | -225 | -4.5 | -225 | -4.5 | | | -225 | -4.5 | | |
| 26852 | 1 | Culley 3 | SIGE | 270 | -270 | -5.4 | -270 | -5.4 | | | -270 | -5.4 | | |
| 210 | | Total | SIGE | | -495 | | -495 | | | | -495 | | | |
| **Grand Total** | | | | | **5000** | **-100.0** | **5000** | **-100.0** | | | **5000** | **-100.0** | | |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**



| **MAAC Exports** **( Part 1 of 2 )** | E100 Base Case Dispatch (MW) | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | MAAC to MECS | | --- | | --- | | MAAC to MECS | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| Bus (Number/Unit/Name/System) | | Export = 5000 | | | | | | Export = 3000 | | | |
| | (MW) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| MAAC (areas 25 to 35) dispatched in proportion to available (non-dispatched) generation (6400 MW). The following MUST program method was used:<br><br>`SUBSYSTEM 'MAAC_EXPORT'`<br>`  AREAS 25 35`<br>`  SCALE ALL FOR EXPORT INCLUDE OFFLINE EXCEPT`<br>`  BUS 33`<br>`  BUS 36`<br>`  END`<br>`END` | 51772 | 5000 | 100.0 | | | | | 3000 | 100.0 | | |
| **Grand Total** | | **5000** | **100.0** | | | | | **3000** | **100.0** | | |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**



| **MAAC Exports** **( Part 2 of 2 )** | E100 Base Case Dispatch (MW) | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | MAAC to Indiana<br>MAAC to TVA<br>MAAC to MAIN<br>---<br>---<br>--- | | MAAC to Indiana<br>---<br>MAAC to MAIN<br>---<br>---<br>--- | | ---<br>---<br>---<br>---<br>---<br>--- | | MAAC to Indiana<br>---<br>MAAC to MAIN<br>---<br>---<br>--- | | ---<br>MAAC to TVA<br>---<br>---<br>---<br>--- | |
| Bus (Number/Unit/Name/System) | | Export = 5000 | | Export = 5000 | | | | Export = 5000 | | Export = 5000 | |
| | | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| MAAC (areas 25 to 35) dispatched in proportion to available (non-dispatched) generation (6400 MW). The following MUST program method was used:<br><br>`SUBSYSTEM 'MAAC_EXPORT'`<br>`  AREAS 25 35`<br>`  SCALE ALL FOR EXPORT INCLUDE OFFLINE EXCEPT`<br>`  BUS 33`<br>`  BUS 36`<br>`  END`<br>`END` | 51772 | 5000 | 100.0 | 5000 | 100.0 | | | 5000 | 100.0 | 5000 | 100.0 |
| **Grand Total** | | **5000** | **100.0** | **5000** | **100.0** | | | **5000** | **100.0** | **5000** | **100.0** |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**



| MAAC Imports | | | | E100 Base Case Dispatch | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | | | | ECAR to MAAC | | --- | | MAIN to MAAC | | --- | | --- | |
| | | | | | MAIN to MAAC | | --- | | --- | | --- | | --- | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| Bus (Number/Unit/Name/System) | | | | | Import = | 5000 | | | Import = | 5000 | | | | |
| | | | | (MW) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| 3135 | 1 | Brunner Island 3 | PP&L | 735 | -735 | -14.7 | | | -735 | -14.7 | | | | |
| 3146 | 1 | Montour 1 | PP&L | 759 | -759 | -15.2 | | | -759 | -15.2 | | | | |
| 3162 | 1 | Sunbury 4 | PP&L | 128 | -128 | -2.6 | | | -128 | -2.6 | | | | |
| 29 | | Total | PP&L | | -1622 | | | | -1622 | | | | | |
| 5180 | 1 | Bergen GT | PSE&G | 380 | -380 | -7.6 | | | -380 | -7.6 | | | | |
| 5140 | 1 | Mercer 1 | PSE&G | 324 | -324 | -6.5 | | | -324 | -6.5 | | | | |
| 31 | | Total | PSE&G | | -704 | | | | -704 | | | | | |
| 5901 | 1 | Brandon Shrs 1 | BG&E | 663 | -663 | -13.3 | | | -663 | -13.3 | | | | |
| 5902 | 1 | Brandon Shrs 2 | BG&E | 662 | -220 | -4.4 | | | -220 | -4.4 | | | | |
| 32 | | Total | BG&E | | -883 | | | | -883 | | | | | |
| 7106 | 1 | Chalk Point 3 | PEPCO | 612 | -612 | -12.2 | | | -612 | -12.2 | | | | |
| 7107 | 1 | Chalk Point 4 | PEPCO | 612 | -612 | -12.2 | | | -612 | -12.2 | | | | |
| 7115 | 1 | Morgantown 1 | PEPCO | 583 | -565 | -11.3 | | | -565 | -11.3 | | | | |
| 33 | | Total | PEPCO | | -1789 | | | | -1789 | | | | | |
| **Grand Total** | | | | | **5000** | **-100.0** | | | **5000** | **-100.0** | | | | |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**



| **VACAR Exports** **( Part 1 of 2 )** | E100 Base Case Dispatch (MW) | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | VACAR to MECS | | VACAR to MECS | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| Bus (Number/Unit/Name/System) | | Export = 5000 | | Export = 3500 | | | | | | | |
| | | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| VACAR (areas 140 to 145) dispatched in proportion to available (non-dispatched) generation (6700 MW). The following MUST program method was used:<br><br>`SUBSYSTEM 'VACAR_EXPORT'`<br>`  AREAS 140 145`<br>`  SCALE ALL FOR EXPORT INCLUDE OFFLINE`<br>`END` | 46708 | 5000 | 100.0 | 3500 | 100.0 | | | | | | |
| **Grand Total** | | **5000** | **100.0** | **3500** | **100.0** | | | | | | |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**



| **VACAR Exports** **( Part 2 of 2 )** | E100 Base Case Dispatch (MW) | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | VACAR to MAIN | | VACAR to MAIN | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| Bus (Number/Unit/Name/System) | | Export = 5000 | | Export = 5000 | | | | | | | |
| | (MW) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| VACAR (areas 140 to 145) dispatched in proportion to available (non-dispatched) generation (6700 MW). The following MUST program method was used:<br><br>`SUBSYSTEM 'VACAR_EXPORT'`<br>`  AREAS 140 145`<br>`  SCALE ALL FOR EXPORT INCLUDE OFFLINE`<br>`END` | 46708 | 5000 | 100.0 | 5000 | 100.0 | | | | | | |
| **Grand Total** | | **5000** | **100.0** | **5000** | **100.0** | | | | | | |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**

Date: 04/17/01



| VACAR Imports | | | | | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | | | | ECAR to VACAR | | --- | | MAIN to VACAR | | --- | | --- | |
| | | | | | MAIN to VACAR | | --- | | --- | | --- | | MAIN to VACAR | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| | | | | E100 | --- | | --- | | --- | | --- | | --- | |
| | | | | Base | --- | | --- | | --- | | --- | | --- | |
| | | | | Case | --- | | --- | | --- | | --- | | --- | |
| Bus (Number/Unit/Name/System) | | | | Dispatch | Import = | 5000 | | | Import = | 5000 | | | Import = | 5000 |
| | | | | (MW) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| 10862 | 1 | Brunswick 1 | CPLE | 820 | -820 | -16.4 | | | -820 | -16.4 | | | -820 | -16.4 |
| 140 | | Total | CPLE | | -820 | | | | -820 | | | | -820 | |
| 11004 | 2 | Catawba 2 | DUKE | 1129 | -1129 | -22.6 | | | -1129 | -22.6 | | | -1129 | -22.6 |
| 11006 | 2 | Oconee 2 | DUKE | 846 | -846 | -16.9 | | | -846 | -16.9 | | | -846 | -16.9 |
| 142 | | Total | DUKE | | -1975 | | | | -1975 | | | | -1975 | |
| 14901 | 1 | Bath County 1 | VP | 304 | -304 | -6.1 | | | -304 | -6.1 | | | -304 | -6.1 |
| 14901 | 2 | Bath County 2 | VP | 304 | -304 | -6.1 | | | -304 | -6.1 | | | -304 | -6.1 |
| 14901 | 3 | Bath County 3 | VP | 303 | -303 | -6.1 | | | -303 | -6.1 | | | -303 | -6.1 |
| 14901 | 4 | Bath County 4 | VP | 303 | -303 | -6.1 | | | -303 | -6.1 | | | -303 | -6.1 |
| 14286 | 5 | Chesterfield 5 | VP | 326 | -326 | -6.5 | | | -326 | -6.5 | | | -326 | -6.5 |
| 14287 | 6 | Chesterfield 6 | VP | 658 | -658 | -13.2 | | | -658 | -13.2 | | | -658 | -13.2 |
| 145 | | Total | VP | | -2198 | | | | -2198 | | | | -2198 | |
| **Grand Total** | | | | | **5000** | **-100.0** | | | **5000** | **-100.0** | | | **5000** | **-100.0** |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**



| **TVA Exports** **( Part 1 of 2 )** | E100 Base Case Dispatch (MW) | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | TVA to MECS | | --- | | --- | | --- | | --- | |
| | | TVA to MAIN | | --- | | --- | | TVA to MAIN | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| Bus (Number/Unit/Name/System) | | Export = | 5000 | | | | | Export = | 5000 | | |
| | (MW) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| TVA (areas 147 and 170 to 173) dispatched in proportion to available (non-dispatched) generation (2000 MW) and total load. The following MUST program method was used: | 31908 (Gens) | 2000 | 40.0 | | | | | 2000 | 40.0 | | |
| | 29666 (Load) | 3000 | 60.0 | | | | | 3000 | 60.0 | | |
| **Grand Total** | | **5000** | **100.0** | | | | | **5000** | **100.0** | | |

```
SUBSYSTEM 'TVA_GENS'
  AREA  147
  AREAS 170 173
  SCALE ALL FOR EXPORT INCLUDE OFFLINE
END
SUBSYSTEM 'TVA_LOAD'
  AREA  147
  SCALE ALL LOAD
END
SUBSYSTEM 'TVA_EXPORT'
  AREA  147
  AREAS 170 173
  PARTICIPATE
    SYSTEM TVA_GENS 40
    SYSTEM TVA_LOAD 60
  END
END
```

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**



| **TVA Exports ( Part 2 of 2 )** | E100 Base Case Dispatch (MW) | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | TVA to NE | | TVA to NE | | TVA to NE | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| Bus (Number/Unit/Name/System) | | Export = 6000 | | Export = 6000 | | Export = 6000 | | | | | |
| | (MW) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| TVA (areas 147 and 170 to 173) dispatched in proportion to available (non-dispatched) generation (2000 MW) and total load. The following MUST program method was used: | 31908 (Gens) | 2400 | 40.0 | 2400 | 40.0 | 2400 | 40.0 | | | | |
| | 29666 (Load) | 3600 | 60.0 | 3600 | 60.0 | 3600 | 60.0 | | | | |
| **Grand Total** | | **6000** | **100.0** | **6000** | **100.0** | **6000** | **100.0** | | | | |

```
SUBSYSTEM 'TVA_GENS'
  AREA  147
  AREAS 170 173
  SCALE ALL FOR EXPORT INCLUDE OFFLINE
END
SUBSYSTEM 'TVA_LOAD'
  AREA  147
  SCALE ALL LOAD
END
SUBSYSTEM 'TVA_EXPORT'
  AREA  147
  AREAS 170 173
  PARTICIPATE
    SYSTEM TVA_GENS 40
    SYSTEM TVA_LOAD 60
  END
END
```

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**



| TVA Imports | | | | | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | | | | ECAR to TVA | | --- | | --- | | --- | | ECAR to TVA | |
| | | | | | MAAC to TVA | | --- | | --- | | --- | | MAAC to TVA | |
| | | | | | MAIN to TVA | | --- | | MAIN to TVA | | --- | | MAIN to TVA | |
| | | | | E100 | --- | | --- | | --- | | --- | | --- | |
| | | | | Base | --- | | --- | | --- | | --- | | --- | |
| | | | | Case | --- | | --- | | --- | | --- | | --- | |
| Bus (Number/Unit/Name/System) | | | | Dispatch | Import = | 5000 | | | Import = | 5000 | | | Import = | 5000 |
| | | | | (MW) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| 18137 | 1 | Browns Ferry 3 | TVA | 1143 | -1143 | -22.9 | | | -1143 | -22.9 | | | -1143 | -22.9 |
| 18167 | 1 | Cumberland 1H | TVA | 681 | -681 | -13.6 | | | -681 | -13.6 | | | -681 | -13.6 |
| 18167 | 2 | Cumberland 1L | TVA | 681 | -681 | -13.6 | | | -681 | -13.6 | | | -681 | -13.6 |
| 18270 | 1 | Raccoon Mt 1 | TVA | 383 | -325 | -6.5 | | | -325 | -6.5 | | | -325 | -6.5 |
| 18271 | 1 | Raccoon Mt 2 | TVA | 383 | -325 | -6.5 | | | -325 | -6.5 | | | -325 | -6.5 |
| 18272 | 1 | Raccoon Mt 3 | TVA | 383 | -325 | -6.5 | | | -325 | -6.5 | | | -325 | -6.5 |
| 18273 | 1 | Raccoon Mt 4 | TVA | 383 | -320 | -6.4 | | | -320 | -6.4 | | | -320 | -6.4 |
| 18274 | 1 | Sequoyah 2 | TVA | 1199 | -1199 | -24.0 | | | -1199 | -24.0 | | | -1199 | -24.0 |
| 147 | | Total | TVA | | -4999 | | | | -4999 | | | | -4999 | |
| **Grand Total** | | | | | **5000** | **-100.0** | | | **5000** | **-100.0** | | | **5000** | **-100.0** |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**



| **MAIN Exports** **( Part 1 of 3 )** | E100 Base Case Dispatch (MW) | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | MAIN to MECS<br>MAIN to MAAC<br>MAIN to VACAR<br>MAIN to TVA<br>---<br>--- | | ---<br>---<br>---<br>---<br>---<br>--- | | MAIN to MECS<br>MAIN to MAAC<br>MAIN to VACAR<br>MAIN to TVA<br>---<br>--- | | MAIN to MECS<br>---<br>---<br>---<br>---<br>--- | | ---<br>---<br>MAIN to VACAR<br>MAIN to TVA<br>---<br>--- | |
| Bus (Number/Unit/Name/System) | | Export = 5000 | | | | Export = 5000 | | Export = 3000 | | Export = 5000 | |
| | | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| MAIN (areas 356, 357, 363) dispatched in proportion to available (non-dispatched) generation (9200 MW). The following MUST program method was used:<br><br>`SUBSYSTEM 'MAIN_EXPORT'`<br>`  AREA 356`<br>`  AREA 357`<br>`  AREA 363`<br>`  SCALE ALL FOR EXPORT INCLUDE OFFLINE`<br>`END` | 35780 | 5000 | 100.0 | | | 5000 | 100.0 | 3000 | 100.0 | 5000 | 100.0 |
| **Grand Total** | | **5000** | **100.0** | | | **5000** | **100.0** | **3000** | **100.0** | **5000** | **100.0** |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**



| **MAIN Exports ( Part 2 of 3 )** | E100 Base Case Dispatch (MW) | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | MAIN to NE | | --- | | MAIN to NE | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| | | --- | | --- | | --- | | --- | | --- | |
| Bus (Number/Unit/Name/System) | | Export = 6000 | | | | Export = 6000 | | | | | |
| | (MW) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| MAIN (areas 356, 357, 363) dispatched in proportion to available (non-dispatched) generation (9200 MW). The following MUST program method was used:<br><br>`SUBSYSTEM 'MAIN_EXPORT'`<br>`  AREA 356`<br>`  AREA 357`<br>`  AREA 363`<br>`  SCALE ALL FOR EXPORT INCLUDE OFFLINE`<br>`END` | 35780 | 6000 | 100.0 | | | 6000 | 100.0 | | | | |
| **Grand Total** | | **6000** | **100.0** | | | **6000** | **100.0** | | | | |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**



| **MAIN Exports** **( Part 3 of 3 )** | E100 Base Case Dispatch (MW) | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | MAIN to Kentucky --- --- --- --- --- --- | | --- --- --- --- --- --- | | MAIN to Kentucky --- --- --- --- --- --- | | --- --- --- --- --- --- | | MAIN to Kentucky --- --- --- --- --- --- | |
| Bus (Number/Unit/Name/System) | | Export = 2500 | | | | Export = 2500 | | | | Export = 2500 | |
| | | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| MAIN (areas 356, 357, 363) dispatched in proportion to available (non-dispatched) generation (9200 MW). The following MUST program method was used:<br><br>`SUBSYSTEM 'MAIN_EXPORT'`<br>`  AREA 356`<br>`  AREA 357`<br>`  AREA 363`<br>`  SCALE ALL FOR EXPORT INCLUDE OFFLINE`<br>`END` | 35780 | 2500 | 100.0 | | | 2500 | 100.0 | | | 2500 | 100.0 |
| **Grand Total** | | **2500** | **100.0** | | | **2500** | **100.0** | | | **2500** | **100.0** |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

**Table G-3**
**ECAR 2001 Summer Assessment of Transmission System Performance**
**Generation Dispatch for Transfer Scenarios**

Date: 04/17/01



| MAIN Imports / Bus (Number/Unit/Name/System) | | | | E100 Base Case Dispatch (MW) | INCREMENTAL GENERATION DISPATCH | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Case E100 | | Case E101 | | Case E102 | | Case E103 | | Case E104 | |
| | | | | | ECAR to MAIN | | --- | | --- | | ECAR to MAIN | | --- | |
| | | | | | MAAC to MAIN | | MAAC to MAIN | | --- | | MAAC to MAIN | | --- | |
| | | | | | VACAR to MAIN | | VACAR to MAIN | | --- | | --- | | --- | |
| | | | | | TVA to MAIN | | --- | | --- | | TVA to MAIN | | --- | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| | | | | | --- | | --- | | --- | | --- | | --- | |
| | | | | | Import = 5000 | | Import = 5000 | | | | Import = 5000 | | | |
| | | | | | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) | (MW) | (%) |
| 30397 | 2 | Coffeen 2 | AMRN | 530 | -530 | -10.6 | -530 | -10.6 | | | -530 | -10.6 | | |
| 30895 | 2 | Labadie 2 | AMRN | 555 | -420 | -8.4 | -420 | -8.4 | | | -420 | -8.4 | | |
| 31333 | 2 | Newton 2 | AMRN | 540 | -540 | -10.8 | -540 | -10.8 | | | -540 | -10.8 | | |
| 356 | | Total | AMRN | | -1490 | | -1490 | | | | -1490 | | | |
| 32274 | 3 | Baldwin 3 | IP | 595 | -595 | -11.9 | -595 | -11.9 | | | -595 | -11.9 | | |
| 357 | | Total | IP | | -595 | | -595 | | | | -595 | | | |
| 37522 | 1 | Braidwood 1 | CE | 1116 | -525 | -10.5 | -525 | -10.5 | | | -525 | -10.5 | | |
| 37524 | 1 | Byron 1 | CE | 1114 | -1114 | -22.3 | -1114 | -22.3 | | | -1114 | -22.3 | | |
| 37529 | 4 | Collins 4 | CE | 515 | -515 | -10.3 | -515 | -10.3 | | | -515 | -10.3 | | |
| 37551 | 1 | Quad Cities 1 | CE | 762 | -762 | -15.2 | -762 | -15.2 | | | -762 | -15.2 | | |
| 363 | | Total | CE | | -2916 | | -2916 | | | | -2916 | | | |
| **Grand Total** | | | | | **5000** | **-100.0** | **5000** | **-100.0** | | | **5000** | **-100.0** | | |

Case E100 = ECAR Primary Base Case E100
Case E101 = ECAR Primary Base Case E100 + EAST to WEST 4000 MW Transfer Bias
Case E102 = ECAR Primary Base Case E100 + WEST to EAST 4000 MW Transfer Bias
Case E103 = ECAR Primary Base Case E100 + SOUTH to NORTH 4000 MW Transfer Bias
Case E104 = ECAR Primary Base Case E100 + NORTH to SOUTH 4000 MW Transfer Bias

# APPENDIX H

## Operating Procedures

This section of the Appendix lists and briefly describes those operating procedures which are available to allow for improvement of transfer capabilities or alleviate facility overloads in specific areas of the ECAR bulk transmission network. These operating procedures have been developed by member systems and are designed to relieve overloading problems that may result from interconnected system operation. The date of first publication and latest revision in this series of reports, is also shown.

**Black Oak 500-138 kV (AP) Transformer (May 1999)**

When single contingency analysis results show that the Black Oak 500-138 kV (AP) transformer may become a thermal limit for regional and inter-regional transfers, and analysis indicates that by opening the transformer the thermal limits are relieved, the transformer may be opened.

**Broadford - Atkins - Wythe 138 kV (AEP) (May 1998)**

To prevent overloads on the Broadford - Smyth - Atkins - Rural Retreat - Mount Airy - Wythe 138 kV (AEP) path resulting from a loss of the Broadford - Jacksons Ferry 765 kV (AEP) circuit, an 8% series reactor will automatically be inserted at the Broadford end of the Broadford - Atkins 138 kV (AEP) circuit upon the loss of the Broadford - Jacksons Ferry 765 kV (AEP) circuit.

**Burma - Piney 115 kV (AP-PENELEC)**
**Carroll - Germantown 138 kV (AP-METED)**
**Garrett - Deep Creek 115 kV (AP-PENELEC)**
**Grand Point - Roxbury 138 kV (AP-PENELEC)**
**Social Hall - Blairsville 138 kV (AP-PENELEC) (November 1987)**

These tielines between AP and companies in the MAAC Region may be opened if necessary during west-to-east power transfer conditions to protect various facilities such as the Grand Point - Roxbury 138 kV, Catoctin - Carroll 138 kV, and Carlisle - Roxbury 115 kV circuits. The need for implementation of these operating procedures is strongly dependent on local load and generation patterns.

**Columbus Region Emergency Procedures (AEP) (November 1999)**

The Columbus Region Emergency Procedures (CREP) were developed by AEP to reduce the risk of a voltage collapse in the Central Ohio area. These procedures include: (1) dispatching Conesville and Picway generation at full output; (2) removing the 765 kV shunt reactors at Marysville; (3) switching shunt capacitors by supervisory control; (4) requesting voluntary load curtailments; and (5) initiating load shedding. These procedures would be enacted at times of peak demand on the transmission network in conjunction with transmission outages.

**Cook 765-345 kV (AEP) Transformer**
**Dumont 765-345 kV (AEP) Transformer (May 2000)**

An outage of the 765-345 kV transformer at either the Cook or Dumont station, in conjunction with peak loads and high levels of power transactions (particularly into MECS) may lead to an overload of the 765-345 kV transformer at the other station. If a contingency overload occurs (or anticipated to occur), the Dumont - Olive 345 kV and Cook - Kenzie Creek 345 kV (AEP) lines can be opened to reduce transformer loadings. This operating procedure is not expected to be initiated in isolation of other control options.

The anticipated operating mode of the Phase Angle Regulators (PARs) on the Michigan - Ontario interface (that of holding a fixed flow at reserved transfer levels) results in increased loadings on the Cook and Dumont transformers. Furthermore, transformer overloads are most likely when there are heavy power sales to MECS from the south (i.e., AEP, FE, and NIPS). Accordingly, it is expected that use of this operating procedure will be part of a joint effort which includes the beneficial control of the PARs and possibly the reduction of transfers into Michigan from the south.

**Elrama - Mitchell 138 kV (DLCO-AP) (November 1990)**

Heavy loadings on the Elrama - Mitchell 138 kV (DLCO-AP) circuit may be reduced by (1) opening a Collier 345-138 kV (DLCO) transformer, (2) opening the Collier - Woodville 138 kV (DLCO) line at Woodville, (3) re-dispatching generation at the Mitchell and Elrama generating stations, or (4) removing the Elrama - Mitchell 138 kV (DLCO-AP) circuit from service.

**Gallagher (CIN) Generating Station (May 1995)**

A double contingency outage of the two 230 kV lines from the plant could cause the Gallagher 230-138 kV (CIN) transformer to overload. In the event of a double contingency and resulting overload, the 230 kV generation would be reduced to a level below the emergency rating of the transformer.

