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May 11, 2012

By Electronic Filing

Hon. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Subject: **Midwest Independent Transmission System Operator, Inc. and International Transmission Company d/b/a ITC*Transmission*, Docket No. ER11-1844-000, PUBLIC Version of Testimony of New York Independent System Operator, Inc. Witness Zachary G. Smith**

Dear Ms. Bose:

The New York Independent System Operator, Inc. submits by electronic filing the **PUBLIC** version of the attached Prepared Direct and Answering Testimony of Zachary G. Smith (Exhibit NYI-38 for identification), with verification.

The testimony has been served on all parties as required by Rule 2010 of the Commission's Rules of Practice and Procedure. In addition, two three-hole punched chambers copies are being provided to Presiding Administrative Law Judge Steven Sterner, along with a summary of the testimony.

Very truly yours,

/s/ Howard H. Shafferman

Howard H. Shafferman

Cc: Parties of Record
Vintricia Alexander. (Law Clerk to Judge Sterner)

HHS/

DMEAST #15031602 v1

DOCKET NO. ER11-1844
EXHIBIT NO. NYI-38

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Midwest Independent Transmission System Operator, Inc. and International Transmission Company d/b/a ITC*Transmission*	**Docket No. ER11-1844-000**

SUMMARY OF TESTIMONY OF ZACHARY G. SMITH (EXHIBIT NYI-38)

Mr. Smith is Manager of Transmission Studies for the New York Independent System Operator, Inc. ("NYISO").

By submitting testimony addressing the merits of the MISO/ITC filing, the NYISO is not conceding that the Commission has legal authority under the Federal Power Act to accept the MISO/ITC filing, that the Commission has made the findings necessary to permit the NYISO to recover PAR-related charges it receives from MISO from the NYISO's customers, or that the collection of any or all the proposed charges – under any circumstance – is just and reasonable and not unduly discriminatory or preferential.

In Section III of his testimony, Mr. Smith provides background on the "DFAX analysis" that is the basis for the cost allocation proposed by the Midwest Independent Transmission System Operator, Inc. ("MISO") and the International Transmission Company ("ITC") in this proceeding (page 3, line 17 through page 8, line 2). Mr. Smith explains that the DFAX analysis uses a computer model of the electric network to measure the effect of the load of each transmission zone on the transmission circuits being analyzed (page 3, line 18 through page 4, line 7). MISO's DFAX study tested a hypothetical 2015 case. MISO's DFAX analysis measured the total change in MW flow on the four transmission circuits that comprise the

Michigan/Ontario Interface ("MI/ON Interface") for power transfers between each studied region's generation and that region's loads. The studies were performed on a region-by-region basis (they were not performed simultaneously) and all four of the transmission lines that comprise the MI/ON Interface were permitted to flow freely, without PAR controls. (page 4, line 9 through page 5, line 23).

Mr. Smith explains that it was not appropriate for MISO to base its DFAX analysis on the contribution to flows across the entire MI/ON Interface (which consist of four circuits). Instead, MISO's analysis should only have considered impacts on the "B3N" circuit, on which the PARs built by ITC that are at issue in this proceeding (the "Replacement PARs"), are located (page 6, lines 2 through 9). The study MISO performed understates MISO's expected use of the MI/ON PARs because MISO power flows from Michigan to Ontario on two of the circuits, and loops back to Michigan on the two other circuits, but the MISO's method inappropriately nets these two flows against each other (page 6, line 11 through page 7, line 6). The DFAX analysis should have set the Replacement PARs on the B3N circuit to "inactive" and the Hydro One PARs to "inactive," producing a more focused assessment of generation-to-load impacts on that circuit, as shown in a table (page 7, line 8 through page 8, line 1).

In Section IV of his testimony, Mr. Smith assesses the use of load duration curves in the DFAX analysis (page 8, line 3 through page 13, line 6). He explains that a load duration curve shows the number of hours of the year that a utility's or region's load is at or above a given percentage of peak load (page 8, lines 4 through 12). Mr. Smith explains why it was improper for the DFAX analysis to have used the MISO's load duration curve for all regions, rather than the load duration curves for each of the regions to which Replacement PAR costs are proposed to be allocated (page 9, line 3 through page 12, line 7). Applying MISO's load duration curve to

New York penalizes the NYISO in the calculation of the overall weighted participation (page 12, line 9 through page 13, line 6).