**Genoa - Latson 138 kV (CONS-DECO)**
**Hemphill - Hunters Creek 120 kV (CONS-DECO)**
**Karn - Atlanta - Thetford 138 kV (CONS-DECO-CONS) (May 1991)**

The loss of the double circuit tower containing the Jewell - Thetford 345 kV and Pontiac - Hampton 345 kV lines may cause the Hemphill - Hunters Creek 120 kV, Karn - Atlanta - Thetford 138 kV, and Genoa - Latson 138 kV lines to exceed their emergency (24-hour) ratings. If the real-time security analysis program indicates that post contingency flows would exceed the short-term (4-hour) ratings, the following operating procedures may be implemented: (1) if CONS system security is not jeopardized, CONS will split the Hemphill bus into two bus groups; (2) if DECO system security is not jeopardized, DECO will split the Hunters Creek bus by opening bus sectionalizing breaker 101-102; (3) reduce generating output at Thetford, Karn 3, or Karn 4 to relieve the potential overload condition.

**Gibson - Petersburg 345 kV (CIN-IPL) (May 1997)**

In the event the Gibson - Petersburg 345 kV (CIN-IPL) circuit overloads, CIN has an existing operating procedure to reduce generation at Gibson upon the loss of multiple transmission outlets. This operating procedure will eliminate the overload condition.

**Green River 161-138 kV (LGEE) Transformers (May 1997)**

If one of the two Green River 161-138 kV (LGEE) transformers, located at the LGEE-BREC interface, is out of service and the flow through the remaining in-service transformer exceeds its rating, it will be removed from service.

**Hoytdale-Maple-Krendale-Butler 138 kV (FE-AP) (Nov 1987 /Rev May 1999)**

The west-to-east loading on the Hoytdale - Maple - Seneca - Krendale - Shanor Manor - Butler 138 kV path can be relieved by opening the Maple - Krendale 138 kV (FE-AP) portion. This procedure would be initiated by the FE system, but could be called upon by either FE or AP. Additionally, opening the Maple - Krendale 138 kV (FE-AP) line section can also relieve loadings on the same line section in the east-to-west direction. This procedure would be initiated by FE, but could be called upon by either FE or AP.

**Kanawha River - Matt Funk 345 kV (AEP) (Nov. 1987 / Rev. May 1995)**

The Kanawha River - Matt Funk 345 kV (AEP) circuit is subject to excessive voltage decline, large phase-angle separation, and possible steady-state instability, caused by the outage of parallel EHV facilities. To enhance its loadability characteristics, adjustable series compensation (from 0% to 60% in steps of 10%) was placed in service in 1991. An appropriate level of series compensation will be inserted on a pre-contingency basis to increase the loadability of the circuit, thereby improving the overall performance of the transmission system in the area. Furthermore, in accordance with a prior agreement between AEP and AP, series compensation may be inserted to reduce flows on AP 500 kV facilities when the combined MAAC and VP imports from ECAR are curtailed below 2800 MW. When appropriate, series compensation levels may also be adjusted as part of a NERC Security Coordinator's efforts to maintain regional reliability margins. Zero percent series compensation is modeled in study base cases.

Based on several factors, including the status of the 450 MVAR shunt reactors at the Cloverdale 765 kV station and the 300 MVAR shunt reactor at the Axton 765 kV station, the prior and anticipated outages, and the amount of series compensation, the maximum recommended contingency loading will vary from approximately 500 MW to 1,600 MW. If the Kanawha River - Matt Funk 345 kV circuit actually reaches these loading levels following an outage, the parallel 138 kV paths may be overloaded, requiring operator intervention. Operating procedures to limit loading on this circuit include reducing pumping loads at Smith Mountain and Bath County, shifting local generation, and/or reducing transfers to the east and south.

**Kokomo - Highland Park 230-138-69 kV (CIN) Transformers (May 1988)**

The 138 kV windings of the three 230-138-69 kV transformers at Kokomo - Highland Park may overload for large transfers from west-to-east or during certain generation or transmission outages in the vicinity of the Greentown 765 kV substation. This overload may be reduced or eliminated by splitting the 138 kV bus at Greentown which isolates the Greentown - Hummel Creek 138 kV (AEP) and Greentown - Grant 138 kV (AEP) circuits from the Greentown - Kokomo 138 kV (CIN) and Greentown - Wabash 138 kV (CIN) circuits.

**Kyger Creek - Sporn 345 kV (OVEC-AEP) (May 2000)**

Past operating experience indicates that the Kyger Creek - Sporn 345 kV tieline between OVEC and AEP may become heavily loaded by high levels of west-to-east transactions, especially if these transfers coincide with reduced output at any of several AEP plants east of this tieline. AEP and OVEC have agreed to open the Kyger Creek - Sporn 345 kV circuit, as needed. Opening this tieline under these conditions will increase loadings on the Sargents 345-138 kV transformer, but the existing operating procedure to address the transformer loading concerns are still applicable. No other overloads would be expected to result from implementation of these operating procedures.

**Lake Erie Emergency Re-dispatch Procedure (May 1999)**

The objective of the Lake Erie Emergency Re-dispatch (LEER) procedure is to facilitate emergency re-dispatch among participants within the Lake Erie Control Area (AEP, AP, MECS, NYPP, OH, and PJM) to avoid the shedding of firm load. The LEER procedure is only intended to be for emergency re-dispatch to relieve transmission constraints that could otherwise result in the requirement of another Lake Erie Company to shed firm load. The LEER procedure would only be fully effected when firm load curtailment is imminent. Lake Erie Control Areas must purchase emergency power from unconstrained directions or from other sources, if possible, before calling on LEER emergency re-dispatch. The Lake Erie Security Process is considered a supplement to the NERC Transmission Loading Relief (TLR) Procedure and may be implemented in place of or in addition to the NERC TLR Procedure.

**Leslie - Stinnett - Pineville 161 kV (AEP-TVA) (November 1997)**

Loading on the Leslie - Stinnett - Pineville 161 kV (AEP-TVA) circuit may be reduced by inserting the 8% series reactor located at the Leslie station.

**Lincoln - Northeast - Northwest 120 kV (DECO) (Nov. 1987 / Rev. May 2001)**

An overload protection scheme has been installed to open section breakers at the Northwest Station (DECO) whenever the loading on the Northwest end of the Lincoln - Northeast - Northwest 120 kV line exceeds its summer emergency rating of 250 MVA. The loss of the double-circuit tower containing the Belle River - Pontiac 345 kV (DECO) and Belle River - Greenwood - Pontiac 345 kV

(DECO) lines or the loss of the double-circuit tower containing the Pontiac - Placid - Wayne 345 kV and Quaker - Wixom - Wayne 345 kV (DECO) lines could cause the flow on the Lincoln - Northeast - Northwest 120 kV line to exceed its emergency rating. This overload is more severe if the Jewell - Thetford 345 kV line is out of service or when Greenwood generation is running. The overload on the Lincoln - Northeast - Northwest 120 kV line is reduced by opening Northwest section breakers. Depending upon system conditions, splitting the 120 kV ring bus may not eliminate the Lincoln - Northeast - Northwest 120 kV overload. A new trip scheme implemented in 1999 rejects generation at Greenwood for a loss of the Pontiac - Belle River 345 kV and Belle River - Greenwood - Pontiac 345 kV (DECO) double-circuit tower.

**Muskingum River - Wolf Creek - Corner 138 kV (AEP-AP)**
**Riverview - Corner 138 kV (AP) (May 1995)**

Heavy loadings on the Muskingum River - Wolf Creek - Corner 138 kV (AEP-AP) tieline or Riverview - Corner 138 kV (AP) circuit may be reduced by one of the following options: (1) opening the Belmont end of the Belmont - Riverview 138 kV (AP) circuit; (2) adjusting generation levels at the Willow Island (AP) generating plant; or (3) opening the Muskingum River - Wolf Creek 138 kV (AEP-AP) tieline. In addition, loadings in the Muskingum River to Wolf Creek direction may be relieved by reducing output at the Muskingum River generating plant. The specific action chosen will depend on local conditions at the time.

**Newtonville - Cloverport 138 kV (SIGE-LGEE) (May 1994 / Rev. May 1998)**

The Newtonville - Cloverport 138 kV (SIGE-LGEE) line may overload under contingency conditions (loss of the Wilson - Green River 161 kV (BREC-LGEE) circuit). To increase transfers, BREC would attempt to lower the output of the Coleman generating station (go off economic dispatch) to relieve the loading on this line if it could do so without interrupting exports. If this action does not relieve the loading on this line, SIGE would open the line.

**Petersburg 345-138 kV (IPL) Transformers (May 2000)**

The Local Petersburg Autotransformer Operating Procedure was implemented on January 6, 2000, to alleviate potential overloads on the two Petersburg 345-138 kV autotransformers. When loadings on these two autotransformers approach their operating limits, IPL will notify the ECAR MET Security

Coordinator, SIGE, CIN, and HE, that if the Petersburg autotransformer power flows and temperatures continue to increase, IPL will implement the Local Petersburg Autotransformer Operating Procedure to alleviate the overload if the situation does not allow the time for curtailing non-firm transmission transactions. Should such emergency conditions occur, IPL will notify CIN and open the Petersburg - Vincennes Junction 138 kV (IPL-CIN) line, as recommended by the ECAR August 31, 1998, Disturbance Report, dated July 16, 1999. If loadings continue to increase, IPL will notify CIN and close the Petersburg - Vincennes Junction 138 kV line, and will ask SIGE to split the 138 kV bus at Dubois. If the Dubois bus is not split, IPL will open the Dubois 138 kV line terminal at Petersburg. If the loadings continue to increase, IPL will notify CIN and open the Petersburg - Oakland City 138 kV (IPL-CIN) line. As soon as conditions allow, the lines will be returned to service and non-firm transactions will be resumed.

**Pierce 345 kV (OVEC) Station (May 2001)**

To prevent exposure to possible fault duties in excess of the capability of many of the 345 kV breakers at the Pierce station, Pierce circuit breakers E and G will be operated "Normally Open" until installation of higher capability breakers is completed, expected by 2004 Summer. This temporary reconfiguration will leave the Dearborn - Pierce #1 345 kV (OVEC) and Pierce - X533 #1 345 kV (OVEC) circuits connected to each other, but isolated from the remainder of the Pierce station. This temporary change is expected to have little effect on flows in the area for most operating conditions. Breakers E and G could be reclosed, if desired, during outages of the Pierce - Foster 345 kV (OVEC-CIN) tieline.

**Pierce 345-138 kV (OVEC) Transformer (January 1990)**

The Pierce 345-138 kV (OVEC) transformer may experience heavy loading depending on the status of the system. In the event the Pierce transformer exceeds its emergency rating, CIN would remove the transformer from service at the request of OVEC.

**Reliability Coordination Plan (AP-PJM-VP) (November 1990)**

To control loadings on the ECAR-MAAC-VP interface, including on the Pruntytown - Mount Storm 500 kV (AP-VP) and Mount Storm - Meadow Brook 500 kV (VP-AP) circuits, a Reliability Coordination Plan (RCP) is in place between AP, PJM, and VP. The RCP is used to curtail or freeze transfers to

ensure that adequate thermal and voltage reliability is maintained. For more information regarding these thermal and voltage limitations, refer to the latest VEM seasonal operating study.

**Ridgeway - Dan River 138 kV (AEP-DUKE) (November 1991)**

Loading on the Ridgeway - Dan River 138 kV (AEP-DUKE) circuit may be reduced by inserting either one or both of the 18.8% series reactors into the line.

**Rockport (AEP) Generation (May 1995)**

During certain transmission contingencies, including an outage of the Rockport - Jefferson 765 kV (AEP) circuit, generation at the Rockport Plant will be curtailed to address certain thermal, voltage, and stability concerns in the area. Maximum plant output levels for various combinations of outages, while utilizing several special controls (single phase switching, fast valving, rapid unit runback, emergency unit tripping, etc.) available at the plant, are outlined in the Rockport Operating Guidelines developed by AEP.

**Rodburn 138-69 kV (LGEE) Transformer (November 1987) (Rev. May 1992)**

In the event of an overload of the Rodburn 138-69 kV transformer, located at the 69 kV EKPC-LGEE-AEP interface, a procedure exists to open the Morehead - Leon 69 kV circuit at Morehead and/or transfer the Index 69 kV station load to Jackson.

**Saint Clair - Lambton (L4D) 345 kV (DECO-HONI)**
**Saint Clair - Lambton (L51D) 345 kV (DECO-HONI)**
**Bunce Creek - Scott (B3N) 230 kV (DECO-HONI)**
**Waterman - Keith (J5D) 230 kV (DECO-HONI) (May 1988 / Rev. Aug. 1990)**

The Michigan - Ontario interface flow may be optimized for various system conditions by: (1) adjusting the ± 30° phase shifter regulator on the Waterman - Keith 230 kV interconnection; (2) switching the Saint Clair generating unit #6 from the 345 kV to the 120 kV switchyards; (3) operating Marysville generating units #7 and #8; (4) using real-time ratings for the Waterman - Keith 230 kV and Bunce Creek - Scott 230 kV interconnections; (5) arming the generation rejection scheme at Lambton. One Lambton unit (485 MW) may be selected for automatic

generation rejection for the loss of either the L4D or L51D interconnections (both terminate at the Lambton and Saint Clair Power Plants).

**Sargents 345-138 kV (OVEC) Transformer (Nov. 1992 / Rev. May 2000)**

To relieve overloads on the Sargents 345-138 kV (OVEC) transformer, the preferred procedure is to open the Sargents - Wakefield 138 kV (OVEC-AEP) line. If this action is not adequate, the Sargents 345 kV high side breakers at the DOE X530 station may be opened, while leaving the Sargents - Waverly 138 kV (OVEC-AEP) and Sargents - Wakefield 138 kV (OVEC-AEP) circuits tied together on the low side. This procedure must be coordinated between OVEC and AEP to minimize risk to area loads while correcting the transformer overload condition.

**Southern Transmission Emergency Procedures (AEP)**
**(November 1997 / Revised November 1999)**

The Southern Transmission Emergency Procedures (STEP), developed by AEP, are intended to reduce, to the extent possible, excessive loadings on critical transmission and subtransmission facilities located within AEP's Roanoke Transmission Region. These procedures, which incorporate the Kanawha River - Matt Funk 345 kV (AEP) operating procedure, were developed to address transmission loadings and voltage conditions that may occur at critical facilities within AEP's Roanoke Transmission Region due to the delay of the Wyoming - Cloverdale Project. Specific actions that may be taken as part of these procedures include: (1) removing the 765 kV shunt reactors at selected stations; (2) adjusting the series compensation on the Kanawha River - Matt Funk 345 kV (AEP) circuit; (3) redispatching generation; (4) curtailing transfers from AEP to the east, southeast, and south; (5) purchasing power from the east and south; (6) requesting voluntary load curtailments; and (7) initiating load shedding.

**Springdale - Cheswick 138 kV (AP-DLCO) (May 1991)**

During normal system operating conditions with Cheswick generation on-line, the Springdale - Cheswick 138 kV interconnection between AP and DLCO is operated normally open, because circuit loading approaches the continuous rating. When Cheswick generation is off-line, the interconnection is placed in service.

**State Line - Wolf Lake - Sheffield 138 kV (CE-NIPS) (November 1987)**

Loading on the State Line - Wolf Lake - Sheffield 138 kV circuits may be reduced by shifting generation at State Line, Mitchell, Schahfer, and Dune Acres. The Wolf Lake - State Line 138 kV circuit could also be opened if overloaded.

**Transmission Loading Relief Procedure (NERC) (May 1998 / Rev. May 1999)**

The NERC Transmission Loading Relief (TLR) Procedure is a step-by-step procedure for preventing transmission overloads through the curtailment of transactions and the re-dispatch of generation. Details and up-to-date information about the TLR may be obtained from the NERC home page (www.nerc.com).

**Wabash River - Crawfordsville 138 kV (CIN) (May 1997)**

If the Wabash River - Crawfordsville 138 kV (CIN) circuit overloads under contingency conditions, CIN will open the Crawfordsville - Lafayette Southeast 138 kV (CIN) circuit. This action is effective in reducing the overload.

**Worthington 345-138 kV (HE) Transformer (May 2000)**

The Worthington 345-138 kV (HE) transformer will be operated out-of-service during the summer months when the Worthington 170 MW combustion turbine is in operation. This is being done to prevent any potential contingency overloads on the Cinergy transmission system when the Worthington CT is operating. When the Worthington CT is not operating, the Worthington 345-138 kV transformer will be operated in service.

# APPENDIX I

## Contingency Outages

This appendix contains a listing of the contingency outages that were considered as part of this ECAR seasonal transmission assessment. These contingencies are categorized under the following four types of outages: (1) single circuits; (2) single circuit segments of multiple terminal circuits (circuit segments that can be outaged by automatically sectionalizing multiple terminal circuits); (3) multiple terminal circuits (single circuit segments that are outaged together by normal circuit breaker action); and (4) selected double-circuit towers. Specifically, those outages which have a "YES" entry under the ECAR label were the ones simulated in this ECAR seasonal transmission assessment.

ECAR TYPE 1 OUTAGES -- SINGLE (TWO TERMINAL) CIRCUIT OUTAGES.
SINGLE (TWO TERMINAL) CIRCUITS, 345 KV OR ABOVE WITH LOWER VOLTAGE CIRCUITS INCLUDED BY EXCEPTION, THAT ARE OUTAGED BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR MEN | MET | VEM | GROUP | IN | OUT | N/A N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AEP | 05AMOS 765 | 05CULLOD 765 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05AMOS 765 | 05MOUNTN 765 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05BAKER 765 | 05BROADF 765 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05BAKER 765 | 05CULLOD 765 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05BAKER 765 | 05HANG R 765 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05BROADF 765 | 05J.FERR 765 | 1 | | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05CLOVRD 765 | 05J.FERR 765 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05CLOVRD 765 | 05WYOMIN 765 | 1 | YES | YES | YES | 001 | 2004S | | | AEP (AP) |
| AEP | 05CULLOD 765 | 05WYOMIN 765 | 1 | YES | YES | YES | 001 | 2004S | | | AEP (AP) |
| AEP | 05CULLOD 765 | 05GAVIN 765 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05J.FERR 765 | 05WYOMIN 765 | 1 | YES | YES | YES | 001 | 2004S | | | AEP (AP) |
| AEP | 05CLOVRD 765 | 05CLOVRD 500 | 1 | YES | YES | YES | 001 | 2004S | | | AEP (AP) |
| AEP | 05AMOS 765 | 05AMOS 345 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05BAKER 765 | 05BAKER 345 | 1 | YES | YES | | 001 | | | | AEP (AP) |
| AEP | 05CLOVRD 765 | 05CLOVRD 345 | 1 | YES | YES | YES | 001 | 2004S | | | AEP (AP) |
| AEP | 05BROADF 765 | 05BROADF 138 | 1 | YES | YES | | 001 | | | | AEP (AP) |
| AEP | 05J.FERR 765 | 05J.FERR 138 | 1 | YES | YES | | 001 | | | | AEP (AP) |
| AEP | 05NAGEL 500 | 05NAGEL 138 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05AMOS 345 | 05KANAWH 345 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05AMOS 345 | 05SPORN 345 | 1 | YES | | | 001 | | | | AEP (AP) |
| AEP | 05CLOVRD 345 | 05M FUNK 345 | 1 | YES | | YES | 001 | | | | AEP (AP) |
| AEP | 05AMOS 345 | 05AMOS 138 | 7 | YES | | | 001 | | | | AEP (AP) |
| AEP | 05AMOS 345 | 05AMOS 138 | 8 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05CLOVRD 345 | 05CLOVRD 138 | 3 | YES | | | 001 | | | | AEP (AP) |
| AEP | 05SPORN 345 | 05SPORNB 138 | 3 | YES | | | 001 | | | | AEP (AP) |
| AEP | 05BRADLE 138 | 05KANAWH 138 | 1 | | | YES | 001 | | | | AEP (AP) |
| AEP | 05GLENLY 138 | 05CLYTR1 138 | 1 | | | YES | 001 | | | | AEP (AP) |
| AEP | 05LOGAN 138 | 05WYOMIN 138 | 1 | | | YES | 001 | | | | AEP (AP) |
| AEP-CPL | 05EDANV1 230 | 6ROX 1-4 230 | 1 | YES | YES | YES | 001 | 1998S | | | AEP (AP) |
| AEP-CPL | 05EDANV2 230 | 6YANCY T 230 | 1 | YES | YES | YES | 001 | 1998S | | | AEP (AP) |
| AEP-OVEC | 05SPORN 345 | 06KYGER 345 | 1 | YES | | | 001 | | | | AEP (AP) |
| AEP-TVA | 05NAGEL 500 | 8PHIPP B 500 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP-TVA | 05NAGEL 500 | 8SULLIVA 500 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP-VP | 05LEESVI 138 | 4ALTVSTA 138 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |

ECAR TYPE 1 OUTAGES -- SINGLE (TWO TERMINAL) CIRCUIT OUTAGES.
SINGLE (TWO TERMINAL) CIRCUITS, 345 KV OR ABOVE WITH LOWER VOLTAGE CIRCUITS INCLUDED BY EXCEPTION, THAT ARE OUTAGED BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AEP | 05COOK 765 | 05DUMONT 765 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05DUMONT 765 | 05GRNTWN 765 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05DUMONT 765 | 05MARYSV 765 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05GRNTWN 765 | 05JEFRSO 765 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05JEFRSO 765 | 05ROCKPT 765 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05ROCKPT 765 | 05SULLVA 765 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05COOK 765 | 05COOK 345 | 1 | YES | YES | YES | | 001 | | | | | AEP (IM) |
| AEP | 05SULLVA 765 | 05BREED 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05SULLVA 765 | 05BREED 345 | 2 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05ALLEN 345 | 05ROB PK 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05BREED 345 | 05DEQUIN 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05BREED 345 | 05EUGENE 345 | 1 | YES | YES | YES | | 001 | | | | | AEP (IM) |
| AEP | 05COOK 345 | 05OLIVE 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05DEQUIN 345 | 05EUGENE 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05DESOTO 345 | 05FALL C 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05DESOTO 345 | 05DESOTO 138 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05FALL C 345 | 05FALL C 138 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05ROB PK 345 | 05ROB PK 138 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05SORENS 345 | 05SORENS 138 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05TANNER 345 | 05TANNER 138 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05TWIN B 345 | 05TWIN B 138 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP-CIN | 05GRNTWN 765 | 08GRNTWN 138 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP-CIN | 05EUGENE 345 | 08CAYUGA 345 | 1 | YES | | YES | | 001 | | 2000S | | | AEP (IM) |
| AEP-CIN | 05EUGENE 345 | 08CAYSUB 345 | 1 | YES | | YES | | 001 | 2000S | | | | AEP (IM) |
| AEP-CIN | 05TANNER 345 | 08EBEND 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP-CIN | 05HUMMEL 138 | 08GRNTWN 138 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP-CIPS | 05BREED 345 | CASEY 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP-CONS | 05COOK 345 | 18PALISA 345 | 1 | YES | YES | YES | | 001 | | | | | AEP (IM) |
| AEP-CONS | 05ROB PK 345 | 18ARGENT 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP-CONS | 05TWIN B 345 | 18ARGENT 345 | 1 | YES | YES | YES | | 001 | | | | | AEP (IM) |
| AEP-IPL | 05BREED 345 | 16PETE 345 | 1 | YES | | YES | | 001 | | 2000S | | | AEP (IM) |
| AEP-IPL | 05BREED 345 | 16WHEAT 345 | 1 | YES | | YES | | 001 | 2000S | | | | AEP (IM) |
| AEP-IPL | 05TANNER 345 | 16HANNA 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP-NI | 05DUMONT 765 | WILTO; 765 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP-NI | 05OLIVE 345 | E FRA; R 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |

ECAR TYPE 1 OUTAGES -- SINGLE (TWO TERMINAL) CIRCUIT OUTAGES.
SINGLE (TWO TERMINAL) CIRCUITS, 345 KV OR ABOVE WITH LOWER VOLTAGE CIRCUITS INCLUDED BY EXCEPTION, THAT ARE OUTAGED BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AEP-NI | 05OLIVE 345 | G ACR; T 345 | 1 | YES | YES | YES | | 001 | | | | | AEP (IM) |
| AEP-NIPS | 05DUMONT 345 | 17STLWEL 345 | 1 | YES | YES | YES | | 001 | | | | | AEP (IM) |
| AEP | 05GAVIN 765 | 05MARYSV 765 | 1 | YES | | YES | | 001 | | | | | AEP (OP) |
| AEP | 05GAVIN 765 | 05MOUNTN 765 | 1 | YES | | YES | YES | 001 | | | | | AEP (OP) |
| AEP | 05HANG R 765 | 05JEFRSO 765 | 1 | YES | | YES | | 001 | | | | | AEP (OP) |
| AEP | 05KAMMER 765 | 05MARYSV 765 | 1 | YES | | YES | | 001 | | 2001S | | | AEP (OP) |
| AEP | 05MARYSV 765 | 05ORANGE 765 | 1 | YES | | YES | | 001 | 2001S | | | | AEP (OP) |
| AEP | 05BEATTY 345 | 05BIXBY 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05BEATTY 345 | 05HAYDEN 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05BIXBY 345 | 05CONES 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05BIXBY 345 | 05MARQUI 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05CANTNC 345 | 05SCANTO 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05CONES 345 | 05CORRID 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05CONES 345 | 05HYATT 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05CORRID 345 | 05HYATT 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05E LIMA 345 | 05FOSTOR 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05E LIMA 345 | 05MARYSV 345 | 1 | YES | YES | YES | | 001 | | | | | AEP (OP) |
| AEP | 05E LIMA 345 | 05SW LIM 345 | 1 | YES | YES | | | 001 | | | | | AEP (OP) |
| AEP | 05HAYDEN 345 | 05HYATT 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05HYATT 345 | 05MARYSV 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05KAMMER 345 | 05MUSKNG 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05MARYSV 345 | 05SW LIM 345 | 1 | YES | YES | YES | | 001 | | | | | AEP (OP) |
| AEP | 05MUSKNG 345 | 05SPORN 345 | 1 | YES | | | | 001 | | 2002S | | | AEP (OP) |
| AEP | 05WATERF 345 | 05MUSKNG 345 | 1 | YES | | | | 001 | 2002S | | | | AEP (OP) |
| AEP | 05WATERF 345 | 05SPORN 345 | 1 | YES | | | | 001 | 2002S | | | | AEP (OP) |
| AEP | 05MUSKNG 345 | 05TIDD 345 | 1 | YES | | | YES | 001 | | 2002S | | | AEP (OP) |
| AEP | 05BEVERL 345 | 05MUSKNG 345 | 1 | YES | | | YES | 001 | 2002S | | | | AEP (OP) |
| AEP | 05BEVERL 345 | 05TIDD 345 | 1 | YES | | | YES | 001 | 2002S | | | | AEP (OP) |
| AEP | 05BEATTY 345 | 05BEATTY 138 | 3 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05BIXBY 345 | 05BIXBY 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05BIXBY 345 | 05BIXBY 138 | 2 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05CORRID 345 | 05CORRID 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05FOSTOR 345 | 05FOSTOR 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05ROBERT 345 | 05ROBERT 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |

ECAR TYPE 1 OUTAGES -- SINGLE (TWO TERMINAL) CIRCUIT OUTAGES.
SINGLE (TWO TERMINAL) CIRCUITS, 345 KV OR ABOVE WITH LOWER VOLTAGE CIRCUITS INCLUDED BY EXCEPTION, THAT ARE OUTAGED BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AEP | 05SCANTO 345 | 05SCANTO 138 | 1 | YES | | | | 001 | | 2001S | | | AEP (OP) |
| AEP | 05SCANTO 345 | 05SCANTE 138 | 1 | YES | | | | 001 | 2001S | | | | AEP (OP) |
| AEP | 05SCANTO 345 | 05SCANTW 138 | 1 | YES | | | | 001 | 2001S | | | | AEP (OP) |
| AEP | 05SW LIM 345 | 05SW LIM 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-AP | 05TIDD 345 | 01WYLIER 345 | 1 | YES | YES | | YES | 001 | | | | | AEP (OP) |
| AEP-AP | 05TIDD 138 | 01CARNEG 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-AP | 05TIDD 138 | 01MAHNSL 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-AP | 05TILTON 138 | 01WINDSR 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-DLCO | 05TIDD 345 | 15COLLIE 345 | 1 | YES | | | YES | 001 | | | | | AEP (OP) |
| AEP-DPL | 05BEATTY 345 | 09ADKINS 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-DPL | 05BEATTY 345 | 09GREENE 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-DPL | 05MARQUI 345 | 09KILLEN 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-DPL | 05SW LIM 345 | 09SHELBY 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-DPL | 05HILLSB 138 | 09OHH 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-FE | 05CANTNC 345 | 02HANNA 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-FE | 05FOSTOR 345 | 02BAY SH 345 | 1 | YES | YES | | | 001 | | | | | AEP (OP) |
| AEP-FE | 05FOSTOR 345 | 02GALION 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-FE | 05FOSTOR 345 | 02LEMOYN 345 | 1 | YES | YES | | | 001 | | | | | AEP (OP) |
| AEP-FE | 05FRMNT 138 | 02LEMOYN 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-FE | 05HYATT 345 | 02TANGY 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-FE | 05SCANTO 345 | 02SAMMIS 345 | 1 | YES | | | YES | 001 | | | | | AEP (OP) |
| AEP-FE | 05SCANTO 345 | 02STAR 345 | 1 | YES | YES | | YES | 001 | | | | | AEP (OP) |
| AEP-FE | 05CANTNC 138 | 02CLVRDL 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-FE | 05CANTNC 138 | 02BLUBEL 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-FE | 05TORREY 138 | 02CLVRDL 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-FE | 05W CANT 138 | 02DALE 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-FE | 05W.END 138 | 02LEMOYN 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-OVEC | 05MARQUI 345 | 06DOE530 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-OVEC | 05MARQUI 345 | 06DOE533 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AP | 01BEDNGT 500 | 01BLACKO 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01BEDNGT 500 | 01DOUBS 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01BELMNT 500 | 01HARRSN 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01BLACKO 500 | 01HATFLD 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01CABOT 500 | 01WYLIER 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01FMARTN 500 | 01HATFLD 500 | 1 | YES | YES | | YES | 001 | | | | | AP |

ECAR TYPE 1 OUTAGES -- SINGLE (TWO TERMINAL) CIRCUIT OUTAGES.
SINGLE (TWO TERMINAL) CIRCUITS, 345 KV OR ABOVE WITH LOWER VOLTAGE CIRCUITS INCLUDED BY EXCEPTION, THAT ARE OUTAGED BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AP | 01FMARTN 500 | 01PRNTY 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01HARRSN 500 | 01PRNTY 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01HARRSN 500 | 01WYLIER 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01HATFLD 500 | 01YUKON 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01WYLIER 500 | 01WYLIER 345 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01WYLIER 500 | 01WYLIER 345 | 2 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01WYLIER 345 | 01WYLIER 138 | 1 | YES | | | | 001 | | | | | AP |
| AP | 01WYLIER 345 | 01WYLIER 138 | 2 | YES | | | | 001 | | | | | AP |
| AP | 01WYLIER 345 | 01WYLIER 138 | 3 | YES | | | | 001 | | | | | AP |
| AP | 01DOUBS 230 | 01AQUEDT 230 | 1 | YES | | | YES | 001 | | | | | ECAR |
| AP | 01ARMSTR 138 | 01N BETH 138 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01BURMA 138 | 01CLARN 138 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP-FE | 01WYLIER 345 | 02SAMMIS 345 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP-PEPCO | 01DOUBS 230 | STATIONH 230 | 1 | YES | | | YES | 001 | | | | | ECAR |
| AP-PJM500 | 01CABOT 500 | KEYSTONE 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP-PJM500 | 01DOUBS 500 | BRIGHTON 500 | 1 | YES | YES | | YES | 001 | | | | | ECAR |
| AP-PJM500 | 01YUKON 500 | KEYSTONE 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP-VP | 01DOUBS 500 | 8LOUDOUN 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP-VP | 01DOUBS 500 | 8MT STM 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP-VP | 01MDWBRK 500 | 8MORRSVL 500 | 1 | YES | YES | | YES | 001 | 1995S | | | | AP |
| AP-VP | 01MDWBRK 500 | 8MT STM 500 | 1 | YES | YES | | YES | 001 | 1995S | | | | AP |
| AP-VP | 01PRNTY 500 | 8MT STM 500 | 1 | YES | YES | YES | YES | 001 | | | | | AP |
| BREC | 14COLE 7 345 | 14WILSO7 345 | 1 | YES | | YES | | 001 | | | | | BREC |
| BREC | 14REID 7 345 | 14WILSO7 345 | 1 | YES | | YES | | 001 | | | | | BREC |
| BREC | 14COLE 5 161 | 14NATAL5 161 | 1 | YES | | YES | | 001 | | | | | BREC |
| BREC-LGEE | 14WILSO5 161 | 11GR RV 161 | 1 | YES | YES | YES | YES | 001 | | | | | BREC |
| BREC-LGEE | 14N.HAR4 138 | 11CLVRPR 138 | 1 | YES | | YES | | 001 | | | | | BREC |
| BREC-SIGE | 14HENDR4 138 | 10ABBRWN 138 | 1 | YES | | YES | | 001 | | | | | BREC |
| BREC-TVA | 14HOPCO5 161 | 5BARKLEY 161 | 1 | YES | | YES | | 001 | | | | | BREC |
| BREC-TVA | 14LIVIN5 161 | 5BARKLEY 161 | 1 | YES | | | | 001 | | | | | VAST |
| BREC-TVA | 14LIVIN5 161 | 5MARSHAL 161 | 1 | YES | | | | 001 | | | | | VAST |
| BREC-TVA | 14MCRAK5 161 | 5MARSHAL 161 | 1 | YES | | | | 001 | | | | | VAST |
| BREC-TVA | 14MCRAK5 161 | 5MCCRACK 161 | 1 | YES | | | | 001 | | | | | VAST |
| BREC-TVA | 14N.HAR5 161 | 5PARADIS 161 | 1 | YES | | YES | | 001 | | | | | BREC |

ECAR TYPE 1 OUTAGES -- SINGLE (TWO TERMINAL) CIRCUIT OUTAGES.
SINGLE (TWO TERMINAL) CIRCUITS, 345 KV OR ABOVE WITH LOWER VOLTAGE CIRCUITS INCLUDED BY EXCEPTION, THAT ARE OUTAGED BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR MEN | MET | VEM | GROUP | IN | OUT | N/A N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CIN | 08BEDFRD 345 | 08COLMBU 345 | 1 | YES | YES | | 001 | | | | CIN |
| CIN | 08CAYUGA 345 | 08NUCOR 345 | 1 | YES | YES | | 001 | | | | CIN |
| CIN | 08COLMBU 345 | 08GWYNN 345 | 1 | YES | YES | | 001 | | 2001S | | CIN |
| CIN | 08COLMBU 345 | 08PRESCT 345 | 1 | YES | YES | | 001 | 2001S | | | CIN |
| CIN | 08GWYNN 345 | 08PRESCT 345 | 1 | YES | YES | | 001 | 2001S | | | CIN |
| CIN | 08DEEDSV 345 | 08WALTON 345 | 1 | YES | YES | | 001 | | | | CIN |
| CIN | 08EBEND 345 | 08TERMNL 345 | 1 | YES | | | 001 | | | | CIN |
| CIN | 08GIBSON 345 | 08QUALTC 345 | 1 | YES | YES | | 001 | | 2000S | | CIN |
| CIN | 08GIBSON 345 | 08WHEAT 345 | 1 | YES | YES | | 001 | 2000S | | | CIN |
| CIN | 08WHEAT 345 | 08QUALTC 345 | 1 | YES | YES | | 001 | 2000S | 2001S | | CIN |
| CIN | 08WHEAT 345 | 08AMO 345 | 1 | YES | YES | | 001 | 2001S | | | CIN |
| CIN | 08AMO 345 | 08QUALTC 345 | 1 | YES | YES | | 001 | 2001S | | | CIN |
| CIN | 08QUALTC 345 | 08WHITST 345 | 1 | YES | YES | | 001 | | | | CIN |
| CIN | 08NUCOR 345 | 08WHITST 345 | 1 | YES | YES | | 001 | | | | CIN |
| CIN | 08GIBSON 345 | 08GIB 138 | 1 | YES | YES | | 001 | | | | ECAR |
| CIN | 08CAYUGA 230 | 08NEWLON 230 | 99 | YES | YES | | 001 | | 2000S | | ECAR |
| CIN | 08CAYUGA 230 | 08FRNKFT 230 | 1 | YES | YES | | 001 | 2000S | | | ECAR |
| CIN | 08NEWLON 230 | 08FRNKFT 230 | 1 | YES | YES | | 001 | 2000S | | | ECAR |
| CIN | 08GRNTWN 230 | 08KOEAST 230 | 1 | YES | YES | | 001 | | | | CIN |
| CIN | 08NEWLON 230 | 08WEBSTE 230 | 1 | YES | YES | | 001 | | | | CIN |
| CIN | 08STAUTN 230 | 08WAB R 230 | 1 | YES | YES | | 001 | | | | CIN |
| CIN | 08WALTON 230 | 08WEBSTE 230 | 1 | YES | YES | | 001 | | | | CIN |
| CIN | 08BATESV 138 | 08LAUREL 138 | 1 | YES | YES | | 001 | | | | CIN |
| CIN | 08GRNTWN 138 | 08MAPLE 138 | 1 | YES | YES | | 001 | 2000S | | | ECAR |
| CIN | 08GRNTWN 138 | 08DELCO 138 | 1 | YES | YES | | 001 | 2000S | | | ECAR |
| CIN-DPL | 08FOSTER 345 | 09STUART 345 | 1 | YES | | | 001 | | | | CIN |
| CIN-DPL | 08FOSTER 345 | 09SUGRCK 345 | 1 | YES | | | 001 | | | | CIN |
| CIN-DPL | 08M.FORT 345 | 09WMILTN 345 | 1 | YES | | | 001 | | | | CIN |
| CIN-DPL | 08ZIMER 345 | 09STUART 345 | 1 | YES | | | 001 | | | | CIN |
| CIN-EKPC | 08BUFTN1 138 | 20BOONE 138 | 1 | YES | YES | | 001 | | | | CIN |
| CIN-HE | 08DRESSR 345 | 07MEROM5 345 | 1 | YES | YES | | 001 | | | | HE |
| CIN-HE | 08GIBSON 345 | 07MEROM5 345 | 1 | YES | YES | | 001 | | | | HE |
| CIN-IPL | 08OKLND 138 | 16PETE 138 | 1 | YES | YES | | 001 | | | | IPL |
| CIN-IPL | 08VIN J 138 | 16PETE 138 | 1 | YES | YES | | 001 | | | | IPL |
| CIN-LGEE | 08SPEED 345 | 11GHENT 345 | 1 | YES | YES | | 001 | | | | LGEE |

ECAR TYPE 1 OUTAGES -- SINGLE (TWO TERMINAL) CIRCUIT OUTAGES.
SINGLE (TWO TERMINAL) CIRCUITS, 345 KV OR ABOVE WITH LOWER VOLTAGE CIRCUITS INCLUDED BY EXCEPTION, THAT ARE OUTAGED BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CIN-LGEE | 08SPEED 138 | 11NORTHS 138 | 1 | YES | | | | 001 | | | | | LGEE |
| CIN-LGEE | 08GALAGH 138 | 11P WEST 138 | 1 | YES | | YES | | 001 | | | | | LGEE |
| CIN-NIPS | 08DEEDSV 345 | 17LESBRG 345 | 1 | YES | | YES | | 001 | | | | | NIPS |
| CIN-OVEC | 08FOSTER 345 | 06PIERCE 345 | 1 | YES | | | | 001 | | | | | CIN |
| CIN-SIGE | 08OKLND 138 | 10TOYOTA 138 | 1 | YES | | YES | | 001 | | | | | CIN |
| CONS | 18HAMPTO 345 | 18THETFR 345 | 1 | YES | | | | 001 | | | | | CONS |
| CONS | 18KEYSTO 345 | 18LIVINS 345 | 1 | YES | | | | 001 | | | | | CONS |
| CONS | 18TALLMA 345 | 18TALLMA 138 | 1 | YES | | | | 001 | | | | | CONS |
| CONS | 18TALLMA 345 | 18TALLMA 138 | 2 | YES | | | | 001 | | | | | CONS |
| CONS | 18MCGULP 138 | 18STRAIT 138 | 1 | YES | | YES | | 001 | | | | | CONS |
| CONS | 18MCGULP 138 | 18STRAIT 138 | 3 | YES | | YES | | 001 | | | | | CONS |
| CONS-DECO | 18HAMPTO 345 | 19PONTC 345 | 1 | YES | | | | 001 | | | | | CONS |
| CONS-DECO | 18THETFR 345 | 19JEWEL 345 | 1 | YES | | | | 001 | | | | | CONS |
| CONS-DECO | 18TOMPKN 345 | 19MAJTC 345 | 1 | YES | | | | 001 | | | | | CONS |
| CONS-DECO | 18ONEIDA 345 | 19MAJTC 345 | 1 | YES | | | | 001 | 2001S | | | | CONS |
| CONS-DECO | 18HMPHLD 120 | 19HUNTC 120 | 1 | YES | | | | 001 | | | | | CONS |
| CONS-DECO | 18WHTNGA 120 | 19CUSTR 120 | 1 | YES | | | | 001 | | | | | CONS |
| CONS-NIPS | 18BATAVI 138 | 17BRTNLK 138 | 1 | YES | | | | 001 | | | | | CONS |
| DECO | 19BFOOT 345 | 19BLRPP 345 | 1 | YES | | | | 001 | 2000S | | | | DECO |
| DECO | 19BFOOT 345 | 19MADRD 345 | 1 | YES | | | | 001 | 2000S | | | | DECO |
| DECO | 19BFOOT 345 | 19PONTC 345 | 1 | YES | | | | 001 | 2000S | | | | DECO |
| DECO | 19BNSTNN 345 | 19ENFPP 345 | 1 | YES | | | | 001 | | | | | DECO |
| DECO | 19BNSTNN 345 | 19MON34 345 | 1 | YES | YES | | | 001 | | | | | DECO |
| DECO | 19BNSTNN 345 | 19WAYNE 345 | 1 | YES | | | | 001 | | | | | DECO |
| DECO | 19BNSTNS 345 | 19ENFPP 345 | 1 | YES | | | | 001 | | | | | DECO |
| DECO | 19BNSTNS 345 | 19MON12 345 | 1 | YES | YES | | | 001 | | | | | DECO |
| DECO | 19BNSTNS 345 | 19WAYNE 345 | 1 | YES | | | | 001 | | | | | DECO |
| DECO | 19BLRPP 345 | 19JEWEL 345 | 1 | YES | YES | | | 001 | | | | | DECO |
| DECO | 19BLRPP 345 | 19PONTC 345 | 1 | YES | YES | | | 001 | | | | | DECO |
| DECO | 19BLRPP 345 | 19STCPP 345 | 1 | YES | YES | | | 001 | | | | | DECO |
| DECO | 19JEWEL 345 | 19STCPP 345 | 1 | YES | YES | | | 001 | | | | | DECO |
| DECO | 19JEWEL 345 | 19STEPH 345 | 1 | YES | | | | 001 | | | | | DECO |
| DECO | 19MAJTC 345 | 19WAYNE 345 | 1 | YES | | | | 001 | | | | | DECO |
| DECO | 19MON12 345 | 19WAYNE 345 | 1 | YES | YES | | | 001 | | | | | DECO |

ECAR TYPE 1 OUTAGES -- SINGLE (TWO TERMINAL) CIRCUIT OUTAGES.
SINGLE (TWO TERMINAL) CIRCUITS, 345 KV OR ABOVE WITH LOWER VOLTAGE CIRCUITS INCLUDED BY EXCEPTION, THAT ARE OUTAGED BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DECO | 19PONTC 345 | 19WIXOM 345 | 1 | YES | | | | 001 | | | | | DECO |
| DECO | 19STCPP 345 | 19STEPH 345 | 1 | YES | YES | | | 001 | | | | | DECO |
| DECO | 19WAYNE 345 | 19QUATP 345 | 1 | YES | | | | 001 | | | | | DECO |
| DECO | 19BNSTNN 345 | 19BNSTNN 230 | 1 | YES | | | | 001 | | | | | DECO |
| DECO | 19BNSTNS 345 | 19BNSTNS 230 | 1 | YES | | | | 001 | | | | | DECO |
| DECO | 19PONTC 345 | 19PONTC1 230 | 1 | YES | | | | 001 | | | | | DECO |
| DECO | 19WAYNE 345 | 19WAYNE 230 | 1 | YES | YES | | | 001 | | | | | DECO |
| DECO | 19MON34 345 | 19MONPP 120 | 1 | YES | | | | 001 | | | | | DECO |
| DECO | 19QUAKR 345 | 19QUAKR 120 | 1 | YES | | | | 001 | | | | | DECO |
| DECO | 19STEPH 345 | 19STEPH 120 | 1 | YES | | | | 001 | | | | | DECO |
| DECO | 19STEPH 345 | 19STEPH 120 | 2 | YES | | | | 001 | | | | | DECO |
| DECO | 19WAYNE 345 | 19WAYNE 120 | 1 | YES | | | | 001 | | | | | DECO |
| DECO | 19WAYNE 345 | 19WAYNE 120 | 2 | YES | | | | 001 | | | | | DECO |
| DECO | 19WIXOM 345 | 19WIXOM 120 | 1 | YES | | | | 001 | | | | | DECO |
| DECO-FE | 19MAJTC 345 | 02LEMOYN 345 | 1 | YES | YES | | | 001 | | | | | DECO |
| DECO-FE | 19MON12 345 | 02BAY SH 345 | 1 | YES | YES | | | 001 | | | | | DECO |
| DECO-OH | 19STCPP 345 | LAMB L4D 345 | 1 | YES | YES | | | 001 | | | | | DECO |
| DECO-OH | 19STCPP 345 | LAMB L51 345 | 1 | YES | YES | | | 001 | | 2000S | | | DECO |
| DECO-OH | 19L51 PS 220 | LAMB L51 220 | 1 | YES | YES | | | 001 | 2000S | | | | DECO |
| DECO-OH | 19WTRMN 230 | J5D PS 230 | 1 | YES | YES | | YES | 001 | | | | | DECO |
| DECO-OH | 19BUNCE 230 | SCOTT 220 | 1 | YES | YES | | YES | 001 | | 2000S | | | DECO |
| DECO-OH | 19B3N PS 220 | SCOTT 220 | 1 | YES | YES | | YES | 001 | 2000S | | | | DECO |
| DLCO | 15BVRVAL 345 | 15CLINTN 345 | 1 | YES | | | | 001 | | | | | DLCO |
| DLCO | 15BVRVAL 345 | 15CRESCN 345 | 1 | YES | | | | 001 | | | | | DLCO |
| DLCO | 15CLINTN 345 | 15COLLIE 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| DLCO | 15COLLIE 345 | 15CRESCN 345 | 1 | YES | | | | 001 | | | | | DLCO |
| DLCO | 15COLLIE 138 | 15ELWYN 138 | 1 | YES | | | | 001 | | | | | DLCO |
| DLCO-FE | 15BVRVAL 345 | 02HANNA 345 | 1 | YES | | | | 001 | | | | | DLCO |
| DLCO-FE | 15BVRVAL 345 | 02MANSFD 345 | 1 | YES | | | | 001 | | | | | DLCO |
| DLCO-FE | 15BVRVAL 345 | 02SAMMIS 345 | 1 | YES | | | | 001 | | | | | DLCO |
| DLCO-FE | 15CRESCN 345 | 02MANSFD 345 | 1 | YES | | | | 001 | | | | | FE |
| DPL | 09ATLNTA 345 | 09STUART 345 | 1 | YES | | | | 001 | | | | | DPL |
| DPL | 09GREENE 345 | 09SUGRCK 345 | 1 | YES | | | | 001 | | | | | DPL |
| DPL | 09KILLEN 345 | 09STUART 345 | 1 | YES | | | | 001 | | | | | DPL |
| DPL | 09MIAMI 345 | 09SHELBY 345 | 1 | YES | | | | 001 | | | | | DPL |