In Section V of his testimony, Mr. Smith addresses the three load blocks used in MISO's DFAX analysis (page 13, line 8 through page 16, line 2). He explains that a load block indicates the number of hours that the system load levels are within a given range (page 13, lines 9 through 16). Mr. Smith explains MISO's use of only three load blocks was inappropriate because such a simplistic construct cannot depict a region's electricity usage accurately over the 8760 hours in a given year (page 14, lines 1 through 18). Mr. Smith explains that the use of just three load blocks penalizes New York by mis-assigning a significant portion of the NYISO's participation (flows) to higher load hours (page 14, line 20 through page 15, line 19). Instead, the MISO should have conducted the DFAX analysis for each region based on that region's load level for each hour of the year (page 15, line 21 through page 16, line 2).

Section VI of Mr. Smith's testimony explains other flaws in the DFAX analysis (page 16, line 4 through page 19, line 18). These include ignoring the cumulative contribution of regions other than MISO, NYISO, PJM and IESO to unscheduled Lake Erie power flows. Mr. Smith points out that the multitude of small "contributors" illustrates that if regions are permitted to assess charges to each other on the basis of asserted "benefits" in the absence of regional agreements, this "chain reaction" and ensuing litigation will have no logical stopping place (page 16, line 5 through page 19, line 6). Other flaws include: (i) failing to include an amount of PJM generation and an amount of MISO generation, (ii) additional generation was incorrectly added to the NYISO and (iii) additional loads were incorrectly added to the NYISO (page 19, lines 8 through 18).

In Section VII, Mr. Smith indicates why a 1998 study referenced in the MISO/ITC filing did not represent a coordinated planning effort to design the PAR originally installed on the B3N circuit (the "Original PAR")[1] as a multi-regional facility, or to allocate the costs of the Original PAR among the regions that participated in the study (page 20, line 1 through page 21, line 14). NYISO has never participated in the MISO's MTEP planning process, whether with respect to the PARs at the MI/ON Interface or otherwise (page 21, lines 16 through 18).

Section VIII presents NYISO's modification of the MISO's DFAX study in order to rebut claims by MISO and ITC that the Replacement PARs (operating together with the three "Hydro One PARs" on the Ontario side of the MI/ON Interface) will provide a unique, multi-region benefit (page 21, line 20 through page 25, line 10). The NYISO's modification to the MISO's DFAX study shows that all PARs in the Eastern Interconnection affect power flows over the MI/ON Interface. The PARs at the MI/ON Interface are not unique in this regard (page 22, line 2 through page 25, line 2). If the other PARs in the Eastern Interconnection were removed from service, the modified DFAX analysis that the NYISO performed suggests that unscheduled Lake Erie power flows would be substantially higher than they are today (page 25, lines 4 through 10).

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[1] The Original PAR failed, and was replaced by the Replacement PARs, the cost allocation for which is at issue in this proceeding.

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Midwest Independent Transmission System Operator, Inc. and International Transmission Company d/b/a ITC*Transmission*	**Docket No. ER11-1844-000**

TESTIMONY OF ZACHARY G. SMITH

I. SUMMARY OF TESTIMONY

A summary precedes my testimony.

II. WITNESS IDENTITY AND QUALIFICATIONS

Q. Please state your name, title and business address.

A. My name is Zachary G. Smith. I serve as Manager of Transmission Studies for the New York Independent System Operator, Inc. ("NYISO"). My business address is 10 Krey Boulevard, Rensselaer, New York 12144.

Q. Please describe your educational background and work experience.

A. I received a B.S. and M.S. in Electrical Engineering from Michigan Technological University. I was employed by Schlumberger Oilfield Services from 2003-2004, and joined the Transmission Planning department at the NYISO as an Engineer in 2004. In March, 2009 I was promoted to Manager of Transmission Studies. For the last 7 years, I have been involved in NYISO interconnection and planning studies. My current responsibilities include ensuring compliance with planning standards, criteria, and reliability rules. I serve as Vice-chair of the Eastern Interconnection Planning Collaborative (EIPC) Steady State Modeling Load Flow Working Group, and am a member of the Steering Committee for the Eastern Interconnection Reliability Assessment Group (ERAG), the Joint Interregional Planning Committee, the Northeast Power Coordinating Council (NPCC) Task Force on System Studies and the NPCC Task Force on Coordination of Planning.

Q. Have you previously testified in regulatory proceedings?

A. Yes. I testified before the New York State Public Service Commission ("NYSPSC") at a Proceeding on Motion of the Commission to Identify Sources of Electric System Losses and the Means of Reducing Them. NYSPSC Case 08-E-0751. In addition, I have assisted with preparation of testimony for a number of other proceedings (e.g., Indian Point).

Q. What topics do you address in your testimony?

My direct testimony:

(i) provides background on the DFAX analysis performed by MISO (page 3);

(ii) addresses the load duration curve used in the DFAX analysis (page 8);

(iii) addresses the load blocks used in the DFAX analysis (page 13);

(iv) describes other analytic flaws in the DFAX analysis (page 16);

(v) addresses the purpose of the "MEN Study" referenced in the MISO/ITC filing (page 20); and

(vi) explains that all PARs in the Eastern Interconnection affect power flows over the Michigan-Ontario interface (page 21).

New York Transmission Owners' witness David Clarke's direct testimony addresses whether it is appropriate to use a DFAX method, at all, for the type of cost allocation that MISO and ITC propose in this proceeding.

Q. In what context are you addressing these topics?

A. By submitting testimony addressing the merits of the MISO/ITC filing, the NYISO is not conceding that the Commission has legal authority under the Federal Power Act to accept the MISO/ITC filing, that the Commission has made the findings necessary to permit the NYISO to recover PAR-related charges it receives from MISO from the NYISO's customers, or that the collection of any or all the proposed charges – under any circumstance – is just and reasonable and not unduly discriminatory or preferential.

III. <u>BACKGROUND ON THE DFAX ANALYSIS</u>

Q. On what theory is the cost allocation proposed in Schedule 36 of the MISO tariff based?

A. The cost allocation is based on a "DFAX analysis" performed by MISO and updated as described in Mr. Chatterjee's testimony filed January 31, 2012. The DFAX analysis uses a computer model of the electric network and power flow modeling software to calculate individual distribution factors for each facility on which a reliability violation has been identified. This calculation is performed prior to the addition of the reinforcement identified to resolve the violation. The distribution factors, represented as percentages, express the portions of a transfer of energy from a defined source to a defined sink (*i.e.*, generation-to-load flows or transfers) that will flow across a particular transmission facility or group of facilities. On an aggregated basis, distribution factors represent a measure of the effect of the load of each transmission zone on the transmission circuits being analyzed.

Q. How did MISO structure the DFAX analysis for purposes of its proposed allocation of the costs of the ITC replacement phase angle regulators (the "Replacement PARs") among the MISO, PJM and NYISO regions?

A. According to the testimony of MISO witness Chatterjee (who adopted the testimony of former MISO witness Jeff Webb) (at 4-5), the DFAX analysis measures the total change in MW flow on a transmission branch for a power transfer between a set of generators and loads, in this case between each region's (*e.g.*, NYISO, PJM, MISO and IESO) generation and that region's load nodes.

The Webb/Chatterjee testimony also states (at 5) that the allocation factors are based on the contribution to interface flows in an intermediate level (five-year) planning horizon, as representative of typical flow contributions, and states (at 7) that the allocation is based on the contributions of each region to loop flows that would flow across the Michigan-Ontario interface (the "MI/ON Interface") if there were no PARs at the MI/ON Interface controlling or regulating loop flow. Region-by-region contribution is calculated, according to Webb/Chatterjee (at 7), by multiplying the "shift factors" (distribution factors, shift factors and participation factors all refer to the same thing) associated with each load node by the modeled load in megawatts at each node, with the shift factor being the amount of change in the sum of the flows on the PARs controlling the MI/ON Interface for each MW change of nodal load. For example, if reducing the load at a load node by 10 MW resulted in a 1MW reduction in flows over one of the four transmission lines at the MI/ON Interface, that particular load node would have a 0.1 (10%) distribution factor (or shift factor, or participation factor) on the particular transmission circuit that is being studied.