ECAR TYPE 1 OUTAGES -- SINGLE (TWO TERMINAL) CIRCUIT OUTAGES.
SINGLE (TWO TERMINAL) CIRCUITS, 345 KV OR ABOVE WITH LOWER VOLTAGE CIRCUITS INCLUDED BY EXCEPTION, THAT ARE OUTAGED BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DPL | 09MIAMI 345 | 09WMILTN 345 | 1 | YES | | | | 001 | | | | | DPL |
| DPL | 09GREENE 345 | 09GREENE 138 | 1 | YES | | | | 001 | | | | | DPL |
| DPL | 09GREENE 345 | 09GREENE 138 | 2 | YES | | | | 001 | | | | | DPL |
| DPL | 09SHELBY 345 | 09SHELBY 138 | 1 | YES | | | | 001 | | | | | DPL |
| DPL | 09GRNVIL 138 | 09GRNVIL69.0 | 1 | YES | | | | 001 | | | | | ECAR |
| EKPC | 20LAURLC 161 | 20LAURLD 161 | 1 | YES | | YES | | 001 | | | | | EKPC |
| EKPC | 20JKSMIT 138 | 20POWELL 138 | 1 | YES | | YES | | 001 | | | | | LGEE |
| EKPC-LGEE | 20BLIT C 161 | 11BLUE L 161 | 1 | YES | | YES | | 001 | | | | | EKPC |
| EKPC-LGEE | 20AVON 138 | 11LOUDON 138 | 1 | YES | | YES | | 001 | | | | | EKPC |
| EKPC-LGEE | 20SPURLK 138 | 11KENTON 138 | 1 | YES | YES | YES | YES | 001 | | | | | EKPC |
| EKPC-LGEE | 20SPURLK 138 | 11KENTON 138 | 2 | YES | YES | YES | YES | 001 | | | | | EKPC |
| EKPC-TVA | 20SSHADE 161 | 5SUMMER 161 | 1 | YES | | | | 001 | | | | | VAST |
| EKPC-TVA | 20SSHADT 161 | 5SUMMER 161 | 1 | YES | | | | 001 | | | | | VAST |
| EKPC-TVA | 20RUSSEL 161 | 5WOLF CR 161 | 1 | YES | | | | 001 | | | | | VAST |
| FE | 02AVON 345 | 02BEAVER 345 | 1 | YES | YES | | YES | 001 | | | | | FE |
| FE | 02AVON 345 | 02JUNIPE 345 | 1 | YES | YES | | | 001 | | | | | FE |
| FE | 02BAY SH 345 | 02DAV-BE 345 | 1 | YES | YES | YES | | 001 | | | | | FE |
| FE | 02BEAVER 345 | 02CARLIL 345 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02BEAVER 345 | 02DAV-BE 345 | 1 | YES | YES | | | 001 | | | | | FE |
| FE | 02CARLIL 345 | 02STAR 345 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02CHAMBR 345 | 02MANSFD 345 | 1 | YES | | | YES | 001 | | | | | FE |
| FE | 02DAV-BE 345 | 02LEMOYN 345 | 1 | YES | YES | | | 001 | | | | | FE |
| FE | 02EASTLK 345 | 02JUNIPE 345 | 1 | YES | YES | | | 001 | | | | | FE |
| FE | 02EASTLK 345 | 02PERRY 345 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02FOX 345 | 02HARDIN 345 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02HANNA 345 | 02HGHLND 345 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02HANNA 345 | 02JUNIPE 345 | 1 | YES | YES | | YES | 001 | | | | | FE |
| FE | 02HARDIN 345 | 02CHAMBR 345 | 1 | YES | YES | | YES | 001 | | | | | FE |
| FE | 02HARDIN 345 | 02INLAND 345 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02HARDIN 345 | 02JUNIPE 345 | 1 | YES | YES | | | 001 | | | | | FE |
| FE | 02HARDIN 345 | 02PERRY 345 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02HGHLND 345 | 02MANSFD 345 | 1 | YES | | | YES | 001 | | | | | FE |
| FE | 02HGHLND 345 | 02SAMMIS 345 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02HGHLND 345 | 02SHNAGO 345 | 1 | YES | | | | 001 | | | | | FE |

ECAR TYPE 1 OUTAGES -- SINGLE (TWO TERMINAL) CIRCUIT OUTAGES.
SINGLE (TWO TERMINAL) CIRCUITS, 345 KV OR ABOVE WITH LOWER VOLTAGE CIRCUITS INCLUDED BY EXCEPTION, THAT ARE OUTAGED BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FE | 02HOYTDL 345 | 02MANSFD 345 | 1 | YES | | | YES | 001 | | | | | FE |
| FE | 02HOYTDL 345 | 02SHNAGO 345 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02INLAND 345 | 02PERRY 345 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02JUNIPE 345 | 02STAR 345 | 1 | YES | YES | | YES | 001 | | | | | FE |
| FE | 02LEMOYN 345 | 02MIDWAY 345 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02SAMMIS 345 | 02STAR 345 | 1 | YES | YES | | YES | 001 | | | | | FE |
| FE | 02ALLEN 345 | 02 ALLEN 138 | 1 | YES | YES | | | 001 | | | | | FE |
| FE | 02AVON 345 | 02AVON 138 | 91 | YES | YES | | | 001 | | | | | FE |
| FE | 02BAY SH 345 | 02BAYSHO 138 | 1 | YES | YES | | | 001 | | | | | FE |
| FE | 02BEAVER 345 | 02BEAVER 138 | 1 | YES | YES | | | 001 | | | | | FE |
| FE | 02BEAVER 345 | 02BEAVER 138 | 2 | YES | YES | | | 001 | | | | | FE |
| FE | 02CARLIL 345 | 02CARLIL 138 | 1 | YES | YES | | | 001 | | | | | FE |
| FE | 02EASTLK 345 | 02EASTLK 138 | 61 | YES | YES | | | 001 | | | | | FE |
| FE | 02HANNA 345 | 02HANNA 138 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02HANNA 345 | 02HANNA 138 | 2 | YES | | | | 001 | | | | | FE |
| FE | 02HGHLND 345 | 02HGHLND 138 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02HGHLND 345 | 02HGHLND 138 | 2 | YES | | | | 001 | | | | | FE |
| FE | 02HOYTDL 345 | 02HOYTDL 138 | 1 | YES | | | YES | 001 | | | | | ECAR |
| FE | 02INLAND 345 | 02INQ-11 138 | 3 | YES | YES | | | 001 | | | | | FE |
| FE | 02INLAND 345 | 02INQ-14 138 | 4 | YES | YES | | | 001 | | | | | FE |
| FE | 02JUNIPE 345 | 02JNPRQ1 138 | 45 | YES | YES | | | 001 | | | | | FE |
| FE | 02JUNIPE 345 | 02JNPRQ3 138 | 6 | YES | YES | | | 001 | | | | | FE |
| FE | 02JUNIPE 345 | 02JNPRQ4 138 | 3 | YES | YES | | | 001 | | | | | FE |
| FE | 02LEMOYN 345 | 02LEMOYN 138 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02LEMOYN 345 | 02LEMOYN 138 | 2 | YES | | | | 001 | | | | | FE |
| FE | 02MIDWAY 345 | 02MIDWAY 138 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02SHNAGO 345 | 02SHNAGO 138 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02SHNAGO 345 | 02SHNAGO 138 | 2 | YES | | | | 001 | | | | | FE |
| FE | 02STAR 345 | 02STAR 138 | 1 | YES | | | | 001 | | | | | FE |
| HE-IPL | 07RATTS8 138 | 16PETE 138 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16HANNA 345 | 16SUNNYS 345 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16PETE 345 | 16THOMPS 345 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16STOUT 345 | 16THOMPS 345 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16PETE 345 | 16PETE 138 | E | YES | | YES | | 001 | | | | | ECAR |
| IPL | 16PETE 345 | 16PETE 138 | W | YES | | YES | | 001 | | | | | ECAR |

ECAR TYPE 1 OUTAGES -- SINGLE (TWO TERMINAL) CIRCUIT OUTAGES.
SINGLE (TWO TERMINAL) CIRCUITS, 345 KV OR ABOVE WITH LOWER VOLTAGE CIRCUITS INCLUDED BY EXCEPTION, THAT ARE OUTAGED BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IPL-SIGE | 16PETE 138 | 10CATO_T 138 | 1 | YES | | YES | | 001 | | | | | IPL |
| LGEE | 11MIDDLT 345 | 11MIL CK 345 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11MIDDLT 345 | 11TRIMBL 345 | 1 | YES | YES | YES | YES | 001 | | | | | LGEE |
| LGEE | 11BRWN N 345 | 11BRWN N 138 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11SMITH 345 | 11SMITH 138 | 1 | YES | | YES | YES | 001 | | | | | LGEE |
| LGEE | 11EARL N 161 | 11LIV C 161 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11LIV C 161 | 11S PADU 161 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11GR RV 161 | 11GR RVR 138 | 2 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11ADAMS 138 | 11TYRONE 138 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11BRWN N 138 | 11HIGBY 138 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11BRWN P 138 | 11FAWKES 138 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11CLARK 138 | 11FAWKES 138 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11FAWK T 138 | 11LR TAP 138 | 1 | YES | YES | YES | YES | 001 | | | | | LGEE |
| LGEE | 11HAEFLI 138 | 11W LEXN 138 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11HARDN 138 | 11HARDBG 138 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11FINCHV69.0 | 11MIDDLT69.0 | EQ | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11SHLBYV69.0 | 116658 T69.0 | EQ | YES | | YES | | 001 | | | | | LGEE |
| LGEE-OVEC | 11TRIMBL 345 | 06CLIFTY 345 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE-OVEC | 11NORTHS 138 | 06CLIFTY 138 | 1 | YES | | | | 001 | | | | | LGEE |
| LGEE-SIGE | 11CLVRPR 138 | 10NEWTVL 138 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE-TVA | 11POCKET 500 | 8PHIPP B 500 | 1 | YES | | YES | YES | 001 | | | | | LGEE |
| LGEE-TVA | 11LIV C 161 | 5CALVERT 161 | 1 | YES | | | | 001 | | | | | VAST |
| LGEE-TVA | 11PADDYS 161 | 5SUMMER 161 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE-TVA | 11PINEV 161 | 5PINEVIL 161 | 1 | YES | | | | 001 | | | | | VAST |
| NIPS | 17BUROAK 345 | 17LESBRG 345 | 1 | YES | | YES | | 001 | | | | | ECAR |
| NIPS | 17BUROAK 345 | 17SCHAHF 345 | 1 | YES | | YES | | 001 | | | | | NIPS |
| NIPS | 17MITCHL 138 | 17ROXANA 138 | 1 | YES | | YES | | 001 | | | | | NIPS |
| NIPS-NI | 17SHEFLD 345 | BURNH; B 345 | 1 | YES | YES | YES | | 001 | | | | | ECAR |
| NIPS-NI | 17MUNSTR 345 | BURNH;0R 345 | 1 | YES | YES | YES | | 001 | | | | | ECAR |
| OVEC | 06DOE530 345 | 06SARGNT 138 | 1 | YES | | | | 001 | | | | | OVEC |
| SIGE | 10NEWTVL 161 | 10NEWTVL 138 | 1 | YES | | YES | | 001 | | | | | SIGE |
| SIGE | 10CULLEY 138 | 10GRNDVW 138 | 1 | YES | | YES | | 001 | | | | | SIGE |
| SIGE | 10GRNDVW 138 | 10NEWTVL 138 | 1 | YES | | YES | | 001 | | | | | SIGE |
| PJM500 | BRIGHTON 500 | W CHAPEL 500 | 1 | | | | YES | 001 | | | | | ECAR |

ECAR TYPE 1 OUTAGES -- SINGLE (TWO TERMINAL) CIRCUIT OUTAGES.
SINGLE (TWO TERMINAL) CIRCUITS, 345 KV OR ABOVE WITH LOWER VOLTAGE CIRCUITS INCLUDED BY EXCEPTION, THAT ARE OUTAGED BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PJM500 | CONEM-GH 500 | JUNIATA 500 | 1 | YES | YES | | YES | 001 | | | | | ECAR |
| PJM500 | JUNIATA 500 | KEYSTONE 500 | 1 | YES | YES | | YES | 001 | | | | | ECAR |
| AMRN | CASEY 345 | NEOGA 345 | 1 | YES | | YES | | 001 | | | | | ECAR |
| AMRN | CASEY 345 | NEWTON 345 | 1 | YES | YES | YES | | 001 | | | | | ECAR |
| AMRN | DUCK CRK 345 | TAZEWELL 345 | 1 | | YES | YES | | 001 | | | | | ECAR |
| AMRN | RUSH 345 | ST FRANC 345 | 1 | YES | | YES | YES | 001 | | | | | ECAR |
| AMRN-AECI | BLAND 345 | 7FRANKS 345 | 1 | YES | | YES | YES | 001 | | | | | ECAR |
| AMRN-IP | E W FKFT 345 | MT VRNON 345 | 1 | YES | | YES | | 001 | | | | | ECAR |
| IP | BUNSONVL 345 | BUNSONVL 138 | 1 | YES | | | | 001 | | | | | ECAR |
| NI | LISLE B 345 | LOMBRD B 345 | 1 | | YES | YES | | 001 | | | | | ECAR |
| OH | BECK A 345 | BECK2PA1 220 | 1 | | YES | | YES | 001 | | | | | (TBA) |
| OH | LAMB L4D 345 | LAMBTON 220 | T7 | | YES | | YES | 001 | | | | | (TBA) |
| CPL-VP | 8WAKE 500 | 8CARSON 500 | 1 | YES | | | YES | 001 | | | | | ECAR |
| CPL-VP | 6PERSON 230 | 6HALIFAX 230 | 1 | YES | | | YES | 001 | | | | | ECAR |
| DUKE | 8MCGUIRE 500 | 8JOCASSE 500 | 1 | | | | YES | 001 | | | | | VAST |
| DUKE-SOUTHER | 8OCONEE 500 | 8NORCROS 500 | 1 | YES | | | | 001 | | | | | VAST |
| SOUTHERN-TVA | 8BOWEN 500 | 8SNP 500 | 1 | YES | | | YES | 001 | | | | | ECAR |
| TVA | 8BULL RU 500 | 8VOLUNTE 500 | 1 | YES | | | | 001 | | | | | VAST |
| TVA | 8CUMBERL 500 | 8DAVIDSO 500 | 1 | YES | | | | 001 | | | | | ECAR |
| TVA | 8CUMBERL 500 | 8JVILLE 500 | 1 | YES | | | YES | 001 | | | | | ECAR |
| TVA | 8CUMBERL 500 | 8MARSHAL 500 | 1 | YES | | | | 001 | | | | | VAST |
| TVA | 8MARSHAL 500 | 8SHAWNEE 500 | 1 | YES | | | | 001 | | | | | VAST |
| TVA | 8PHIPP B 500 | 8SULLIVA 500 | 1 | | | YES | YES | 001 | | | | | ECAR |
| TVA | 8PHIPP B 500 | 8VOLUNTE 500 | 1 | YES | | YES | YES | 001 | | | | | ECAR |
| TVA | 8VOLUNTE 500 | 8WBNP 1 500 | 1 | YES | | | | 001 | | | | | ECAR |
| TVA | 8PHIPP B 500 | 5PHIPP B 161 | 1 | | | YES | YES | 001 | | | | | ECAR |
| TVA | 8SULLIVA 500 | 5SULLIVA 161 | 1 | | | YES | | 001 | | | | | ECAR |
| TVA | 5LAFOLLE 161 | 5PINEVIL 161 | 1 | | | YES | | 001 | | | | | ECAR |
| VP | 8BATH CO 500 | 8LEXNGTN 500 | 1 | YES | | | YES | 001 | | | | | ECAR |
| VP | 8BATH CO 500 | 8VALLEY 500 | 1 | YES | | YES | YES | 001 | | | | | ECAR |
| VP | 8DOOMS 500 | 8LDYSMTH 500 | 1 | YES | | | YES | 001 | 2004S | | | | ECAR |
| VP | 8DOOMS 500 | 8VALLEY 500 | 1 | YES | | | YES | 001 | | | | | ECAR |
| VP | 8LOUDOUN 500 | 8MORRSVL 500 | 1 | | | | YES | 001 | | | | | ECAR |

ECAR TYPE 2 OUTAGES -- SINGLE CIRCUIT SEGMENT OF MULTIPLE TERMINAL CIRCUIT OUTAGES.
SINGLE CIRCUIT SEGMENTS, 345 KV OR ABOVE WITH LOWER VOLTAGE SEGMENTS INCLUDED BY EXCEPTION, THAT ARE OUTAGED ALONE BY AUTOMATICALLY SECTIONALIZING MULTIPLE TERMINAL CIRCUITS.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR MEN | MET | VEM | GROUP | IN | OUT | N/A N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AEP | 05CLOVRD 765 | 05CLOVRD 345 | 1 | YES | YES | YES | 001 | | 2004S | | AEP (AP) |
| AEP | 05JOSHUA 765 | 05JOSHUA 500 | 1 | YES | YES | YES | 001 | 2004S | | | AEP (AP) |
| AEP | 05JOSHUA 765 | 05JOSHUA 500 | 2 | YES | YES | YES | 001 | 2004S | | | AEP (AP) |
| AEP | 05JOSHUA 765 | 05JOSHUA 138 | 1 | YES | YES | YES | 001 | 2004S | | | AEP (AP) |
| AEP | 05WYOMIN 765 | 05WYOMX1 138 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05WYOMIN 765 | 05WYOMX2 138 | 2 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05KANAWH 345 | 05SPORN 345 | 1 | YES | | YES | 001 | | | | AEP (AP) |
| AEP | 05KANAWH 345 | 05KANAWH 138 | 1 | YES | | YES | 001 | | | | AEP (AP) |
| AEP | 05M FUNK 345 | 05M FUNK 138 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05TRISTA 345 | 05TRISTA 138 | 1 | YES | | | 001 | | | | AEP (AP) |
| AEP | 05TRISTA 345 | 05TRISTA 138 | 2 | YES | | | 001 | | | | AEP (AP) |
| AEP-DUKE | 05RIDGWA 138 | 4DAN RIV 138 | 3 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05ALLEN 345 | 05SORENS 345 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP | 05BENTON 345 | 05COOK 345 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP | 05COLNGW 345 | 05ROB PK 345 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP | 05COOK 345 | 05EELKHA 345 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP | 05COOK 345 | 05JACKSR 345 | 1 | YES | YES | | 001 | | 2002S | | AEP (IM) |
| AEP | 05BARODA 345 | 05COOK 345 | 1 | YES | YES | | 001 | 2002S | | | AEP (IM) |
| AEP | 05BARODA 345 | 05JACKSR 345 | 1 | YES | YES | | 001 | 2002S | | | AEP (IM) |
| AEP | 05COOK 345 | 05KENZIE 345 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP | 05DEQUIN 345 | 05OLIVE 345 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP | 05DEQUIN 345 | 05REYNOL 345 | 1 | YES | | | 001 | | | | AEP (IM) |
| AEP | 05JACKSR 345 | 05TWIN B 345 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP | 05KENZIE 345 | 05TWIN B 345 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP | 05OLIVE 345 | 05REYNOL 345 | 1 | YES | | | 001 | | | | AEP (IM) |
| AEP | 05ALLEN 345 | 05ALLEN 138 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP | 05BENTON 345 | 05BENTON 138 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP | 05EELKHA 345 | 05EELKHA 138 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP-CIN | 05GRNTWN 765 | 08GRNTWN1.00 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP-CIN | 05FALL C 345 | 08NOBLSV 345 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP-CONS | 05BENTON 345 | 18PALISA 345 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP-IP | 05EUGENE 345 | BUNSONVL 345 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP-IPL | 05FALL C 345 | 16SUNNYS 345 | 1 | YES | YES | | 001 | | | | AEP (IM) |
| AEP-NIPS | 05REYNOL 345 | 17RYNLDS 138 | 1 | YES | YES | | 001 | | | | AEP (IM) |

ECAR TYPE 2 OUTAGES -- SINGLE CIRCUIT SEGMENT OF MULTIPLE TERMINAL CIRCUIT OUTAGES.
SINGLE CIRCUIT SEGMENTS, 345 KV OR ABOVE WITH LOWER VOLTAGE SEGMENTS INCLUDED BY EXCEPTION, THAT ARE OUTAGED ALONE BY AUTOMATICALLY SECTIONALIZING MULTIPLE TERMINAL CIRCUITS.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AEP | 05KAMMER 765 | 05ORANGE 765 | 1 | YES | | YES | | 001 | 2001S | | | | AEP (OP) |
| AEP | 05NPROCT 765 | 05NPROCT 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05ORANGE 765 | 05ORANGE 138 | 1 | YES | | | | 001 | 2001S | | | | AEP (OP) |
| AEP | 05CANTNC 345 | 05SECANT 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05CANTNC 345 | 05TIDD 345 | 1 | YES | | | YES | 001 | | | | | AEP (OP) |
| AEP | 05E LIMA 345 | 05ROB PK 345 | 1 | YES | | YES | | 001 | | 2002S | | | AEP (OP) |
| AEP | 05CONVOY 345 | 05E LIMA 345 | 1 | YES | | YES | | 001 | 2002S | | | | AEP (OP) |
| AEP | 05CONVOY 345 | 05ROB PK 345 | 1 | YES | | YES | | 001 | 2002S | | | | AEP (OP) |
| AEP | 05MUSKNG 345 | 05WMILLP 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05MUSKNG 345 | 05WMILLP 345 | 2 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05SCANTO 345 | 05SECANT 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05CANTNC 345 | 05CANTNC 138 | 1 | YES | | | YES | 001 | | | | | AEP (OP) |
| AEP | 05KIRK 345 | 05KIRK 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05OHIOCT 345 | 05OHIOCX 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05SECANT 345 | 05SECANT 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05WBELLA 345 | 05WBELLA 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05WMILLP 345 | 05WMILLP 138 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP-AP | 05BELMON 765 | 01BELMNT 500 | 1 | YES | YES | YES | YES | 001 | | | | | ECAR |
| AEP-AP | 05KAMMER 765 | 01KAMMER 500 | 1 | YES | YES | YES | YES | 001 | | | | | ECAR |
| AEP-FE | 05OHIOCT 345 | 02GALION 345 | 1 | YES | | YES | | 001 | | | | | AEP (OP) |
| AP | 01 502 J 500 | 01FMARTN 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01 502 J 500 | 01HARRSN 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01 502 J 500 | 01KAMMER 500 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01BEDNGT 500 | 01BEDNGT 138 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01BEDNGT 500 | 01BEDNGT 138 | 2 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01MDWBRK 500 | 01MDWBRK 138 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01MDWBRK 500 | 01MDWBRK 138 | 2 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01BEDNGT 138 | 01HARMNY 138 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01CHERYR 138 | 01HARMNY 138 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01MARLOW 138 | 01HARMNY 138 | 1 | YES | YES | | YES | 001 | | | | | AP |
| CIN | 08BEDFRD 345 | 08GIBSON 345 | 1 | YES | | YES | | 001 | | | | | CIN |
| CIN | 08BEDFRD 345 | 08LOST R 345 | 1 | YES | | YES | | 001 | | | | | CIN |
| CIN | 08CAY CT 345 | 08DRESSR 345 | 1 | YES | | YES | | 001 | | | | | CIN |
| CIN | 08NOBLSV 345 | 08WHITST 345 | 1 | YES | | YES | | 001 | | 2001S | | | CIN |
| CIN | 08NOBLSV 345 | 08HORTVL 345 | 1 | YES | | YES | | 001 | 2001S | | | | CIN |