Q. Is MISO basing its DFAX analysis on the contribution to flows across the B3N circuit on which the Replacement PARs have been installed?

A. No. MISO is basing its DFAX analysis on the contribution to flows across the entire MI/ON Interface, and not just across the B3N circuit on which the Replacement PARs have been installed. In addition to the B3N circuit, the MI/ON Interface consists of three other circuits (the J5D, L4D and L51D lines), each of which includes a PAR (the Keith T2, the Lambton PS4 and Lambton PS51 PARs, respectively). The Keith T2, the Lambton PS4 and Lambton PS51 PARs are all located in Ontario and owned by Hydro One Networks Inc. The three PARs that are owned by Hydro One are referred to collectively in my direct testimony as the "Hydro One PARs." For ease of reference, I will refer to the circuits that are associated with the Hydro One PARs as the J5D, L4D and L51D circuits. The Hydro One PARs and the Replacement PARs are referred to collectively in my direct testimony at the "MI/ON PARs."

Q. Is the approach the MISO employed appropriate?

A. No. The DFAX analysis should have been based on the impact of generation-to-load flows only over the B3N circuit (on which the Replacement PARs have been constructed), and not over the transmission lines that are associated with the Hydro One PARs. The Hydro One PARs do not belong to ITC, are not located in the MISO (or the United States), and are not the subject of this proceeding. The Replacement PARs on the B3N circuit are the only PARs that MISO and ITC are asking NYISO and PJM customers to pay for.

Q. Why should the DFAX analysis only consider the generation-to-load flows over the B3N circuit?

A. MISO's flows over the MI/ON Interface are different from the NYISO, PJM and IESO flows. When power is permitted to flow freely over the four circuits on the MI/ON Interface they participate in the transfer of power from MISO generation to MISO load. Unlike the NYISO, PJM and IESO power flows in the DFAX analysis (which are unidirectional), MISO's power flows "loop" across the four circuits that comprise the MI/ON Interface when all MISO load areas are accounted for. The MISO DFAX analysis indicates that MISO power flows from Michigan to Ontario (positive distribution factors) on the L4D and L51D circuits, and flows back from Ontario to Michigan (negative distribution factors) on the J5D and B3N circuits. By simply summing the participation factors on all four of the circuits as MISO has done, MISO's use of the MI/ON Interface and true contribution to flows on the B3N circuit are understated. MISO is using more of the Replacement PARs capability than the participation factors from the MISO DFAX analysis reflect.

Evaluating impacts over the Replacement PARs on the B3N circuit is also appropriate because the Replacement PARs are the only PARs that MISO and ITC are asking NYISO and PJM customers to pay for.

Q. How can the DFAX analysis be structured to only consider the generation-to-load flows over the B3N circuit?

A. The DFAX analysis should have set the Replacement PARs on the B3N circuit to "inactive" and the Hydro One PARs to "active,"[1] allowing all PARs other than the B3N PARs to control flow equal to schedule. In this manner, the L4D, L51D, and J5D circuits would not have participated in the generation-to-load transfers, but the B3N circuit would have participated in those transfers, and the resulting DFAX analysis would have focused on the B3N circuit's participation in those transfers. The results of this analysis would have produced a more focused assessment of generation-to-load impacts on the B3N circuit, which is the circuit that is associated with ITC's Replacement PARs. The table below provides the weighted participation and associated percentages of weighted participation on the B3N circuit only.

[1] A phase angle regulator set to "active" power flow control will make automatic adjustments to the phase shift angle in order to maintain a certain power flow schedule. A phase angle regulator set to "inactive" power flow control will not make such adjustments, allowing power to flow freely across the circuit.

RTO	Weighted Participation	Weighted %
Midwest ISO	154.11	27.67%
PJM	60.48	10.86%
NYISO	70.74	12.70%
IESO	271.74	48.78%

IV. LOAD DURATION CURVE USED IN THE DFAX ANALYSIS

Q. What is a load duration curve?

A. A load duration curve shows the number of hours of the year that the load is at or above a given percentage of peak load. To make a load-duration curve, the 8,760 hours of the year are sorted in decreasing order of their peak hourly load on the x-axis. The y-axis represents the percentage of the peak load over the course of the year. The load-duration curve for a particular system makes it easy to see, for example, that the total system load exceeds 90% of peak load in 200 hours out of the year, or that for 50% of the year, the load is at or above some percentage of peak load.

Q. How did MISO apply a load duration curve to the planning cases relied on for the DFAX analysis?

A. MISO relied on three planning cases, obtained from the Multiregional Modeling Working Group ("MMWG"), representing different system load levels. As stated on page 9 of the Webb/Chatterjee testimony, "Load levels modeled were peak load, shoulder peak at 85% of peak load, and a light load at 50% of peak." Each case was then weighted by the number of hours in each band (*i.e.*, peak load, 85% of peak load and 50% of peak load) from the MISO load duration curve.

Q. Did the DFAX analysis utilize the load duration curves for each of the regions to which MISO and ITC propose to allocate Replacement PAR costs?

A. No. As stated on page 9 of the Webb testimony, "Results of each case were weighted by the amount of hours in each band ***from the Midwest ISO load duration curve***…." (Emphasis added.)

Q. Was it proper for the DFAX analysis to have utilized MISO's own load duration curve for all regions? If not, why not?

A. No. As indicated in Exhibit NYI-39, the load profiles, described by the load duration curves, vary significantly among MISO, IESO, PJM, and NYISO. The variation can result from differences in weather patterns and varying characteristics of load within each specific region. For greater accuracy, the DFAX analysis should have relied on each region's load duration curve for the generation-to-load transfer analysis of that region (*e.g.*, the NYISO load duration curve should apply to the NYISO generation-to-load analysis). The NYISO load duration curve (the blue line on the graph in Exhibit NYI-39 has fewer peak hours than MISO, PJM, or IESO, and decreases at a rate such that NYISO has the fewest hours at any given load level relative to the peak (indicated by the percentage of peak load on the y-axis of the graph). The table below shows the number of hours contained in each load block identified by MISO for the DFAX analysis, *i.e.*, hours between 100% and 85% of peak load (peak), hours between 85% and 50% of peak load (shoulder peak), and less than 50% of peak load (low load). The "MISO's 2015 PROMOD Hours as provided in Exhibit A1 to

Chatterjee's Testimony" portion of the table provides the number of hours in each load block, and associated percentages, as specified in the MISO DFAX analysis. The rest of the table provides the number of hours in each load block for each region based on that region's 2015 projected load duration curve.

	Hours between Peak and 85% Peak	Hours between 85% Peak and 50% Peak	Hours below 50% Peak
MISO's 2015 PROMOD Hours as provided in Exhibit A1 to Chatterjee's Testimony	248	6784	1728
Weight	2.83%	77.44%	19.73%
2015 MISO hours based on MISO Load Duration Curve Obtained from Ventyx[2]	439	7570	751
Weight (MISO)	5.01%	86.42%	8.57%
2015 PJM hours based on PJM Load Duration Curve Obtained from Ventyx	278	6616	1866
Weight (PJM)	3.17%	75.53%	21.30%
2015 NYISO hours based on NYISO Load Duration Curve Obtained from Ventyx	221	5637	2902
Weight (NYISO)	2.52%	64.35%	33.13%
2015 IESO hours based on IESO Load Duration Curve Obtained from Ventyx	1538	7050	172
Weight (IESO)	17.56%	80.48%	1.96%