ECAR TYPE 2 OUTAGES -- SINGLE CIRCUIT SEGMENT OF MULTIPLE TERMINAL CIRCUIT OUTAGES.
SINGLE CIRCUIT SEGMENTS, 345 KV OR ABOVE WITH LOWER VOLTAGE SEGMENTS INCLUDED BY EXCEPTION, THAT ARE OUTAGED ALONE BY AUTOMATICALLY SECTIONALIZING MULTIPLE TERMINAL CIRCUITS.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CIN | 08WHITST 345 | 08HORTVL 345 | 1 | YES | | YES | | 001 | 2001S | | | | CIN |
| CIN | 08WALTON 345 | 08WALTON 230 | 1 | YES | | YES | | 001 | | | | | CIN |
| CIN | 08BEDFRD 345 | 08BEDFRD 138 | 1 | YES | | YES | | 001 | | | | | CIN |
| CIN | 08DRESSR 345 | 08DRESSR 138 | 1 | YES | | YES | | 001 | | | | | CIN |
| CIN | 08GRNBOR 345 | 08GRNBOR 138 | 1 | YES | | YES | | 001 | | | | | CIN |
| CIN | 08SPEED 345 | 08SPEED 138 | 1 | YES | | YES | | 001 | | | | | CIN |
| CIN | 08WALTON 230 | 08WEBSTE 230 | 1 | YES | | YES | | 001 | | | | | CIN |
| CIN-IPL | 08GIBSON 345 | 16PETE 345 | 1 | YES | | YES | | 001 | | | | | ECAR |
| CIN-IPL | 08GWYNN 345 | 16SUNNYS 345 | 1 | YES | | YES | | 001 | | | | | CIN |
| CIN-IPL | 08LOST R 345 | 16PETE 345 | 1 | YES | | YES | | 001 | | | | | IPL |
| CIN-IPL | 08WHITST 345 | 16GUION 345 | 1 | YES | | YES | | 001 | | | | | IPL |
| DECO | 19CVTRY 345 | 19MAJTC 345 | 1 | YES | | | | 001 | | | | | DECO |
| DPL | 09BATH 345 | 09GREENE 345 | 1 | YES | | | | 001 | | | | | DPL |
| DPL | 09BATH 345 | 09MIAMI 345 | 1 | YES | | | | 001 | | | | | DPL |
| DPL | 09CLINTO 345 | 09STUART 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| DPL | 09ATLNTA 345 | 09ATLNTA69.0 | 1 | YES | | | | 001 | | | | | DPL |
| FE | 02FOX 345 | 02FOXQ11 138 | 2 | YES | YES | | | 001 | | | | | FE |
| FE | 02FOX 345 | 02FOXQ12 138 | 5 | YES | YES | | | 001 | | | | | FE |
| FE | 02FOX 345 | 02FOXQ13 138 | 3 | YES | YES | | | 001 | | | | | FE |
| FE | 02FOX 345 | 02FOXQ14 138 | 4 | YES | YES | | | 001 | | | | | FE |
| FE | 02HARDIN 345 | 02HDGQ12 138 | 2 | YES | YES | | | 001 | | | | | FE |
| FE | 02HARDIN 345 | 02HDGQ13 138 | 3 | YES | YES | | | 001 | | | | | FE |
| FE | 02HARDIN 345 | 02HDGQ14 138 | 4 | YES | YES | | | 001 | | | | | FE |
| IPL | 16GUION 345 | 16ROCKVL 345 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16HANNA 345 | 16PETE 345 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16HANNA 345 | 16STOUT 345 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16ROCKVL 345 | 16THOMPS 345 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16GUION 345 | 16GUION 138 | N | YES | | YES | | 001 | | | | | IPL |
| IPL | 16GUION 345 | 16GUION 138 | S | YES | | YES | | 001 | | | | | IPL |
| IPL | 16HANNA 345 | 16HANNA 138 | E | YES | | YES | | 001 | | | | | IPL |
| IPL | 16HANNA 345 | 16HANNA 138 | W | YES | | YES | | 001 | | | | | IPL |
| IPL | 16ROCKVL 345 | 16ROCKVL 138 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16STOUT 345 | 16STOUTS 138 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16SUNNYS 345 | 16SUNNYS 138 | 1 | YES | | YES | | 001 | | | | | IPL |

ECAR TYPE 2 OUTAGES -- SINGLE CIRCUIT SEGMENT OF MULTIPLE TERMINAL CIRCUIT OUTAGES.
SINGLE CIRCUIT SEGMENTS, 345 KV OR ABOVE WITH LOWER VOLTAGE SEGMENTS INCLUDED BY EXCEPTION, THAT ARE OUTAGED ALONE BY AUTOMATICALLY SECTIONALIZING MULTIPLE TERMINAL CIRCUITS.
NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) ALPHA BY COMPANY, AND (2) VOLTAGE THEN ALPHA BY BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NIPS-NI | 17SHEFLD 345 | SLINE; B 345 | 1 | YES | YES | YES | | 001 | | | | | AEP (IM) |
| OVEC | 06CLIFTY 345 | 06DEARBN 345 | 1 | YES | | | | 001 | | | | | OVEC |
| OVEC | 06DEARBN 345 | 06PIERCE 345 | 1 | YES | | | | 001 | | | | | OVEC |
| OVEC-AEP | 06KYGER 345 | 05TRISTA 345 | 1 | YES | | | | 001 | | | | | AEP (AP) |
| PJM500 | CNASTONE 500 | HUNTERTN 500 | 1 | YES | YES | | YES | 001 | | | | | ECAR |
| PJM500 | CONEM-GH 500 | HUNTERTN 500 | 1 | YES | YES | | YES | 001 | | | | | ECAR |
| PJM500 | HUNTERTN 500 | HUNTRSTN 230 | 1 | | YES | | YES | 001 | | | | | ECAR |
| IP | BUNSONVL 345 | SIDNEY 345 | 1 | YES | | YES | | 001 | | | | | ECAR |
| NI | SLINE; R 345 | SLINE; R 138 | 1 | | YES | YES | | 001 | | | | | AEP (IM) |
| VP | 8MT STM 500 | 8VALLEY 500 | 1 | YES | YES | | YES | 001 | | | | | ECAR |
| VP | 8ELMONT 500 | 6ELMONT 230 | 2 | | | | YES | 001 | | | | | ECAR |
| VP | 8VALLEY 500 | 6VALLEY 230 | 1 | | | | YES | 001 | | | | | ECAR |
| VP | 8LEXNGTN 500 | 6LXNGTN2 230 | 1 | | | | YES | 001 | | | | | ECAR |

ECAR TYPE 3 OUTAGES -- MULTIPLE TERMINAL CIRCUIT OUTAGES.
SINGLE CIRCUIT SEGMENTS, 345 KV OR ABOVE WITH LOWER VOLTAGE SEGMENTS INCLUDED BY EXCEPTION, THAT ARE OUTAGED TOGETHER BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: CRO = COMMON RIGHT-OF-WAY OUTAGE, CSO = COMMON STATION OUTAGE.
NOTE: ENTRIES SORTED BY (1) VOLTAGE THEN ALPHA BY BUSNAME, AND (2) ALPHA BY COMPANY OF FIRST BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR MEN | MET | VEM | GROUP | IN | OUT | CRO | CSO | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AEP | 05AMOS 765 | 05NPROCT 765 | 1 | YES | YES | YES | 001 | | | | | AEP (OP) |
| AEP | 05HANG R 765 | 05NPROCT 765 | 1 | YES | YES | YES | 002 | | | | | AEP (OP) |
| AEP | 05NPROCT 765 | 05NPROCT 138 | 1 | YES | YES | YES | 003 | | | | | AEP (OP) |
| AEP | 05AXTON 765 | 05J.FERR 765 | 1 | YES | YES | YES | 001 | | | | | AEP (AP) |
| AEP | 05AXTON 765 | 05AXTON 138 | 1 | YES | YES | YES | 002 | | | | | AEP (AP) |
| AEP | 05BROADF 765 | 05J.FERR 765 | 1 | YES | YES | YES | 001 | | | | | AEP (AP) |
| AEP | 05BROADF 138 | 05BROADX 138 | BP | YES | YES | YES | 002 | | | | | AEP (AP) |
| AEP | 05CLOVRD 765 | 05JOSHUA 765 | 1 | YES | | YES | 001 | | 2004S | | | AEP (AP) |
| AEP | 05JOSHUA 765 | 05JOSHUA 138 | 1 | YES | | YES | 002 | | 2004S | | | AEP (AP) |
| AEP | 05CLOVRD 765 | 05JOSHUA 765 | 1 | YES | | YES | 001 | | 2004S | | YES | AEP (AP) |
| AEP | 05CLOVRD 765 | 05J.FERR 765 | 1 | YES | | YES | 002 | | 2004S | | YES | AEP (AP) |
| AEP | 05CLOVRD 765 | 05CLOVRD 345 | 1 | YES | | YES | 003 | | 2004S | | YES | AEP (AP) |
| AEP | 05JOSHUA 765 | 05JOSHUA 138 | 1 | YES | | YES | 004 | | 2004S | | YES | AEP (AP) |
| AEP | 05CLOVRD 765 | 05JOSHUA 765 | 1 | YES | | YES | 001 | 2004S | | | | AEP (AP) |
| AEP | 05JOSHUA 765 | 05JOSHUA 500 | 1 | YES | | YES | 002 | 2004S | | | | AEP (AP) |
| AEP | 05JOSHUA 765 | 05JOSHUA 500 | 2 | YES | | YES | 003 | 2004S | | | | AEP (AP) |
| AEP | 05JOSHUA 765 | 05JOSHUA 138 | 1 | YES | | YES | 004 | 2004S | | | | AEP (AP) |
| VP-AEP | 8ELMONT 500 | 05JOSHUA 500 | 1 | YES | | YES | 005 | 2004S | | | | AEP (AP) |
| VP | 8ELMONT 500 | 6ELMONT 230 | 2 | YES | | YES | 006 | 2004S | | | | AEP (AP) |
| AEP | 05CULLOD 765 | 05WYOMIN 765 | 1 | YES | YES | YES | 001 | | 2004S | | | AEP (AP) |
| AEP | 05WYOMIN 765 | 05WYOMX1 138 | 1 | YES | YES | YES | 002 | | 2004S | | | AEP (AP) |
| AEP | 05WYOMIN 765 | 05WYOMX2 138 | 2 | YES | YES | YES | 003 | | 2004S | | | AEP (AP) |
| AEP | 05BROADF 765 | 05BROADF 500 | 1 | YES | YES | YES | 001 | | | | | AEP (AP) |
| AEP-TVA | 05BROADF 500 | 8SULLIVA 500 | 1 | YES | YES | YES | 002 | | | | | AEP (AP) |
| AEP-VP | 05CLOVRD 765 | 05CLOVRD 500 | 1 | YES | YES | YES | 001 | 2004S | | | | AEP (AP) |
| AEP-VP | 05CLOVRD 500 | 8LEXNGTN 500 | 1 | YES | YES | YES | 002 | 2004S | | | | AEP (AP) |
| AEP | 05CLOVRD 500 | 05CLOVRD 345 | 6A | YES | YES | YES | 003 | 2004S | | | | AEP (AP) |
| AEP | 05CLOVRD 500 | 05CLOVRD 345 | 6B | YES | YES | YES | 004 | 2004S | | | | AEP (AP) |
| VP | 8LEXNGTN 500 | 6LEXNGT2 230 | 1 | YES | YES | YES | 005 | 2004S | | | | AEP (AP) |
| AEP | 05J.FERR 765 | 05J.FERR 500 | 1 | YES | YES | YES | 001 | | | | | AEP (AP) |
| DUKE-AEP | 8ANTIOCH 500 | 05J.FERR 500 | 1 | YES | YES | YES | 002 | | | | | AEP (AP) |
| AEP | 05JOSHUA 765 | 05JOSHUA 500 | 1 | YES | | YES | 001 | 2004S | | | | AEP (AP) |
| AEP | 05JOSHUA 765 | 05JOSHUA 500 | 2 | YES | | YES | 002 | 2004S | | | | AEP (AP) |
| VP-AEP | 8ELMONT 500 | 05JOSHUA 500 | 1 | YES | | YES | 003 | 2004S | | | | AEP (AP) |
| VP | 8ELMONT 500 | 6ELMONT 230 | 2 | YES | | YES | 004 | 2004S | | | | AEP (AP) |
| AEP | 05WYOMIN 765 | 05WYOMIN 138 | 1 | YES | | YES | 001 | 2004S | | | | AEP (AP) |
| AEP | 05WYOMIN 765 | 05WYOMIN 138 | 2 | YES | | YES | 002 | 2004S | | | | AEP (AP) |
| AEP-VP | 05CLOVRD 500 | 8LEXNGTN 500 | 1 | YES | YES | YES | 001 | | 2004S | | | AEP (AP) |
| AEP | 05CLOVRD 500 | 05CLOVRD 345 | 6A | YES | YES | YES | 002 | | 2004S | | | AEP (AP) |
| AEP | 05CLOVRD 500 | 05CLOVRD 345 | 6B | YES | YES | YES | 003 | | 2004S | | | AEP (AP) |
| VP | 8LEXNGTN 500 | 6LEXNGT2 230 | 1 | YES | YES | YES | 004 | | 2004S | | | AEP (AP) |
| AEP-VP | 05CLOVRD 500 | 8LEXNGTN 500 | 1 | YES | YES | YES | 001 | 2004S | | | | AEP (AP) |
| VP | 8LEXNGTN 500 | 6LEXNGT2 230 | 1 | YES | YES | YES | 002 | 2004S | | | | AEP (AP) |
| AEP | 05CLOVRD 500 | 05CLOVRD 345 | 1 | YES | YES | YES | 001 | 2004S | | | | AEP (AP) |
| AEP | 05CLOVRD 500 | 05CLOVRD 345 | 2 | YES | YES | YES | 002 | 2004S | | | | AEP (AP) |
| AEP | 05NAGEL 500 | 05NAGEL 230 | 1 | YES | YES | YES | 001 | | | | | AEP (AP) |
| AEP-CPLW | 05NAGEL 230 | 6CANE RI 230 | 1 | YES | YES | YES | 002 | | | | | AEP (AP) |
| AEP | 05BAKER 345 | 05TRISTA 345 | 1 | YES | | | 001 | | | | | AEP (AP) |
| AEP | 05TRISTA 345 | 05TRISTA 138 | 2 | YES | | | 002 | | | | | AEP (AP) |
| AEP | 05CLOVRD 345 | 05M FUNK 345 | 1 | YES | YES | YES | 001 | | | | | AEP (AP) |
| AEP | 05KANAWH 345 | 05KANAWZ 345 | 00 | YES | YES | YES | 002 | | | | | AEP (AP) |

ECAR TYPE 3 OUTAGES -- MULTIPLE TERMINAL CIRCUIT OUTAGES.
SINGLE CIRCUIT SEGMENTS, 345 KV OR ABOVE WITH LOWER VOLTAGE SEGMENTS INCLUDED BY EXCEPTION, THAT ARE OUTAGED TOGETHER BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: CRO = COMMON RIGHT-OF-WAY OUTAGE, CSO = COMMON STATION OUTAGE.
NOTE: ENTRIES SORTED BY (1) VOLTAGE THEN ALPHA BY BUSNAME, AND (2) ALPHA BY COMPANY OF FIRST BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR MEN | MET | VEM | GROUP | IN | OUT | CRO CSO | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AEP | 05KANAWZ 345 | 05M FUNK 345 | 1 | YES | YES | YES | 003 | | | | AEP (AP) |
| AEP | 05M FUNK 345 | 05M FUNK 138 | 1 | YES | YES | YES | 004 | | | | AEP (AP) |
| AEP | 05KANAWH 345 | 05KANAWZ 345 | 00 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP | 05KANAWZ 345 | 05M FUNK 345 | 1 | YES | YES | YES | 002 | | | | AEP (AP) |
| AEP | 05KANAWH 345 | 05SPORN 345 | 1 | YES | | YES | 001 | | | | AEP (AP) |
| AEP | 05KANAWH 345 | 05KANAWH 138 | 1 | YES | | YES | 002 | | | | AEP (AP) |
| AEP | 05CLOVRD 345 | 05CLOVRD 138 | 1A | YES | | YES | 001 | | | | AEP (AP) |
| AEP | 05CLOVRD 345 | 05CLOVRD 138 | 1B | YES | | YES | 002 | | | | AEP (AP) |
| AEP | 05SPORN 345 | 05SPORNA 138 | B | YES | | | 001 | | | | AEP (AP) |
| AEP | 05SPORN 345 | 05SPORNB 138 | 4 | YES | | | 002 | | | | AEP (AP) |
| AEP | 05HAZARD 161 | 05LESLIE 161 | 1 | YES | YES | | 001 | | | | AEP (AP) |
| AEP | 05LESLIE 161 | 05LESLIX 161 | BP | YES | YES | | 002 | | | | AEP (AP) |
| AEP | 05LESLIE 161 | 05LESLIX 161 | SR | YES | YES | | 003 | | | | AEP (AP) |
| AEP | 05LESLIX 161 | 05STINNE 161 | 1 | YES | YES | | 004 | | | | AEP (AP) |
| TVA-AEP | 5PINEVIL 161 | 05STINNE 161 | 1 | YES | YES | | 005 | | | | AEP (AP) |
| AEP | 05BAILS2 138 | 05KOPPER 138 | 1 | | | YES | 001 | | | | AEP (AP) |
| AEP | 05KANAWH 138 | 05TENMIL 138 | 1 | | | YES | 002 | | | | AEP (AP) |
| AEP | 05KOPPER 138 | 05SUNDIA 138 | 1 | | | YES | 003 | | | | AEP (AP) |
| AEP | 05SUNDIA 138 | 05TENMIL 138 | 1 | | | YES | 004 | | | | AEP (AP) |
| AEP | 05BRADL2 138 | 05KINCAI 138 | 1 | | | YES | 001 | | | | AEP (AP) |
| AEP | 05KANAWH 138 | 05KINCAI 138 | 1 | | | YES | 002 | | | | AEP (AP) |
| AEP | 05CATAWB 138 | 05CLOVRD 138 | 1 | | | YES | 001 | | | | AEP (AP) |
| AEP | 05CATAWB 138 | 05KIMBAL 138 | 1 | | | YES | 002 | | | | AEP (AP) |
| AEP | 05GLENL1 138 | 05KIMBAL 138 | 1 | | | YES | 003 | | | | AEP (AP) |
| AEP | 05CELAN 138 | 05CELANZ 138 | 1 | | | YES | 001 | | | | AEP (AP) |
| AEP | 05CELANZ 138 | 05NBLACK 138 | 1 | | | YES | 002 | | | | AEP (AP) |
| AEP | 05CELAN 138 | 05PETERM 138 | 1 | | | YES | 003 | | | | AEP (AP) |
| AEP | 05GLENL2 138 | 05PETERM 138 | 1 | | | YES | 004 | | | | AEP (AP) |
| AEP | 05KUMIS 138 | 05M FUNK 138 | 1 | | | YES | 005 | | | | AEP (AP) |
| AEP | 05KUMIS 138 | 05NBLACK 138 | 1 | | | YES | 006 | | | | AEP (AP) |
| AEP | 05CLYTR2 138 | 05WURNO 138 | 1 | | | YES | 001 | | | | AEP (AP) |
| AEP | 05J.FERR 138 | 05PEAKCK 138 | 1 | | | YES | 002 | | | | AEP (AP) |
| AEP | 05PEAKCK 138 | 05WURNO 138 | 1 | | | YES | 003 | | | | AEP (AP) |
| AEP-CPL-E | 05EDANVI 138 | 4ROXB 1 138 | 1 | YES | YES | YES | 001 | | 1998S | | AEP (AP) |
| CPL-E | 4ROXB 1 138 | 3ROXBORO 115 | 1 | YES | YES | YES | 002 | | 1998S | | AEP (AP) |
| AEP-CPL-E | 05EDANVI 138 | 4YANCY T 138 | 1 | YES | YES | YES | 001 | | 1998S | | AEP (AP) |
| CPL-E | 4ROXB W 138 | 4YANCY T 138 | 1 | YES | YES | YES | 002 | | 1998S | | AEP (AP) |
| CPL-E | 4ROXB W 138 | 4ROXB 1 138 | 99 | YES | YES | YES | 003 | | 1998S | | AEP (AP) |
| CPL-E | 4ROXB 1 138 | 3ROXBORO 115 | 1 | YES | YES | YES | 004 | | 1998S | | AEP (AP) |
| AEP | 05GREENB 138 | 05RONCVR 138 | 1 | YES | | YES | 001 | | | | ECAR |
| AEP-VP | 05GREENB 138 | 4FUDGE H 138 | 1 | YES | | YES | 002 | | | | ECAR |
| AEP | 05HINTON 138 | 05RONCVR 138 | 1 | YES | | YES | 003 | | | | ECAR |
| AEP | 05HOLST2 138 | 05SULVN 138 | 1 | YES | YES | YES | 001 | | | | AEP (AP) |
| AEP-CPL-W | 05SULVN 138 | 4WALT 138 | 1 | YES | YES | YES | 002 | | | | AEP (AP) |
| CPL-W | 4WALT 138 | 3WALT H 115 | 1 | YES | YES | YES | 003 | | | | AEP (AP) |
| AEP | 05HUFFCK 138 | 05PITTST 138 | 1 | | | YES | 001 | | | | AEP (AP) |
| AEP | 05HUFFCK 138 | 05WYOMIN 138 | 1 | | | YES | 002 | | | | AEP (AP) |
| AEP | 05LOGAN1 138 | 05PITTST 138 | 1 | | | YES | 003 | | | | AEP (AP) |
| AEP | 05PITTST 138 | 05RUM CK 138 | 1 | | | YES | 004 | | | | AEP (AP) |
| AEP | 05DUMONT 765 | 05GRNTWN 765 | 1 | YES | | | 001 | 1999S | 1999W | | ECAR |
| AEP-CIN | 05GRNTWN 765 | 08GRNTWN1.00 | 1 | YES | | | 002 | 1999S | 1999W | | ECAR |
| CIN | 08GRNTWN 230 | 08GRNTWN1.00 | 1 | YES | | | 003 | 1999S | 1999W | | ECAR |
| CIN | 08GRNTWN 138 | 08GRNTWN1.00 | 1 | YES | | | 004 | 1999S | 1999W | | ECAR |

ECAR TYPE 3 OUTAGES -- MULTIPLE TERMINAL CIRCUIT OUTAGES.
SINGLE CIRCUIT SEGMENTS, 345 KV OR ABOVE WITH LOWER VOLTAGE SEGMENTS INCLUDED BY EXCEPTION, THAT ARE OUTAGED TOGETHER BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: CRO = COMMON RIGHT-OF-WAY OUTAGE, CSO = COMMON STATION OUTAGE.
NOTE: ENTRIES SORTED BY (1) VOLTAGE THEN ALPHA BY BUSNAME, AND (2) ALPHA BY COMPANY OF FIRST BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | CRO | CSO | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AEP | 05GRNTWN 765 | 05JEFRSO 765 | 1 | YES | | | | 001 | 1999S | 1999W | | | ECAR |
| AEP-CIN | 05GRNTWN 765 | 08GRNTWN1.00 | 1 | YES | | | | 002 | 1999S | 1999W | | | ECAR |
| CIN | 08GRNTWN 230 | 08GRNTWN1.00 | 1 | YES | | | | 003 | 1999S | 1999W | | | ECAR |
| CIN | 08GRNTWN 138 | 08GRNTWN1.00 | 1 | YES | | | | 004 | 1999S | 1999W | | | ECAR |
| AEP | 05ROCKPT 765 | 05SULLVA 765 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05SULLVA 765 | 05BREED 345 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| AEP | 05SULLVA 765 | 05BREED 345 | 2 | YES | | YES | | 003 | | | | | AEP (IM) |
| AEP | 05DUMONT 765 | 05DUMTEQ 999 | 1 | YES | YES | YES | | 001 | | | | | AEP (IM) |
| AEP | 05DUMONT 345 | 05DUMTEQ 999 | 1 | YES | YES | YES | | 002 | | | | | AEP (IM) |
| AEP | 05DUMT C17.3 | 05DUMTEQ 999 | 1 | YES | YES | YES | | 003 | | | | | AEP (IM) |
| AEP-CIN | 05GRNTWN 765 | 08GRNTWN1.00 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| CIN | 08GRNTWN 230 | 08GRNTWN1.00 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| CIN | 08GRNTWN 138 | 08GRNTWN1.00 | 1 | YES | | YES | | 003 | | | | | AEP (IM) |
| AEP | 05ALLEN 345 | 05ROB PK 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05ALLEN 345 | 05SORENS 345 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| AEP | 05ALLEN 345 | 05ALLEN 138 | 1 | YES | | YES | | 003 | | | | | AEP (IM) |
| AEP | 05BENTON 345 | 05COOK 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP-CONS | 05BENTON 345 | 18PALISA 345 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| AEP | 05BENTON 345 | 05BENTON 138 | 1 | YES | | YES | | 003 | | | | | AEP (IM) |
| AEP | 05COLNGW 345 | 05EELKHA 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05COOK 345 | 05EELKHA 345 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| AEP | 05EELKHA 345 | 05EELKHA 138 | 1 | YES | | YES | | 003 | | | | | AEP (IM) |
| AEP | 05COOK 345 | 05JACKSR 345 | 1 | YES | | YES | | 001 | | 2002S | | | AEP (IM) |
| AEP | 05JACKSR 345 | 05TWIN B 345 | 1 | YES | | YES | | 002 | | 2002S | | | AEP (IM) |
| AEP | 05JACKSR 345 | 05JKSNEQ 999 | 1 | YES | | YES | | 003 | | 2002S | | | AEP (IM) |
| AEP | 05JACKSR 138 | 05JKSNEQ 999 | 1 | YES | | YES | | 004 | | 2002S | | | AEP (IM) |
| AEP | 05BARODA 345 | 05JACKSR 345 | 1 | YES | | YES | | 001 | 2002S | | | | AEP (IM) |
| AEP | 05JACKSR 345 | 05TWIN B 345 | 1 | YES | | YES | | 002 | 2002S | | | | AEP (IM) |
| AEP | 05JACKSR 345 | 05JKSNEQ 999 | 1 | YES | | YES | | 003 | 2002S | | | | AEP (IM) |
| AEP | 05JACKSR 138 | 05JKSNEQ 999 | 1 | YES | | YES | | 004 | 2002S | | | | AEP (IM) |
| AEP | 05COOK 345 | 05KENZIE 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05KENZIE 345 | 05TWIN B 345 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| AEP | 05KENZIE 345 | 05KENZIE 138 | 1 | YES | | YES | | 003 | | | | | AEP (IM) |
| AEP | 05DEQUIN 345 | 05OLIVE 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP-CIN | 05DEQUIN 345 | 08WESTWD 345 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| CIN | 08WESTWD 345 | 08WESTWD 138 | 1 | YES | | YES | | 003 | | | | | AEP (IM) |
| AEP | 05DEQUIN 345 | 05REYNOL 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05OLIVE 345 | 05REYNOL 345 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| AEP-NIPS | 05REYNOL 345 | 17RYNLDS 138 | 1 | YES | | YES | | 003 | | | | | AEP (IM) |
| AEP-CIN | 05DEQUIN 345 | 08WESTWD 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| CIN | 08WESTWD 345 | 08WESTWD 138 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| AEP | 05DESOTO 345 | 05FALL C 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP-IPL | 05FALL C 345 | 16SUNNYS 345 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| AEP-CIN | 05FALL C 345 | 08NOBLSV 345 | 1 | YES | | YES | | 001 | | 2001S | | | AEP (IM) |
| CIN | 08NOBLSV 345 | 08WHITST 345 | 1 | YES | | YES | | 002 | | 2001S | | | AEP (IM) |
| CIN | 08NOBLSV 345 | 08NOBLSV 230 | 1 | YES | | YES | | 003 | | 2001S | | | AEP (IM) |
| AEP-CIN | 05FALL C 345 | 08NOBLSV 345 | 1 | YES | | YES | | 001 | 2001S | | | | AEP (IM) |
| CIN | 08NOBLSV 345 | 08HORTVL 345 | 1 | YES | | YES | | 002 | 2001S | | | | AEP (IM) |
| CIN | 08HORTVL 345 | 08WHITST 345 | 1 | YES | | YES | | 003 | 2001S | | | | AEP (IM) |
| CIN | 08NOBLSV 345 | 08NOBLSV 230 | 1 | YES | | YES | | 004 | 2001S | | | | AEP (IM) |
| AEP-CIN | 05FALL C 345 | 08NOBLSV 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05FALL C 345 | 05FALL C 138 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |

ECAR TYPE 3 OUTAGES -- MULTIPLE TERMINAL CIRCUIT OUTAGES.
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NOTE: CRO = COMMON RIGHT-OF-WAY OUTAGE, CSO = COMMON STATION OUTAGE.
NOTE: ENTRIES SORTED BY (1) VOLTAGE THEN ALPHA BY BUSNAME, AND (2) ALPHA BY COMPANY OF FIRST BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | CRO | CSO | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AEP | 05JACKSR 345 | 05JKSNEQ 999 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05JACKSR 138 | 05JKSNEQ 999 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| AEP | 05OLIVE 345 | 05OLIVEQ 999 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05OLIVE 138 | 05OLIVEQ 999 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| AEP | 05OLIVY113.2 | 05OLIVEQ 999 | 1 | YES | | YES | | 003 | | | | | AEP (IM) |
| AEP | 05SORENS 345 | 05SORNEQ 999 | 2 | YES | | YES | | 001 | | | | | AEP (IM) |
| AEP | 05SORENS 138 | 05SORNEQ 999 | 2 | YES | | YES | | 002 | | | | | AEP (IM) |
| AEP | 05SORN Y13.2 | 05SORNEQ 999 | 2 | YES | | YES | | 003 | | | | | AEP (IM) |
| AEP | 05BELMON 765 | 05KAMMER 765 | 1 | YES | YES | YES | YES | 001 | | | | | AEP (OP) |
| AEP | 05BELMON 765 | 05MOUNTN 765 | 1 | YES | YES | YES | YES | 002 | | | | | AEP (OP) |
| AEP-AP | 05BELMON 765 | 01BELMNT 500 | 1 | YES | YES | YES | YES | 003 | | | | | AEP (OP) |
| AEP | 05HANG R 765 | 05MARQUI 765 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05MARQUI 765 | 05MARQUI 345 | 1 | YES | | | | 002 | | | | | AEP (OP) |
| AEP | 05KAMMER 765 | 05ORANGE 765 | 1 | YES | | | YES | 001 | 2001S | | | | AEP (OP) |
| AEP | 05ORANGE 765 | 05ORANGE 138 | 1 | YES | | | YES | 002 | 2001S | | | | AEP (OP) |
| AEP | 05KAMMER 765 | 05SCANTO 765 | 1 | YES | | | YES | 001 | | | | | AEP (OP) |
| AEP | 05SCANTO 765 | 05SCANTO 345 | 1 | YES | | | YES | 002 | | | | | AEP (OP) |
| AEP-AP | 05KAMMER 765 | 01KAMMER 500 | 1 | YES | YES | | YES | 001 | | | | | AEP (OP) |
| AP | 01 502 J 500 | 01FMARTN 500 | 1 | YES | YES | | YES | 002 | | | | | AEP (OP) |
| AP | 01 502 J 500 | 01HARRSN 500 | 1 | YES | YES | | YES | 003 | | | | | AEP (OP) |
| AP | 01 502 J 500 | 01KAMMER 500 | 1 | YES | YES | | YES | 004 | | | | | AEP (OP) |
| AEP | 05KAMMER 765 | 05KMMREQ 999 | 1 | YES | | | YES | 001 | | | | | AEP (OP) |
| AEP | 05KAMMER 345 | 05KMMREQ 999 | 1 | YES | | | YES | 002 | | | | | AEP (OP) |
| AEP | 05MARYSV 765 | 05MARYSV 345 | 1 | YES | YES | YES | YES | 001 | | | | | AEP (OP) |
| AEP-OE | 05MARYSV 345 | 02TANGY 345 | 1 | YES | YES | YES | YES | 002 | | | | | AEP (OP) |
| AEP | 05BIXBY 345 | 05KIRK 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05CORRID 345 | 05KIRK 345 | 1 | YES | | | | 002 | | | | | AEP (OP) |
| AEP | 05KIRK 345 | 05KIRK 138 | 1 | YES | | | | 003 | | | | | AEP (OP) |
| AEP | 05CANTNC 345 | 05SECANT 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05SCANTO 345 | 05SECANT 345 | 1 | YES | | | | 002 | | | | | AEP (OP) |
| AEP | 05SECANT 345 | 05SECANT 138 | 1 | YES | | | | 003 | | | | | AEP (OP) |
| AEP | 05CANTNC 345 | 05TIDD 345 | 1 | YES | | | YES | 001 | | | | | AEP (OP) |
| AEP | 05CANTNC 345 | 05CANTNC 138 | 1 | YES | | | YES | 002 | | | | | AEP (OP) |
| AEP | 05E LIMA 345 | 05ROB PK 345 | 1 | YES | | YES | | 001 | | 2002S | | | AEP (OP) |
| AEP | 05ROB PK 345 | 05ROB PK 138 | 1 | YES | | YES | | 002 | | 2002S | | | AEP (OP) |
| AEP | 05CONVOY 345 | 05ROB PK 345 | 1 | YES | | YES | | 001 | 2002S | | | | AEP (OP) |
| AEP | 05ROB PK 345 | 05ROB PK 138 | 1 | YES | | YES | | 002 | 2002S | | | | AEP (OP) |
| AEP | 05HYATT 345 | 05WMILLP 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05MUSKNG 345 | 05WMILLP 345 | 2 | YES | | | | 002 | | | | | AEP (OP) |
| AEP | 05KAMMER 345 | 05WBELLA 345 | 1 | YES | | | YES | 001 | | | | | AEP (OP) |
| AEP | 05TIDD 345 | 05WBELLA 345 | 1 | YES | | | YES | 002 | | | | | AEP (OP) |
| AEP | 05WBELLA 345 | 05WBELLA 138 | 1 | YES | | | YES | 003 | | | | | AEP (OP) |
| AEP | 05HAYDEN 345 | 05ROBERT 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05ROBERT 345 | 05ROBERT 138 | 1 | YES | | | | 002 | | | | | AEP (OP) |
| AEP | 05MUSKNG 345 | 05WMILLP 345 | 1 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05WMILLP 345 | 05WMILLP 138 | 1 | YES | | | | 002 | | | | | AEP (OP) |
| AEP | 05E LIMA 345 | 05E LIMA 138 | 1A | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05E LIMA 345 | 05E LIMA 138 | 1B | YES | | | | 002 | | | | | AEP (OP) |

ECAR TYPE 3 OUTAGES -- MULTIPLE TERMINAL CIRCUIT OUTAGES.
SINGLE CIRCUIT SEGMENTS, 345 KV OR ABOVE WITH LOWER VOLTAGE SEGMENTS INCLUDED BY EXCEPTION, THAT ARE OUTAGED TOGETHER BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: CRO = COMMON RIGHT-OF-WAY OUTAGE, CSO = COMMON STATION OUTAGE.
NOTE: ENTRIES SORTED BY (1) VOLTAGE THEN ALPHA BY BUSNAME, AND (2) ALPHA BY COMPANY OF FIRST BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | CRO | CSO | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AEP | 05E LIMA 345 | 05ELIMEQ 999 | 2 | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05E LIMA 138 | 05ELIMEQ 999 | 2 | YES | | | | 002 | | | | | AEP (OP) |
| AEP | 05ELIMA 13.2 | 05ELIMEQ 999 | 2 | YES | | | | 003 | | | | | AEP (OP) |
| AEP | 05HYATT 345 | 05HYATT 138 | 1A | YES | | | | 001 | | | | | AEP (OP) |
| AEP | 05HYATT 345 | 05HYATT 138 | 1B | YES | | | | 002 | | | | | AEP (OP) |
| AEP | 05HILLSB 138 | 05SINKG8 138 | 1 | YES | | YES | | 001 | | | | | AEP (OP) |
| AEP | 05MILLBR 138 | 05SINKG8 138 | 1 | YES | | YES | | 002 | | | | | AEP (OP) |
| AP-VP | 01MDWBRK 500 | 8MORRSVL 500 | 1 | YES | YES | | YES | 001 | | 1995S | | | AP |
| AP-VP | 01MDWBRK 500 | 8MT STM 500 | 1 | YES | YES | | YES | 002 | | 1995S | | | AP |
| AP | 01MDWBRK 500 | 01MDWBRK 138 | 1 | YES | YES | | YES | 003 | | 1995S | | | AP |
| AP | 01MDWBRK 500 | 01MDWBRK 138 | 2 | YES | YES | | YES | 004 | | 1995S | | | AP |
| AP | 01BEDNGT 138 | 01HARMNY 138 | 1 | YES | YES | | YES | 001 | | | | | AP |
| AP | 01CHERYR 138 | 01HARMNY 138 | 1 | YES | YES | | YES | 002 | | | | | AP |
| AP | 01MARLOW 138 | 01HARMNY 138 | 1 | YES | YES | | YES | 003 | | | | | AP |
| BREC-SIGE | 14COLE 5 161 | 10NEWTVL 161 | 1 | YES | | YES | | 001 | | | | | ECAR |
| SIGE-HE | 10NEWTVL 161 | 07TASWL1 161 | 1 | YES | | YES | | 002 | | | | | ECAR |
| SIGE | 10NEWTVL 161 | 10NEWTVL 138 | 1 | YES | | YES | | 003 | | | | | ECAR |
| CIN-LGEE | 08BATESV 345 | 11GHENT 345 | 1 | YES | | YES | | 001 | | | | | LGEE |
| CIN | 08BATESV 345 | 08BATESV 138 | 1 | YES | | YES | | 002 | | | | | LGEE |
| CIN | 08BEDFRD 345 | 08GIBSON 345 | 1 | YES | | YES | | 001 | | | | | CIN |
| CIN | 08BEDFRD 345 | 08BEDFRD 138 | 1 | YES | | YES | | 002 | | | | | CIN |
| CIN | 08BEDFRD 345 | 08LOST R 345 | 1 | YES | | YES | | 001 | | | | | CIN |
| CIN | 08BEDFRD 345 | 08BEDFRD 138 | 2 | YES | | YES | | 002 | | | | | CIN |
| CIN | 08CAY CT 345 | 08DRESSR 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| CIN-HE | 08DRESSR 345 | 07MEROM5 345 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| CIN | 08DRESSR 345 | 08DRESSR 138 | 1 | YES | | YES | | 003 | | | | | AEP (IM) |
| CIN | 08DRESSR 345 | 08DRESSR 138 | 2 | YES | | YES | | 004 | | | | | AEP (IM) |
| CIN-IPL | 08GIBSON 345 | 16PETE 345 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16PETE 345 | 16PETE 138 | E | YES | | YES | | 002 | | | | | IPL |
| CIN-HE | 08GIBSON 345 | 07RAMSY5 345 | 1 | YES | | YES | | 001 | | | | | CIN |
| HE-CIN | 07RAMSY5 345 | 08SPEED 345 | 1 | YES | | YES | | 002 | | | | | CIN |
| CIN | 08SPEED 345 | 08SPEED 138 | 1 | YES | | YES | | 003 | | | | | CIN |
| HE | 07RAMSY5 345 | 07RAMSEY69.0 | 1 | YES | | YES | | 004 | | | | | CIN |
| CIN-IPL | 08GWYNN 345 | 16SUNNYS 345 | 1 | YES | | YES | | 001 | | | | | CIN |
| IPL | 16SUNNYS 345 | 16SUNNYS 138 | 1 | YES | | YES | | 002 | | | | | CIN |
| CIN-IPL | 08LOST R 345 | 16PETE 345 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16PETE 345 | 16PETE 138 | W | YES | | YES | | 002 | | | | | IPL |
| CIN-AEP | 08M.FTHS 345 | 05TANNER 345 | 1 | YES | | | | 001 | | | | | CIN |
| CIN | 08M.FTHS 345 | 08MFTM9 138 | 1 | YES | | | | 002 | | | | | CIN |
| CIN | 08REDBK2 345 | 08SGROVE 345 | 1 | YES | | | | 001 | | | | | CIN |
| CIN | 08SGROVE 345 | 08ZIMER 345 | 1 | YES | | | | 002 | | | | | CIN |
| CIN | 08SGROVE 345 | 08SGROVE 138 | 1 | YES | | | | 003 | | | | | CIN |
| CIN | 08REDBK1 345 | 08TERMNL 345 | 1 | YES | | | | 001 | | | | | CIN |
| CIN | 08REDBK1 345 | 08REDBK1 138 | 1 | YES | | | | 002 | | | | | CIN |
| CIN | 08ATTICA 230 | 08LAFAYE 230 | 1 | YES | | YES | | 001 | | | | | CIN |
| CIN | 08ATTICA 230 | 08VDSBRG 230 | 1 | YES | | YES | | 002 | | | | | CIN |
| CIN | 08CAYUGA 230 | 08VDSBRG 230 | 1 | YES | | YES | | 003 | | | | | CIN |
| CIN | 08CAYUGA 230 | 08FRNKFT 230 | 1 | YES | | YES | | 001 | | | | | ECAR |
| CIN | 08FRNKFT 230 | 08NEWLON 230 | 1 | YES | | YES | | 002 | | | | | ECAR |
| CIN | 08CHRYSL 138 | 08MAPLE 138 | 1 | YES | | YES | | 001 | | | | | ECAR |

ECAR TYPE 3 OUTAGES -- MULTIPLE TERMINAL CIRCUIT OUTAGES.
SINGLE CIRCUIT SEGMENTS, 345 KV OR ABOVE WITH LOWER VOLTAGE SEGMENTS INCLUDED BY EXCEPTION, THAT ARE OUTAGED TOGETHER BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: CRO = COMMON RIGHT-OF-WAY OUTAGE, CSO = COMMON STATION OUTAGE.
NOTE: ENTRIES SORTED BY (1) VOLTAGE THEN ALPHA BY BUSNAME, AND (2) ALPHA BY COMPANY OF FIRST BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR MEN | MET | VEM | GROUP | IN | OUT | CRO | CSO | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CIN | 08CHRYSL 138 | 08KOKOMO 138 | 1 | YES | YES | | 002 | | | | | ECAR |
| CIN | 08GRNTWN 138 | 08MAPLE 138 | 1 | YES | YES | | 003 | | | | | ECAR |
| CIN | 08DELCO 138 | 08GRNTWN 138 | 1 | YES | YES | | 001 | | | | | ECAR |
| CIN | 08DELCO 138 | 08DELBK2 138 | 1 | YES | YES | | 002 | | | | | ECAR |
| CIN | 08DELBK2 138 | 08KOKOMO 138 | 2 | YES | YES | | 003 | | | | | ECAR |
| CIN | 08GRNTWN 138 | 08MIER 138 | 1 | YES | YES | | 001 | | | | | CIN |
| CIN | 08MIER 138 | 08WABASH 138 | 1 | YES | YES | | 002 | | | | | CIN |
| CONS | 18GALLAG 345 | 18LIVINS 345 | 1 | YES | | | 001 | | | | | CONS |
| CONS | 18GALLAG 345 | 18TITBAW 345 | 1 | YES | | | 002 | | | | | CONS |
| CONS | 18GALLAG 345 | 18GALLAG 138 | 2 | YES | | | 003 | | | | | CONS |
| CONS | 18MANNIN 345 | 18THETFR 345 | 1 | YES | | | 001 | | | | | CONS |
| CONS | 18MANNIN 345 | 18TITBAW 345 | 1 | YES | | | 002 | | | | | CONS |
| CONS | 18MANNIN 345 | 18MANNIN 138 | 1 | YES | | | 003 | | | | | CONS |
| CONS-DECO | 18ATLNTJ 138 | 19ATLAN 138 | 1 | YES | | | 001 | | | | | CONS |
| CONS | 18ATLNTJ 138 | 18KARN 138 | 1 | YES | | | 002 | | | | | CONS |
| CONS | 18BLACKS 138 | 18WSHTNJ 138 | 1 | YES | | | 001 | | | | | CONS |
| DECO-CONS | 19LARK 138 | 18WSHTNJ 138 | 1 | YES | | | 002 | | | | | CONS |
| CONS | 18OAKLND 138 | 18LATSON 138 | 99 | YES | | | 001 | | | | | CONS |
| DECO-CONS | 19GENOA 138 | 18LATSON 138 | 1 | YES | | | 002 | | | | | CONS |
| DECO | 19CVTRY 345 | 19MAJTC 345 | 1 | YES | | | 001 | | | | | DECO |
| DECO | 19CVTRY 345 | 19MON34 345 | 1 | YES | | | 002 | | | | | DECO |
| DECO | 19CVTRY 345 | 19CVTRY 120 | 1 | YES | | | 003 | | | | | DECO |
| DECO | 19BR-G-P 345 | 19BLRPP 345 | 1 | YES | YES | | 001 | | 2000S | | | ECAR |
| DECO | 19BR-G-P 345 | 19GRNEC 345 | 1 | YES | YES | | 002 | | 2000S | | | ECAR |
| DECO | 19BR-G-P 345 | 19JEWEL 345 | 1 | YES | YES | | 003 | | 2000S | | | ECAR |
| DECO | 19GRNEC 345 | 19GRNEC 120 | 1 | YES | YES | | 004 | | 2000S | | | ECAR |
| DECO | 19GRNEC 345 | 19GRN G126.0 | 1 | YES | YES | | 005 | | 2000S | | | ECAR |
| DECO | 19BR-G-P 345 | 19BLRPP 345 | 1 | YES | YES | | 001 | 2000S | | | | ECAR |
| DECO | 19BR-G-P 345 | 19GRNEC 345 | 1 | YES | YES | | 002 | 2000S | | | | ECAR |
| DECO | 19BR-G-P 345 | 19PONTC 345 | 1 | YES | YES | | 003 | 2000S | | | | ECAR |
| DECO | 19GRNEC 345 | 19GRNEC 120 | 1 | YES | YES | | 004 | 2000S | | | | ECAR |
| DECO | 19GRNEC 345 | 19GRNEC 26.0 | 1 | YES | YES | | 005 | 2000S | | | | ECAR |
| DECO | 19MADRD 345 | 19MAJTC 345 | 1 | YES | | | 001 | | 2000S | | | DECO |
| DECO | 19MADRD 345 | 19PONTC 345 | 1 | YES | | | 002 | | 2000S | | | DECO |
| DECO | 19MADRD 345 | 19MADRD 120 | 1 | YES | | | 003 | | 2000S | | | DECO |
| DECO | 19PLACD 345 | 19PONTC 345 | 1 | YES | | | 001 | | | | | DECO |
| DECO | 19PLACD 345 | 19WAYNE 345 | 1 | YES | | | 002 | | | | | DECO |
| DECO | 19PLACD 345 | 19PLACD 120 | 1 | YES | | | 003 | | | | | DECO |
| DECO | 19PONTC 345 | 19PONTC1 230 | 1 | YES | | | 001 | | | | | ECAR |
| DECO | 19PONTC1 230 | 19BLMFD 230 | 1 | YES | | | 002 | | | | | ECAR |
| DECO | 19BLMFD 230 | 19BLMFD 120 | 1 | YES | | | 003 | | | | | ECAR |
| DECO | 19QUATP 345 | 19WAYNE 345 | 1 | YES | | | 001 | | | | | DECO |
| DECO | 19QUATP 345 | 19WIXOM 345 | 1 | YES | | | 002 | | | | | DECO |
| DECO | 19QUATP 345 | 19QUAKR 345 | 1 | YES | | | 003 | | | | | DECO |
| DECO | 19QUAKR 345 | 19QUAKR 120 | 1 | YES | | | 004 | | | | | DECO |
| DPL | 09ADKINS 345 | 09ATLNTA 345 | 1 | YES | | | 001 | | | | | DPL |
| DPL | 09ATLNTA 345 | 09ATLNTA69.0 | 1 | YES | | | 002 | | | | | DPL |
| DPL | 09BATH 345 | 09GREENE 345 | 1 | YES | | | 001 | | | | | DPL |
| DPL | 09BATH 345 | 09MIAMI 345 | 1 | YES | | | 002 | | | | | DPL |
| DPL | 09BATH 345 | 09BATH 138 | 1 | YES | | | 003 | | | | | DPL |
| DPL | 09CLINTO 345 | 09GREENE 345 | 1 | YES | | | 001 | | | | | DPL |
| DPL | 09CLINTO 345 | 09STUART 345 | 1 | YES | | | 002 | | | | | DPL |