Using the forecasted 2015 NYISO load duration curve, rather than the MISO load

[2] The NYISO recognizes that the number of hours in each load block for the "2015 MISO hours based on MISO Load Duration Curve Obtained from Ventyx" does not match the number of hours for each load block in the "MISO's 2015 PROMOD Hours as provided in Exhibit A1 to Chatterjee's Testimony." The NYISO relied on 2015 projected load duration curve obtained from Ventyx to determine the number of hours in each load block of the "2015 MISO hours based on MISO Load Duration Curve Obtained from Ventyx." MISO declined, in its response to NYISO/MISO 9-1, attached to my testimony as Exhibit NYI-40, to provide outright the actual load duration curve utilized during its DFAX analysis. After a number of e-mail follow-ups by NYISO counsel to MISO counsel, attached to my testimony as Exhibit NYI-41, MISO still did not provide the curve (despite the fact that NYISO possessed a Ventyx license), instead instructing the NYISO how it could re-create the load duration curve based on data and information already provided by MISO. NYISO was unable to locate and/or create the load duration curve based on MISO's instructions and, since MISO's email was sent on May 3, 2012, did not have enough time to follow up with MISO prior to submission of this direct testimony on May 11, 2012.

duration curve, there are 221 hours between 100% and 85% of peak load, 5637 hours between 85% and 50% of peak load, and 2902 hours less than 50% of peak load. For the NYISO, this means that MISO incorrectly assigned 27 hours to the 100% (peak) load block, MISO incorrectly assigned 1147 hours to the 85% (shoulder peak) load block, and that 1174 hours should have been assigned to the 50% (low) load block, but were not because the MISO instead chose to shoe-horn the NYISO into the MISO's load duration curve.

Q. What effect does the use of the MISO's load duration curve have on the NYISO's participation factors in the DFAX analysis?

A. The NYISO participation factors trend lower as load decreases. That is to say, NYISO participation factors on the MI/ON Interface are greatest when the NYISO load is highest, and NYISO participation factors are the lowest when the NYISO load is lowest. While the foregoing statement might seem intuitively obvious (NYISO's participation is highest when its load is highest), participation factors and load are NOT necessarily aligned in the DFAX analysis. Both PJM and MISO have higher participation factors as their loads decline. In other words, the NYISO's cost responsibility declines if more of the NYISO's hours are accurately represented as occurring in low-load periods. However, MISO and PJM can actually reduce their cost responsibility under the MISO's DFAX method if their hours get reassigned from lower load periods to higher load periods.

Applying the MISO's load duration curve to the NYISO over-assigns high load hours to New York and under-assigns low load hours to New York. As a result, NYISO is penalized in the overall weighted participation. Set forth below is a corrected table of weighted participation factors and associated participation percentages for each region, utilizing each region's load duration curve.

RTO	Weighted Participation	Weighted %
Midwest ISO	189.09	20.46%
PJM	102.47	11.09%
NYISO	115.47	12.49%
IESO	517.32	55.97%

V. LOAD BLOCKS USED IN THE DFAX ANALYSIS

Q. What is a load block?

A. A load block indicates the number of hours that the system load levels are within a given range. For example, the load block for the peak load utilized by MISO includes the number of hours that system load levels are above 85% of peak load. The load block for the shoulder peak (85% of peak load) utilized by MISO includes the number of hours that system load levels are above 50% and at or below 85% of peak load. The low load block includes the hours when total system load was less than 50% of the peak load.

Q. Please explain the manner in which the DFAX analysis utilizes load blocks.

A. According to the Webb testimony (at 8-9): "Three planning cases representing different system load levels were used. Load levels modeled were peak load, shoulder peak at 85% of peak load, and a light load of 50% of peak load. Results of each case were weighted by the amount of hours in each band from the Midwest ISO load duration curve, to provide a reasonable representation of contributions over all system load levels."

Q. Is the use of three load blocks appropriate?

A. No. The DFAX analysis should have utilized more than three load blocks.

Q. Why should MISO's DFAX analysis have used more than three load blocks?

A. Use of only three load blocks cannot depict a region's electricity usage accurately over the 8760 hours in a given year. By selecting load blocks of 100% (peak), 85% (shoulder peak) and 50% (low load), significant MWh are over-counted for contribution to flows on the B3N PARs. The slope of each region's load duration curve, as shown in Exhibit NYI-39, makes a representation using only three blocks a gross over-simplification.