ECAR TYPE 3 OUTAGES -- MULTIPLE TERMINAL CIRCUIT OUTAGES.
SINGLE CIRCUIT SEGMENTS, 345 KV OR ABOVE WITH LOWER VOLTAGE SEGMENTS INCLUDED BY EXCEPTION, THAT ARE OUTAGED TOGETHER BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: CRO = COMMON RIGHT-OF-WAY OUTAGE, CSO = COMMON STATION OUTAGE.
NOTE: ENTRIES SORTED BY (1) VOLTAGE THEN ALPHA BY BUSNAME, AND (2) ALPHA BY COMPANY OF FIRST BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | CRO | CSO | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DPL | 09CLINTO 345 | 09CLINTO69.0 | 1 | YES | | | | 003 | | | | | DPL |
| DPL | 09MIAMI 345 | 09WMILTN 345 | 1 | YES | | | | 001 | | | | | DPL |
| DPL | 09WMILTN 345 | 09WMILTN 138 | 1 | YES | | | | 002 | | | | | DPL |
| DPL | 09CENTER 138 | 09HEMPST 138 | 1 | YES | | | | 001 | | | | | ECAR |
| DPL | 09CENTER 138 | 09NORMAN 138 | 1 | YES | | | | 002 | | | | | ECAR |
| DPL | 09NORMAN 138 | 09SUGRCK 138 | 1 | YES | | | | 003 | | | | | ECAR |
| EKPC | 20AVON 345 | 20SPURLK 345 | 1 | YES | | YES | | 001 | | | | | EKPC |
| EKPC | 20AVON 345 | 20AVON 138 | 1 | YES | | YES | | 002 | | | | | EKPC |
| EKPC | 20AVON 138 | 20BOONST 138 | 1 | YES | | | | 001 | | | | | EKPC |
| EKPC | 20BOONST 138 | 20DALE 138 | 1 | YES | | | | 002 | | | | | EKPC |
| EKPC-LGEE | 20BOONSB 138 | 11BOONSB69.0 | 1 | YES | | | | 003 | | | | | EKPC |
| EKPC | 20DALE 138 | 20TFJ 138 | 1 | YES | | YES | | 001 | | | | | EKPC |
| EKPC | 20FAWKES 138 | 20TFJ 138 | 1 | YES | | YES | | 002 | | | | | EKPC |
| EKPC | 20MAYSVJ 138 | 20PLUMV 138 | 1 | YES | | YES | | 001 | | | | | EKPC |
| EKPC | 20MAYSVJ 138 | 20SPURLK 138 | 1 | YES | | YES | | 002 | | | | | EKPC |
| FE-DECO | 02ALLEN 345 | 19LULU 345 | 1 | YES | YES | | | 001 | | | | | FE |
| DECO | 19LULU 345 | 19MAJTC 345 | 1 | YES | YES | | | 002 | | | | | FE |
| DECO | 19LULU 345 | 19MON34 345 | 1 | YES | YES | | | 003 | | | | | FE |
| FE | 02ALLEN 345 | 02NTAP 345 | 1 | YES | YES | | | 001 | | | | | FE |
| FE | 02MIDWAY 345 | 02NTAP 345 | 1 | YES | YES | | | 002 | | | | | FE |
| FE | 02NTAP 345 | 02NSTAR 345 | 1 | YES | YES | | | 003 | | | | | FE |
| FE-PENLEC | 02AT 345 | ERIE W 345 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02AT 345 | 02PERRY 345 | 1 | YES | | | | 002 | | | | | FE |
| FE | 02AT 345 | 02ASHTBL 138 | 8 | YES | | | | 003 | | | | | FE |
| FE-AEP | 02GALION 345 | 05OHIOCT 345 | 1 | YES | | YES | YES | 001 | | | | | FE |
| AEP | 05MUSKNG 345 | 05OHIOCT 345 | 1 | YES | | YES | YES | 002 | | | | | FE |
| AEP | 05OHIOCT 345 | 05OHIOCX 138 | 1 | YES | | YES | YES | 003 | | | | | FE |
| FE | 02FOX 345 | 02FOXQ11 138 | 2 | YES | | | | 001 | | | | | FE |
| FE | 02FOX 345 | 02FOXQ13 138 | 3 | YES | | | | 002 | | | | | FE |
| FE | 02FOX 345 | 02FOXQ12 138 | 5 | YES | | | | 001 | | | | | FE |
| FE | 02FOX 345 | 02FOXQ14 138 | 4 | YES | | | | 002 | | | | | FE |
| FE | 02GALION 345 | 02GALION 138 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02GALION 345 | 02GALION 138 | 2 | YES | | | | 002 | | | | | FE |
| FE | 02HARDIN 345 | 02HDGQ13 138 | 3 | YES | | | | 001 | | | | | FE |
| FE | 02HARDIN 345 | 02HDGQ14 138 | 4 | YES | | | | 002 | | | | | FE |
| FE | 02STAR 345 | 02STAR 138 | 2 | YES | | | | 001 | | | | | FE |
| FE | 02STAR 345 | 02STAR 138 | 3 | YES | | | | 002 | | | | | FE |
| FE | 02TANGY 345 | 02TANGY 138 | 1 | YES | | | | 001 | | | | | FE |
| FE | 02TANGY 345 | 02TANGY 138 | 2 | YES | | | | 002 | | | | | FE |
| HE | 07BLOMNG 345 | 07WORTHN 345 | 1 | YES | | YES | | 001 | | | | | HE |
| HE | 07MEROM5 345 | 07WORTHN 345 | 1 | YES | | YES | | 002 | | | | | HE |
| HE-CIN | 07BLOMNG 345 | 08BLOOM 230 | 1 | YES | | YES | | 001 | | | | | HE |
| HE | 07WORTHN 345 | 07WORTH8 138 | 1 | YES | | YES | | 003 | | | | | HE |
| HE | 07BLOMNG 345 | 07WORTHN 345 | 1 | YES | | YES | | 001 | | | | | HE |
| HE-CIN | 07BLOMNG 345 | 08BLOOM 230 | 1 | YES | | YES | | 002 | | | | | HE |
| IPL | 16GUION 345 | 16ROCKVL 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| IPL | 16GUION 345 | 16GUION 138 | S | YES | | YES | | 002 | | | | | AEP (IM) |
| IPL | 16GUION 345 | 16ROCKVL 345 | 1 | YES | | YES | | 001 | | | | | IPL |

ECAR TYPE 3 OUTAGES -- MULTIPLE TERMINAL CIRCUIT OUTAGES.
SINGLE CIRCUIT SEGMENTS, 345 KV OR ABOVE WITH LOWER VOLTAGE SEGMENTS INCLUDED BY EXCEPTION, THAT ARE OUTAGED TOGETHER BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: CRO = COMMON RIGHT-OF-WAY OUTAGE, CSO = COMMON STATION OUTAGE.
NOTE: ENTRIES SORTED BY (1) VOLTAGE THEN ALPHA BY BUSNAME, AND (2) ALPHA BY COMPANY OF FIRST BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | CRO | CSO | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IPL | 16ROCKVL 345 | 16THOMPS 345 | 1 | YES | | YES | | 002 | | | | | IPL |
| IPL | 16ROCKVL 345 | 16ROCKVL 138 | 1 | YES | | YES | | 003 | | | | | IPL |
| IPL-CIN | 16GUION 345 | 08WHITST 345 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16GUION 345 | 16GUION 138 | N | YES | | YES | | 002 | | | | | IPL |
| IPL | 16HANNA 345 | 16PETE 345 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16HANNA 345 | 16HANNA 138 | E | YES | | YES | | 002 | | | | | IPL |
| IPL | 16HANNA 345 | 16STOUT 345 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16STOUT 345 | 16THOMPS 345 | 1 | YES | | YES | | 002 | | | | | IPL |
| IPL | 16STOUT 345 | 16STOUTS 138 | 1 | YES | | YES | | 003 | | | | | IPL |
| IPL | 16HANNA 345 | 16STOUT 345 | 1 | YES | | YES | | 001 | | | | | IPL |
| IPL | 16HANNA 345 | 16HANNA 138 | W | YES | | YES | | 002 | | | | | IPL |
| LGEE | 11PINEV 500 | 11POCKET 500 | 1 | YES | | YES | YES | 001 | | | | | LGEE |
| LGEE | 11PINEV 500 | 11PINEVI 345 | 1 | YES | | YES | YES | 002 | | | | | LGEE |
| LGEE | 11ALCALD 345 | 11BRWN N 345 | 1 | YES | YES | YES | YES | 001 | | | | | LGEE |
| LGEE | 11ALCALD 345 | 11PINEVI 345 | 1 | YES | YES | YES | YES | 002 | | | | | LGEE |
| LGEE | 11ALCALD 345 | 11ALCALD 161 | 1 | YES | YES | YES | YES | 003 | | | | | LGEE |
| LGEE | 11BLUELI 345 | 11MIL CK 345 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11BLUELI 345 | 11BLUE L 161 | 1 | YES | | YES | | 002 | | | | | LGEE |
| LGEE | 11BLUELI 345 | 11MIDDLT 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| LGEE | 11BLUELI 345 | 11BLUELI 138 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| LGEE | 11BRWN N 345 | 11HARDN 345 | 1 | YES | | YES | YES | 001 | | | | | LGEE |
| LGEE | 11HARDN 345 | 11SMITH 345 | 1 | YES | | YES | YES | 002 | | | | | LGEE |
| LGEE | 11HARDN 345 | 11HARDN 138 | 1 | YES | | YES | YES | 003 | | | | | LGEE |
| LGEE | 11BRWN N 345 | 11W LEXN 345 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11GHENT 345 | 11W LEXN 345 | 1 | YES | | YES | | 002 | | | | | LGEE |
| LGEE | 11W LEXN 345 | 11W LEXN 138 | 1 | YES | | YES | | 003 | | | | | LGEE |
| LGEE | 11GHENT 345 | 11W FRNK 345 | 1 | YES | | YES | YES | 001 | | | | | LGEE |
| LGEE | 11W FRNK 345 | 11W FRNK 138 | 1 | YES | | YES | YES | 002 | | | | | LGEE |
| LGEE | 11MIL CK 345 | 11PADDYW 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| LGEE | 11PADDYW 345 | 11P WEST 138 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| LGEE | 11NORTHS 345 | 11PADDYW 345 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11NORTHS 345 | 11NORTHS 138 | 1 | YES | | YES | | 002 | | | | | LGEE |
| LGEE | 11CORY T 161 | 11MORGNF 161 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11CORY T 161 | 11GR RV 161 | 1 | YES | | YES | | 002 | | | | | LGEE |
| LGEE | 11CORY T 161 | 11CORYDO 161 | 1 | YES | | YES | | 003 | | | | | LGEE |
| LGEE | 11CORYDO 161 | 11CORYDO69.0 | 1 | YES | | YES | | 004 | | | | | LGEE |
| LGEE | 11CRITTE 161 | 11MORGNF 161 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11CRITTE 161 | 11LIV C 161 | 1 | YES | | YES | | 002 | | | | | LGEE |
| LGEE | 11CRITTE 161 | 11CRITTE69.0 | 1 | YES | | YES | | 003 | | | | | LGEE |
| LGEE | 11EARL N 161 | 11RQ TAP 161 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11GR RV 161 | 11RQ TAP 161 | 1 | YES | | YES | | 002 | | | | | LGEE |
| LGEE | 11RIVR Q 161 | 11RQ TAP 161 | 1 | YES | | YES | | 003 | | | | | LGEE |
| LGEE | 11RIVR Q 161 | 11RIVR Q69.0 | 1 | YES | | YES | | 004 | | | | | LGEE |
| LGEE | 11BEARGR 138 | 113870 T 138 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11MIDDLT 138 | 113870 T 138 | 1 | YES | | YES | | 002 | | | | | LGEE |
| LGEE | 11PLAINV 138 | 113870 T 138 | 1 | YES | | YES | | 003 | | | | | LGEE |
| LGEE | 11BEARGR 138 | 11JEFFJC 138 | 1 | YES | | YES | | 001 | | | | | LGEE |
| CIN-LGEE | 08JEFF 138 | 11JEFFJC 138 | 1 | YES | | YES | | 002 | | | | | LGEE |
| LGEE | 11JEFFJC 138 | 11NORTHS 138 | 1 | YES | | YES | | 003 | | | | | LGEE |
| LGEE | 11DAY-WA 138 | 11DW CRN 138 | 1 | YES | | | | 001 | | | | | LGEE |

ECAR TYPE 3 OUTAGES -- MULTIPLE TERMINAL CIRCUIT OUTAGES.
SINGLE CIRCUIT SEGMENTS, 345 KV OR ABOVE WITH LOWER VOLTAGE SEGMENTS INCLUDED BY EXCEPTION, THAT ARE OUTAGED TOGETHER BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: CRO = COMMON RIGHT-OF-WAY OUTAGE, CSO = COMMON STATION OUTAGE.
NOTE: ENTRIES SORTED BY (1) VOLTAGE THEN ALPHA BY BUSNAME, AND (2) ALPHA BY COMPANY OF FIRST BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | CRO | CSO | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LGEE | 11DAY-WA 138 | 11NAS 138 | 1 | YES | | | | 002 | | | | | LGEE |
| LGEE | 11GHENT 138 | 11NAS 138 | 1 | YES | | | | 003 | | | | | LGEE |
| LGEE | 11FLEMIN 138 | 11GODDRD 138 | 1 | YES | | YES | | 001 | | | | | LGEE |
| LGEE | 11FLEMIN 138 | 11WEDONI 138 | 1 | YES | | YES | | 002 | | | | | LGEE |
| LGEE | 11GODDRD 138 | 11RODBRN 138 | 1 | YES | | YES | | 003 | | | | | LGEE |
| LGEE-EKPC | 11GODDRD 138 | 20GODDRD 138 | 1 | YES | | YES | | 004 | | | | | LGEE |
| LGEE | 11KENTON 138 | 11WEDONI 138 | 1 | YES | | YES | | 005 | | | | | LGEE |
| LGEE | 11GHENT 138 | 11OC TAP 138 | 1 | YES | | | | 001 | | | | | EKPC |
| LGEE | 11OC TAP 138 | 11SCOTT 138 | 1 | YES | | | | 002 | | | | | EKPC |
| LGEE-EKPC | 11OWEN C 138 | 20OWEN C69.0 | 1 | YES | | | | 003 | | | | | EKPC |
| LGEE | 11HAEFLI 138 | 11VILEY 138 | 1 | YES | | | | 001 | | | | | EKPC |
| LGEE | 11VILEY 138 | 11W LEXN 138 | 1 | YES | | | | 002 | | | | | EKPC |
| NIPS | 17BABCOK 345 | 17STLWEL 345 | 1 | YES | | YES | | 001 | | | | | NIPS |
| AEP-NIPS | 05DUMONT 345 | 17STLWEL 345 | 1 | YES | | YES | | 002 | | | | | NIPS |
| NIPS | 17STLWEL 345 | 17STLWEL 138 | 1 | YES | | YES | | 003 | | | | | NIPS |
| NIPS | 17BABCOK 345 | 17TWR RD 345 | 1 | YES | | YES | | 001 | | | | | NIPS |
| NIPS | 17SCHAHF 345 | 17TWR RD 345 | 1 | YES | | YES | | 002 | | | | | NIPS |
| NIPS | 17TWR RD 345 | 17TOWRRD 138 | 2 | YES | | YES | | 003 | | | | | NIPS |
| NIPS | 17CHIAVE 345 | 17DUNACR 345 | 1 | YES | | YES | | 001 | | | | | NIPS |
| NIPS | 17CHIAVE 345 | 17SHEFLD 345 | 1 | YES | | YES | | 002 | | | | | NIPS |
| NIPS | 17CHIAVE 345 | 17CHIAVE 138 | 2 | YES | | YES | | 003 | | | | | NIPS |
| NIPS | 17HIPLE 345 | 17LESBRG 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| NIPS | 17HIPLE 345 | 17HIPLE 138 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| OVEC | 06CLIFTY 345 | 06DEARBN 345 | 1 | YES | | YES | | 001 | | | | | OVEC |
| OVEC | 06DEARBN 345 | 06PIERCE 345 | 1 | YES | | YES | | 002 | | | | | OVEC |
| OVEC-AEP | 06DEARBN 345 | 05TANNER 345 | 1 | YES | | YES | | 003 | | | | | OVEC |
| OVEC-AEP | 06KYGER 345 | 05TRISTA 345 | 1 | YES | | | | 001 | | | | | AEP (AP) |
| AEP | 05TRISTA 345 | 05TRISTA 138 | 1 | YES | | | | 002 | | | | | AEP (AP) |
| OVEC | 06CLIFTY 345 | 06CLIFTY 138 | 1A | YES | | | | 001 | | | | | OVEC |
| OVEC | 06CLIFTY 345 | 06CLIFTY 138 | 1B | YES | | | | 001 | | | | | OVEC |
| PJM500 | CNASTONE 500 | HUNTERTN 500 | 1 | YES | YES | | YES | 001 | | | | | ECAR |
| PJM500 | CONEM-GH 500 | HUNTERTN 500 | 1 | YES | YES | | YES | 002 | | | | | ECAR |
| PJM500 | HUNTERTN 500 | HUNTRSTN 230 | 1 | YES | YES | | YES | 003 | | | | | ECAR |
| AMRN | LUTESVIL 345 | ST FRANC 345 | 1 | YES | | | | 001 | | | | | ECAR |
| AMRN | ST FRANC 345 | ST FRANC 138 | 1 | YES | | | | 002 | | | | | ECAR |
| CIPS-CIN | ALBION 345 | 08GIBSON 345 | 1 | YES | | YES | | 001 | | | | | AEP (IM) |
| CIPS | ALBION 345 | ALBION R 138 | 1 | YES | | YES | | 002 | | | | | AEP (IM) |
| IP-AEP | BUNSONVL 345 | 05EUGENE 345 | 1 | YES | | YES | | 001 | | | | | ECAR |
| IP | BUNSONVL 345 | SIDNEY 345 | 1 | YES | | YES | | 002 | | | | | ECAR |
| IP | BUNSONVL 345 | BUNSONVL 138 | 1 | YES | | YES | | 002 | | | | | ECAR |
| OH | LAMB L4D 345 | LAMBTON 220 | T7 | | YES | | YES | 001 | | | | | (TBA) |
| OH | LAMBTON 220 | LAMBTNG324.0 | T3 | | YES | | YES | 002 | | | | | (TBA) |
| DUKE | 5NANTAHA 161 | 5ROBBINS 161 | 1 | | | YES | | 001 | | | | | VAST |
| DUKE | 8SNP 500 | 8BOWEN 500 | 1 | | | YES | | 002 | | | | | VAST |
| DUKE | 5NANTAHA 161 | 5ROBBINS 161 | 1 | | | YES | | 001 | | | | | VAST |
| DUKE | 05BROADF 765 | 05J.FERR 765 | 1 | | | YES | | 002 | | | | | VAST |
| DUKE | 5NANTAHA 161 | 5ROBBINS 161 | 1 | | | YES | | 001 | | | | | VAST |
| DUKE | 8VOLUNTE 500 | 8PHIPP B 500 | 1 | | | YES | | 002 | | | | | VAST |
| VP | 8DOOMS 500 | 8ELMONT 500 | 1 | | YES | | YES | 001 | | 2004S | | | ECAR |

ECAR TYPE 3 OUTAGES -- MULTIPLE TERMINAL CIRCUIT OUTAGES.
SINGLE CIRCUIT SEGMENTS, 345 KV OR ABOVE WITH LOWER VOLTAGE SEGMENTS INCLUDED BY EXCEPTION, THAT ARE OUTAGED TOGETHER BY NORMAL CIRCUIT BREAKER ACTION.
NOTE: CRO = COMMON RIGHT-OF-WAY OUTAGE, CSO = COMMON STATION OUTAGE.
NOTE: ENTRIES SORTED BY (1) VOLTAGE THEN ALPHA BY BUSNAME, AND (2) ALPHA BY COMPANY OF FIRST BUSNAME.

| COMPANY | FROM BUS | | TO BUS | | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | CRO | CSO | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VP | 8ELMONT | 500 | 6ELMONT | 230 | 2 | | YES | | YES | 002 | | 2004S | | | ECAR |
| VP | 8DOOMS | 500 | 8LEXNGTN | 500 | 1 | | YES | | YES | 001 | | | | | ECAR |
| VP | 8LEXNGTN | 500 | 3LEXNGTN | 115 | 2 | | YES | | YES | 002 | | | | | ECAR |
| VP | 8MT STM | 500 | 8VALLEY | 500 | 1 | | YES | | YES | 001 | | | | | ECAR |
| VP | 8VALLEY | 500 | 6VALLEY | 230 | 1 | | YES | | YES | 002 | | | | | ECAR |
| AEP-VP | 05BANSTR | 138 | 4BANISTR | 138 | 1 | YES | | YES | YES | 001 | | | | | ECAR |
| AEP | 05BANSTR | 138 | 05BEARSK | 138 | 1 | YES | | YES | YES | 002 | | | | | ECAR |
| AEP | 05BANSTR | 138 | 05EDAN 2 | 138 | 1 | YES | | YES | YES | 003 | | | | | ECAR |
| AEP-VP | 05BEARSK | 138 | 4BEARSKN | 138 | 1 | YES | | YES | YES | 004 | | | | | ECAR |
| AEP | 05BEARSK | 138 | 05SMITHM | 138 | 1 | YES | | YES | YES | 005 | | | | | ECAR |