Q. Why do you think MISO's use of only three load blocks produces an unjust result?

A. Exhibit NYI-42 compares the NYISO 2015 forecasted load duration curve to the forecasted load duration curve used by MISO for the DFAX analysis ("Study

Curve"). The comparison indicates that undue weight is given to all three load blocks (*i.e.*, peak load, 85% of peak load and 50% of peak load). The exhibit visually shows the amount of NYISO load per hour that is over-counted in MISO's study. While MISO states that its study is based on 100%, 85%, and 50% of peak load levels, MISO appears to have used the load levels contained within the MMWG cases. As a result, for New York, the three blocks equate to approximately 100%, 73%, and 54% of peak load, not the 100%, 85% and 50% that MISO claimed it used. MISO assumed that load will remain steady at 85% of peak load (73% for New York) for over nine months of the year. The use of 85% (73% for New York) of peak load for more than nine months of the year is simply unrealistic and unnecessarily penalizes New York. The New York load duration curve clearly indicates that load in New York is lower than 60% of peak load for eight months of the year and lower than 50% of peak load for four months of the year. When the MISO's Study Curve is above the "NYISO Load" hourly load duration curve in Exhibit NYI-42, the MISO's analysis is over-counting the MWh used to determine New York's portion of the cost allocation. The area between the curves represents the amount of MWh over-counted, since New York's load is less than the load assumed in the Study Curve utilized by MISO. For New York, this equated to MISO over-counting approximately 40,000,000 MWh.

Q. What alternative approach would have been more accurate?

A. The MISO should have conducted the DFAX analysis for each region based on that region's load level for each hour of the year. That is, MISO should have conducted

8,760 DFAX runs for each region. This analysis could be completed in a reasonable amount of time by adjusting load levels to correspond to each hour for all regions.

VI. OTHER ANALYTIC FLAWS OF THE DFAX ANALYSIS

Q. Do other regions, besides the four regions MISO included in the DFAX analysis, contribute to Lake Erie unscheduled power flow?

A. Yes. MISO admits in its supplemental response to NYISO/MISO 2-2 (Exhibit NYI-43 hereto) that "one hundred percent of Lake Erie loop flow is not caused by NYISO, MISO, IESO and PJM." MISO asserts further that "professional judgment indicates that distribution factors of other Balancing Authorities outside of [MISO, IESO, NYISO and PJM] would fall below modeling thresholds and have de minimis aggregate impacts." However, this is not the case. In fact, as indicated in the table below, prepared by the NYISO applying the MISO methodology, the collective generation-to-load flows of regions other than MISO, IESO, PJM and NYISO contribute significantly to Lake Erie unscheduled power flow (approximately 4% in the aggregate), but are not accounted for in MISO's DFAX analysis. The NYISO is not recommending that MISO send bills to each of these regions, rather, this illustrates, as discussed in Mr. Yeomans's testimony, that all interconnected systems affect and benefit each other. If regions are permitted to assess charges to each other on the basis of asserted "benefits" in the absence of an agreement between the two regions, this "chain reaction," and the ensuing litigation, will have no logical stopping place.

RTO	Weighted Participation	Weighted %
Midwest ISO	190.15	20.22%
PJM	96.40	10.25%
NYISO	117.37	12.48%
IESO	499.93	53.15%
BREC	0.37	0.04%
DPC	0.10	0.01%
ISONE	8.98	0.96%
OVEC	0.09	0.01%
EKPC	0.09	0.01%
AECI	3.62	0.39%
CONWAY	9.37	1.00%
CPL	1.17	0.12%
SOCO	2.16	0.23%
TVA	8.54	0.91%
SPP	2.16	0.23%

Q. How were the participation factors in your table calculated?

A. The methodology MISO utilized in its DFAX analysis, with all its flaws, was applied to each area listed in the table above. For each area, the total generation in that area was transferred to the total load in that area. The participation factors were then calculated by multiplying that area's load by the distribution factors from that transfer on the four MI/ON PARs.

Q. Why do the MISO, PJM, and NYISO participation factors in your table not exactly match the MISO DFAX analysis?

A. The NYISO recognizes that slight differences in weighted participation factors compared to Chatterjee exhibit A1 exist. Despite my careful review of all the data, I am unable to determine the cause of the slight difference in results.