ECAR TYPE 4 OUTAGES -- DOUBLE CIRCUIT TOWER OUTAGES.
SINGLE CIRCUIT, SINGLE CIRCUIT SEGMENT, AND/OR MULTIPLE TERMINAL CIRCUIT COMBINATIONS, SHARING COMMON TOWERS FOR AT LEAST ONE MILE AND WITH AT LEAST ONE CIRCUIT 345 KV OR ABOVE, RESULTING IN A DOUBLE CIRCUIT TOWER OUTAGE. NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) VOLTAGE THEN ALPHA BY BUSNAME, AND (2) ALPHA BY COMPANY OF FIRST BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AEP | 05BENTON 345 | 05COOK 345 | 1 | YES | YES | | 001 | | | | | AEP (IM) |
| AEP-CONS | 05COOK 345 | 18PALISA 345 | 1 | YES | YES | | 002 | | | | | AEP (IM) |
| AEP | 05BENTON 345 | 05COOK 345 | 1 | YES | YES | | 001 | | | | | AEP (IM) |
| AEP-CONS | 05BENTON 345 | 18PALISA 345 | 1 | YES | YES | | 002 | | | | | AEP (IM) |
| AEP-CONS | 05COOK 345 | 18PALISA 345 | 1 | YES | YES | | 003 | | | | | AEP (IM) |
| AEP | 05BENTON 345 | 05BENTON 138 | 1 | YES | YES | | 004 | | | | | AEP (IM) |
| AEP-CONS | 05BENTON 345 | 18PALISA 345 | 1 | YES | YES | | 001 | | | | | AEP (IM) |
| AEP-CONS | 05COOK 345 | 18PALISA 345 | 1 | YES | YES | | 002 | | | | | AEP (IM) |
| CONS | 18ARGENT 345 | 18TOMPKN 345 | 1 | YES | | | 001 | | 2001S | | | CONS |
| CONS | 18BATTLE 345 | 18ONEIDJ 345 | 1 | YES | | | 002 | | 2001S | | | CONS |
| DECO-CONS | 19MAJTC 345 | 18ONEIDJ 345 | 1 | YES | | | 003 | | 2001S | | | CONS |
| CONS | 18ONEIDA 345 | 18ONEIDJ 345 | 1 | YES | | | 004 | | 2001S | | | CONS |
| CONS | 18ARGENT 345 | 18BATTLE 345 | 1 | YES | | | 001 | | | | | CONS |
| CONS | 18ARGENT 345 | 18TOMPKN 345 | 1 | YES | | | 002 | | | | | CONS |
| CONS | 18ARGENT 345 | 18KENOWA 345 | 1 | YES | | | 001 | | | | | ECAR |
| CONS | 18ARGENT 345 | 18TALLMA 345 | 1 | YES | | | 002 | | | | | ECAR |
| CONS | 18ARGENT 345 | 18KENOWA 345 | 1 | YES | | | 001 | | | | | ECAR |
| CONS | 18KENOWA 345 | 18TALLMA 345 | 1 | YES | | | 002 | | | | | ECAR |
| CONS | 18ARGENT 345 | 18PALISA 345 | 1 | YES | | | 001 | | | | | CONS |
| CONS | 18ARGENT 345 | 18PALISA 345 | 2 | YES | | | 002 | | | | | CONS |
| CONS-AEP | 18ARGENT 345 | 05ROB PK 345 | 1 | YES | | | 001 | | | | | CONS |
| CONS-AEP | 18ARGENT 345 | 05TWIN B 345 | 1 | YES | | | 002 | | | | | CONS |
| CONS-AEP | 18ARGENT 345 | 05ROB PK 345 | 1 | YES | | | 001 | 1995S | | | | CONS |
| AEP | 05COLNGW 345 | 05EELKHA 345 | 1 | YES | | | 002 | 1995S | | | | CONS |
| CONS-AEP | 18ARGENT 345 | 05ROB PK 345 | 1 | YES | | | 001 | 1995S | | | | CONS |
| AEP | 05COLNGW 345 | 05ROB PK 345 | 1 | YES | | | 002 | 1995S | | | | CONS |
| CONS-AEP | 18ARGENT 345 | 05ROB PK 345 | 1 | YES | | | 001 | | | | | CONS |
| AEP | 05COOK 345 | 05EELKHA 345 | 1 | YES | | | 002 | | | | | CONS |
| CONS-AEP | 18ARGENT 345 | 05ROB PK 345 | 1 | YES | | | 001 | | 1995S | | | CONS |
| AEP | 05EELKHA 345 | 05ROB PK 345 | 1 | YES | | | 002 | | 1995S | | | CONS |
| CONS | 18ARGENT 345 | 18TOMPKN 345 | 1 | YES | | | 001 | 2001S | | | | CONS |
| CONS | 18BATTLE 345 | 18ONEIDA 345 | 1 | YES | | | 002 | 2001S | | | | CONS |
| CONS | 18ARGENT 345 | 18TOMPKN 345 | 1 | YES | | | 001 | 2001S | | | | CONS |
| CONS-DECO | 18ONEIDA 345 | 19MAJTC 345 | 1 | YES | | | 002 | 2001S | | | | CONS |
| CONS-AEP | 18ARGENT 345 | 05TWIN B 345 | 1 | YES | | | 001 | | | | | CONS |
| AEP | 05COOK 345 | 05EELKHA 345 | 1 | YES | | | 002 | | | | | CONS |
| CONS | 18BATTLE 345 | 18ONEIDJ 345 | 1 | YES | | | 001 | | 2001S | | | CONS |
| DECO-CONS | 19MAJTC 345 | 18ONEIDJ 345 | 1 | YES | | | 002 | | 2001S | | | CONS |
| DECO-CONS | 19MAJTC 345 | 18TOMPKN 345 | 1 | YES | | | 003 | | 2001S | | | CONS |
| CONS | 18ONEIDA 345 | 18ONEIDJ 345 | 1 | YES | | | 004 | | 2001S | | | CONS |
| CONS | 18CAMPSW 345 | 18GAINES 345 | 1 | YES | | | 001 | | 2001S | | | ECAR |
| CONS | 18GAINES 345 | 18VERGEN 345 | 1 | YES | | | 002 | | 2001S | | | ECAR |
| CONS | 18PALISA 345 | 18TALLMA 345 | 1 | YES | | | 003 | | 2001S | | | ECAR |
| CONS | 18CAMPSW 345 | 18GAINES 345 | 1 | YES | | | 001 | 2001S | | | | ECAR |
| CONS | 18GAINES 345 | 18VERGEN 345 | 1 | YES | | | 002 | 2001S | | | | ECAR |
| CONS | 18PALISA 345 | 18ROSEVT 345 | 1 | YES | | | 003 | 2001S | | | | ECAR |
| CONS | 18CAMPSW 345 | 18GAINES 345 | 1 | YES | | | 001 | | 2001S | | | ECAR |
| CONS | 18GAINES 345 | 18VERGEN 345 | 1 | YES | | | 002 | | 2001S | | | ECAR |
| CONS | 18PALISA 345 | 18VERGEN 345 | 1 | YES | | | 003 | | 2001S | | | ECAR |

ECAR TYPE 4 OUTAGES -- DOUBLE CIRCUIT TOWER OUTAGES.
SINGLE CIRCUIT, SINGLE CIRCUIT SEGMENT, AND/OR MULTIPLE TERMINAL CIRCUIT COMBINATIONS, SHARING COMMON TOWERS FOR AT LEAST ONE MILE AND WITH AT LEAST ONE CIRCUIT 345 KV OR ABOVE, RESULTING IN A DOUBLE CIRCUIT TOWER OUTAGE. NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) VOLTAGE THEN ALPHA BY BUSNAME, AND (2) ALPHA BY COMPANY OF FIRST BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONS | 18CAMPSW 345 | 18GAINES 345 | 1 | YES | | | 001 | 2001S | | | | ECAR |
| CONS | 18GAINES 345 | 18VERGEN 345 | 1 | YES | | | 002 | 2001S | | | | ECAR |
| CONS | 18ROSEVT 345 | 18TALLMA 345 | 1 | YES | | | 003 | 2001S | | | | ECAR |
| CONS | 18CAMPSW 345 | 18TALLMA 345 | 1 | YES | | | 001 | | 2001S | | | ECAR |
| CONS | 18CAMPSW 345 | 18GAINES 345 | 1 | YES | | | 002 | | 2001S | | | ECAR |
| CONS | 18GAINES 345 | 18VERGEN 345 | 1 | YES | | | 003 | | 2001S | | | ECAR |
| CONS | 18CAMPSW 345 | 18CAMPBE 138 | 5 | YES | | | 004 | | 2001S | | | ECAR |
| CONS | 18CAMPSW 345 | 18TALLMA 345 | 1 | YES | | | 001 | | 2001S | | | ECAR |
| CONS | 18PALISA 345 | 18TALLMA 345 | 1 | YES | | | 002 | | 2001S | | | ECAR |
| CONS | 18CAMPSW 345 | 18TALLMA 345 | 1 | YES | | | 001 | 2001S | | | | ECAR |
| CONS | 18ROSEVT 345 | 18TALLMA 345 | 1 | YES | | | 002 | 2001S | | | | ECAR |
| CONS | 18GOSS 345 | 18THETFR 345 | 1 | YES | | | 001 | | | | | ECAR |
| CONS | 18GOSS 345 | 18VERGEN 345 | 1 | YES | | | 002 | | | | | ECAR |
| CONS | 18GOSS 345 | 18THETFR 345 | 1 | YES | | | 001 | | | | | ECAR |
| CONS | 18THETFR 345 | 18TITBAW 345 | 1 | YES | | | 002 | | | | | ECAR |
| CONS | 18GOSS 345 | 18VERGEN 345 | 1 | YES | | | 001 | | | | | ECAR |
| CONS | 18KENOWA 345 | 18TITBAW 345 | 1 | YES | | | 002 | | | | | ECAR |
| CONS | 18GOSS 345 | 18VERGEN 345 | 1 | YES | | | 001 | | | | | ECAR |
| CONS | 18KENOWA 345 | 18VERGEN 345 | 1 | YES | | | 002 | | | | | ECAR |
| CONS | 18GOSS 345 | 18VERGEN 345 | 1 | YES | | | 001 | | | | | ECAR |
| CONS | 18THETFR 345 | 18TITBAW 345 | 1 | YES | | | 002 | | | | | ECAR |
| CONS-DECO | 18HAMPTO 345 | 19PONTC 345 | 1 | YES | | | 001 | | | | | ECAR |
| CONS | 18HAMPTO 345 | 18TITBAW 345 | 1 | YES | | | 002 | | | | | ECAR |
| CONS-DECO | 18HAMPTO 345 | 19PONTC 345 | 1 | YES | | | 001 | | | | | CONS |
| DECO-CONS | 19JEWEL 345 | 18THETFR 345 | 1 | YES | | | 002 | | | | | CONS |
| CONS-DECO | 18HAMPTO 345 | 19PONTC 345 | 1 | YES | | | 001 | | 2000S | | | CONS |
| DECO | 19MADRD 345 | 19MAJTC 345 | 1 | YES | | | 002 | | 2000S | | | CONS |
| DECO | 19MADRD 345 | 19PONTC 345 | 1 | YES | | | 003 | | 2000S | | | CONS |
| DECO | 19MADRD 345 | 19MADRD 120 | 1 | YES | | | 004 | | 2000S | | | CONS |
| CONS-DECO | 18HAMPTO 345 | 19PONTC 345 | 1 | YES | | | 001 | 2000S | | | | CONS |
| DECO | 19BFOOT 345 | 19PONTC 345 | 1 | YES | | | 002 | 2000S | | | | CONS |
| CONS-DECO | 18HAMPTO 345 | 19PONTC 345 | 1 | YES | | | 001 | 2000S | | | | CONS |
| DECO | 19BFOOT 345 | 19BLRPP 345 | 1 | YES | | | 002 | 2000S | | | | CONS |
| CONS-DECO | 18HAMPTO 345 | 19PONTC 345 | 1 | YES | | | 001 | | | | | ECAR |
| CONS | 18MANNIN 345 | 18THETFR 345 | 1 | YES | | | 002 | | | | | ECAR |
| CONS | 18MANNIN 345 | 18TITBAW 345 | 1 | YES | | | 003 | | | | | ECAR |
| CONS | 18HAMPTO 345 | 18THETFR 345 | 1 | YES | | | 001 | | | | | ECAR |
| CONS | 18HAMPTO 345 | 18THETFR 345 | 2 | YES | | | 002 | | | | | ECAR |
| CONS | 18HAMPTO 345 | 18TITBAW 345 | 1 | YES | | | 001 | | | | | ECAR |
| CONS | 18MANNIN 345 | 18THETFR 345 | 1 | YES | | | 002 | | | | | ECAR |
| CONS | 18MANNIN 345 | 18TITBAW 345 | 1 | YES | | | 003 | | | | | ECAR |
| CONS | 18KENOWA 345 | 18LUDING 345 | 1 | YES | | | 001 | | | | | ECAR |
| CONS | 18KENOWA 345 | 18LUDING 345 | 2 | YES | | | 002 | | | | | ECAR |
| CONS | 18KENOWA 345 | 18TITBAW 345 | 1 | YES | | | 001 | | | | | ECAR |
| CONS | 18KENOWA 345 | 18VERGEN 345 | 1 | YES | | | 002 | | | | | ECAR |
| CONS | 18KENOWA 345 | 18TITBAW 345 | 1 | YES | | | 001 | | | | | ECAR |
| CONS | 18THETFR 345 | 18TITBAW 345 | 1 | YES | | | 002 | | | | | ECAR |
| CONS | 18KEYSTO 345 | 18LUDING 345 | 1 | YES | | | 001 | | | | | ECAR |

ECAR TYPE 4 OUTAGES -- DOUBLE CIRCUIT TOWER OUTAGES.
SINGLE CIRCUIT, SINGLE CIRCUIT SEGMENT, AND/OR MULTIPLE TERMINAL CIRCUIT COMBINATIONS, SHARING COMMON TOWERS FOR AT LEAST ONE MILE AND WITH AT LEAST ONE CIRCUIT 345 KV OR ABOVE, RESULTING IN A DOUBLE CIRCUIT TOWER OUTAGE. NOTE: N/A = NOT APPLICABLE.
NOTE: ENTRIES SORTED BY (1) VOLTAGE THEN ALPHA BY BUSNAME, AND (2) ALPHA BY COMPANY OF FIRST BUSNAME.

| COMPANY | FROM BUS | TO BUS | CKT | ECAR | MEN | MET | VEM | GROUP | IN | OUT | N/A | N/A | ORIGINATOR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONS | 18LUDING 345 | 18PEREMR 345 | 1 | YES | | | | 002 | | | | | ECAR |
| CONS | 18PEREMR 345 | 18PEREMR 138 | 2 | YES | | | | 003 | | | | | ECAR |
| CONS | 18LUDING 345 | 18TALLMA 345 | 1 | YES | | | | 001 | | | | | ECAR |
| CONS | 18LUDING 345 | 18TALLMA 345 | 2 | YES | | | | 002 | | | | | ECAR |
| CONS | 18ONEIDA 345 | 18BATTLE 345 | 1 | YES | | | | 001 | 2001S | | | | CONS |
| CONS-DECO | 18ONEIDA 345 | 19MAJTC 345 | 1 | YES | | | | 002 | 2001S | | | | CONS |
| CONS | 18PALISA 345 | 18TALLMA 345 | 1 | YES | | | | 001 | | 2001S | | | ECAR |
| CONS | 18PALISA 345 | 18VERGEN 345 | 1 | YES | | | | 002 | | 2001S | | | ECAR |
| CONS | 18PALISA 345 | 18ROSEVT 345 | 1 | YES | | | | 001 | 2001S | | | | ECAR |
| CONS | 18PALISA 345 | 18VERGEN 345 | 1 | YES | | | | 002 | 2001S | | | | ECAR |
| DECO | 19BLRPP 345 | 19JEWEL 345 | 1 | YES | | | | 001 | | | | | ECAR |
| DECO-CONS | 19JEWEL 345 | 18THETFR 345 | 1 | YES | | | | 002 | | | | | ECAR |
| DECO | 19JEWEL 345 | 19PONTC 345 | 1 | YES | | | | 001 | | 2000S | | | ECAR |
| DECO-CONS | 19JEWEL 345 | 18THETFR 345 | 1 | YES | | | | 002 | | 2000S | | | ECAR |
| DECO | 19BR-G-P 345 | 19GRNEC 345 | 1 | YES | | | | 001 | 2000S | | | | ECAR |
| DECO | 19BR-G-P 345 | 19PONTC 345 | 1 | YES | | | | 002 | 2000S | | | | ECAR |
| DECO-CONS | 19JEWEL 345 | 18THETFR 345 | 1 | YES | | | | 003 | 2000S | | | | ECAR |
| DECO | 19GRNEC 345 | 19GRNEC 26.0 | 1 | YES | | | | 004 | 2000S | | | | ECAR |
| DECO | 19BLRPP 345 | 19BFOOT 345 | 1 | YES | | | | 001 | 2000S | | | | ECAR |
| DECO-CONS | 19JEWEL 345 | 18THETFR 345 | 1 | YES | | | | 002 | 2000S | | | | ECAR |
| DECO-CONS | 19MAJTC 345 | 18ONEIDA 345 | 1 | YES | | | | 001 | 2001S | | | | CONS |
| DECO-CONS | 19MAJTC 345 | 18TOMPKN 345 | 1 | YES | | | | 002 | 2001S | | | | CONS |

# APPENDIX J

## Definitions

## Introduction

The transfer capability definitions presented in this appendix are based on the NERC Transmission Transfer Capability publication, dated May 1995. In addition to the definitions, this appendix also contains a discussion on transfer capability and response factor calculations.

## Normal Incremental Transfer Capability (NITC)

The amount of electric power, incremental above normal base power transfers, that can be transferred between two areas of the interconnected transmission systems under conditions where pre-contingency loadings reach the normal thermal rating of a facility, prior to any first contingency transfer limits being reached. When this occurs, NITC replaces FCITC as the most limiting transfer capability. For calculation purposes, NITC is equal to the normal rating of the monitored facility, minus the MW flow on the monitored facility under in the base case, divided by the PTDF.

## First Contingency Incremental Transfer Capability (FCITC)

The amount of electric power, incremental above normal base power transfers, that can be transferred over the interconnected transmission systems in a reliable manner based on all of the following conditions:

1. For the existing or planned system configuration, and with normal (pre-contingency) operating procedures in effect, all facility loading are within normal ratings and all voltages are within normal limits,

2. The electric systems are capable of absorbing the dynamic power swings, and remaining stable, following a disturbance that results in the loss of any single electric system element, such as a transmission line, transformer, or generating unit, and

3. After the dynamic power swings subside following a disturbance that results in the loss of any single electric system element as described in 2 above, and after the operation of any automatic operating systems, but before any post-contingency operator-initiated system adjustments are implemented, all transmission facility loading are within emergency ratings and all voltages are within emergency limits.

For calculation purposes, FCITC is equal to the emergency rating of the monitored facility, minus the post-contingency MW flow on the monitored facility (without the transfer), divided by the OTDF.

**First Contingency Total Transfer Capability (FCTTC)**

The total amount of electric power (net of normal base power transfers plus first contingency incremental transfers) that can be transferred between two areas of the interconnected transmission systems in a reliable manner based on conditions 1, 2, and 3 in the FCITC definition above. For calculation purposes, FCTTC is equal to the FCITC plus the base case transfer level between these two areas of interest.

**Total Import Capability**

The total amount of electric power (net of normal base power transfers from all directions plus first contingency incremental transfers) that can be transferred between two areas of the interconnected transmission systems in a reliable manner based on conditions 1, 2, and 3 in the FCITC definition above. For calculation purposes, Total Import Capability is equal to the FCITC between these two areas of interest, plus the base case net scheduled interchange for the importing area.

**Excluded Transfer Capability Limitations**

Transfer capability is determined by concidering all network facilities within an area of interest. There will be occasions, however, when loadings on non-bulk power facilities may restrict the calculated transfer capability. As recommended in the NERC Transmission Transfer Capability publication, such limitations may be excluded from the results published in this report only if (a) there is an established operating procedure to eliminate the overload condition, and (b) the facility involved has a minimal effect on the bulk power supply system. Transfer responses below 2.5% are taken as prima facie evidence of minimal effect.

## Negative Transfer Capability Levels

Negative transfer capability levels indicate that the limiting facility is already overloaded under the contingency condition being considered without any additional transfers from those already modeled in the base case. As with positive transfer capability values, negative transfer capability values serve as a means of measuring the relative strength of the system from one season to the next.

## Calculation of Power Transfer Distribution Factor (PTDF)

PTDF is equal to the MW flow on the monitored facility under the transfer case, minus the MW flow on the monitored facility under the base case, divided by the MW transfer level.

## Calculation of Line Outage Distribution Factor (LODF)

LODF is equal to the post-contingency MW flow on the monitored facility, minus the pre-contingency MW flow on the monitored facility, divided by the pre-contingency MW flow on the outaged facility.

## Calculation of Outage Transfer Distribution Factor (OTDF)

OTDF is equal to the PTDF of the monitored facility, plus the product of the LODF (for that monitored/outaged facility pair) and the PTDF of the outaged facility.

# APPENDIX K

## Abbreviations

## Part I

| | |
|---|---|
| ECAR | East Central Area Reliability Coordination Agreement |
| AEP | American Electric Power System |
| AP | Appalachian Power Company |
| CS | Columbus Southern Power Company |
| IM | Indiana Michigan Power Company |
| KP | Kentucky Power Company |
| OP | Ohio Power Company |
| AMPO | American Municipal Power - Ohio, Incorporated |
| AP | Allegheny Power |
| BREC | Big Rivers Electric Corporation |
| BUCK | Buckeye Power, Incorporated |
| CIN | Cinergy Corporation |
| CGE | The Cincinnati Gas & Electric Company |
| PSI | PSI Energy, Incorporated |
| CONS | Consumers Energy |
| CPP | Cleveland Public Power |
| DECO | The Detroit Edison Company |
| ITC | International Transmission Company |
| DLCO | Duquesne Light Company |
| DPL | The Dayton Power and Light Company |
| EKPC | East Kentucky Power Cooperative, Incorporated |
| ENWC | Enron Wheatland (CIN Interconnection) |
| ENWI | Enron Wheatland (IPL Interconnection) |
| FE | FirstEnergy |
| ATSI | American Transmission Systems, Incorporated |
| CEI | The Cleveland Electric Illuminating Company |
| OE | Ohio Edison System |
| TE | The Toledo Edison Company |
| HE | Hoosier Energy Rural Electric Cooperative, Incorporated |
| IMPA | Indiana Municipal Power Agency |
| IPL | Indianapolis Power & Light Company |
| LGEE | LG&E Energy Corporation |
| KU | Kentucky Utilities Company |
| LGE | Louisville Gas & Electric Company |
| MCCP | Municipal Cooperative Coordianted Pool - Michigan |
| MCV | Midland Cogeneration Venture |
| MECS | Michigan Electric Coordinated System |

| | |
|---|---|
| NIPS | Northern Indiana Public Service Company |
| OVEC | Ohio Valley Electric Corporation |
| SIGE | Southern Indiana Gas and Electric Company |
| WVPA | Wabash Valley Power Association |
| FRCC | Florida Reliability Coordination Council |
| EQ-FRCC | Powerflow Equivalent of FRCC Region |
| | |
| MAAC | Mid-Atlantic Area Coordination Group |
| AE | Atlantic Electric |
| BG&E | Baltimore Gas and Electric Company |
| DP&L | Delmarva Power and Light Company |
| JCP&L | Jersey Central Power and Light Company |
| METED | Metropolitan Edison Company |
| PECO | PECO Energy |
| PENELEC | Pennsylvania Electric Company |
| PEPCO | Potomac Electric Power Company |
| PJM500 | PJM Interconnection - 500 kV System |
| PP&L | Pennsylvania Power & Light Company |
| PSE&G | Public Service Electric and Gas Company |
| | |
| MAIN | Mid-America Interpool Network |
| AMRN | AMEREN Corporation |
| CIPS | Central Illinois Public Service Company |
| UE | Union Electric System |
| CE | Commonwealth Edison Company |
| CILCO | Central Illinois Light Company |
| CWLP | City Water Light and Power (Springfield, Illinois) |
| EEI | Electric Energy, Incorporated |
| EMO | East Missouri Subregion of MAIN |
| EQ-MAIN | Partial Powerflow Equivalent of MAIN Region |
| IMEA | Illinois Municipal Electric Agency |
| IP | Illinois Power Company |
| NI | Northern Illinois Subregion of MAIN |
| SCILL | South Central Illinois Subregion of MAIN |
| SIPC | Southern Illinois Power Cooperative |
| WUMS | Wisconsin-Upper Michigan Systems Subregion of MAIN |
| | |
| MAPP | Mid-Continent Area Power Pool |
| EQ-MAPP | Powerflow Equivalent of MAPP Region |

| | |
|---|---|
| NPCC | Northeast Power Coordinating Council |
| EQ-NPCC | Partial Powerflow Equivalent of NPCC Region |
| NYISO | New York Independent System Operator |
| NYPP | New York Power Pool |
| HONI | HydroOne (Canada) |
| IMO | Independent Market Operator (Canada) |
| SERC | Southeastern Electric Reliability Council |
| AECI | Associated Electric Cooperative, Incorporated |
| CPLE | Carolina Power & Light Company (East) |
| CPLW | Carolina Power & Light Company (West) |
| DOE | Department of Energy |
| DUKE | Duke Power Company |
| EQ-SERC | Partial Powerflow Equivalent of SERC Region |
| NCEMC | North Carolina Electric Membership Cooperative |
| SEPA | Southeastern Power Administration |
| TVA | Tennessee Valley Authority |
| VACAR | Virginia-Carolinas Subregion of SERC |
| VP | Virginia Power |
| SPP | Southwest Power Pool |
| EQ-SPP | Powerflow Equivalent of SPP Region |

## Part II

| | |
|---|---|
| ATC | Available Transfer Capability |
| CRV | Curtailment Reference Value |
| FCITC | First Contingency Incremental Transfer Capability |
| FCTTC | First Contingency Total Transfer Capability |
| LEER | Lake Erie Emergency Re-dispatch Procedure |
| LODF | Line Outage Distribution Factor |
| MEN | MAAC-ECAR-NPCC |
| MET | MAIN-ECAR-TVA |
| MMWG | Multiregional Modeling Working Group |
| NDC | Net Demonstrated Capability |
| NSC | Net Seasonal Capability |
| NERC | North American Electric Reliability Council |
| NITC | Normal Incremantal Transfer Capability |

| | |
|---|---|
| NTTC | Normal Total Transfer Capability |
| OTDF | Outage Transfer Distribution Factor |
| PAR | Phase Angle Regulator |
| PTDF | Power Transfer Distribution Factor |
| QFW | Queenston Flow West Interface in Ontario Hydro |
| RCP | Reliability Coordination Plan |
| TLR | Transmission Loading Relief Procedure |
| TSPP | Transmission System Performance Panel |
| TSPWG | Transmission System Performance Working Group |
| VAST | VACAR-AEP-Southern-TVA |
| VEM | VACAR-ECAR-MAAC |