Q. What are areas "BREC" and "DPC"?

A. "BREC" stands for Big Rivers Electric Corporation and "DPC" stands for Dairyland Power Cooperative. BREC is an electric cooperative located in Kentucky and DPC is an electric cooperative located in western Wisconsin.

Q. Why are BREC and DPC participation factors low?

A. For the purposes of the table, BREC and DPC were each treated as self-sufficient areas by only transferring generation within those respective areas to load within those respective areas.

Q. Is MISO's treatment of BREC and DPC appropriate?

A. No. BREC and DPC were completely excluded from MISO's DFAX analysis. As indicated in FERC's Order Accepting Compliance Filing,[3] DPC joined MISO as a transmission-owning member effective June 1, 2010 and should have been included in the MISO's DFAX analysis. BREC was in the process of joining MISO at the time of the MISO/ITC October 20, 2010 cost allocation filing and is now a member

[3] 132 FERC ¶ 61,174 (2010).

of MISO, but was not included in MISO's analysis. As indicated in FERC's orders,[4] BREC and MISO filed revisions to MISO's Tariff to include BREC as a member of MISO, effective December 1, 2010. Had these cooperatives been included as part of MISO at the time of the DFAX analysis, MISO load would increase by more than 2,700 MW and those cooperative's loads would contribute to the overall participation factors for MISO.

Q. Are you aware of other flaws in the MISO's DFAX analysis?

A. Yes. The DFAX analysis contains a significant number of flaws. First, 3,751 MW of generation in PJM did not participate in the transfer when simulated by MISO because MISO did not include these generators as part of the PJM generation subsystem. Second, 467 MW of generation in MISO did not participate in the transfer when simulated by MISO because MISO did not include these generators as part of the MISO generation subsystem. Third, a 330 MW equivalent generator modeled in Long Island, New York for the purpose of representing the Cross Sound Cable should have been excluded from the NYISO generation subsystem. Fourth, loads were incorrectly added to the Ramapo 500 kV and Ramapo 345 kV buses within NYISO in the light load (50%) case.

---

[4] *See Midwest Independent Transmission System Operator, Inc. and Big Rivers Electric Corporation*, 133 FERC ¶ 61,175 (2010) and *Midwest Independent Transmission System Operator, Inc. Letter Order* issued February 2, 2011, Docket No. ER11-16-001.

VII. THE "MEN" STUDY

Q. Have you reviewed the "MEN Study" referred to in the filing in this proceeding?

A. Yes. It was provided in response to NYISO/MISO 1-13, and is attached to my testimony as Exhibit NYI-44.

Q. Would you please summarize the purpose of the study?

A. The purpose of the study was to ensure that the reliability, including interregional emergency transfer capabilities, of other Control Areas around Lake Erie would not be adversely impacted by the proposed installation by Detroit Edison of the original PAR on the B3N circuit (referred to in this proceeding as the "Original PAR"). This is evidenced, for example, by the following language used in the study (at page 5 of Exhibit NYI-44):

> The scope was formulated to ascertain the continued reliable operation of the interconnected regional systems, and addressed four areas of study:
>
> Impact on interregional transfer capabilities
> Impact on interregional power flows
> Operational considerations (interactions among PARs)
> Impact on system dynamic performance.

The first conclusion presented in the MEN Study (at page 6 of Exhibit NYI-44) states that "the new Michigan-Ontario phase shifters do not significantly harm system reliability provided they will be operated in accordance with existing regional and interregional operating principles during emergencies."

Q. Does the MEN Study represent a coordinated planning effort to design the Original PAR as a multi-regional facility, or to allocate costs among those multiple regions?

A. No. There is no language in the study evidencing such purposes. In fact, as I explained above, the MEN Study was initiated "[i]n order to ensure continued reliable operation of the interconnected regional systems…" (at page 39 of Exhibit NYI-44, "Appendix D – Scope of Study"). The MEN Study used linear transfer analysis to determine the potential impacts on interregional emergency transfer capability, or first contingency incremental transfer capability (FCITC). The FCITC results do not guide planning or design of the system, but rather provide insight to system operators as to the state of the interregional power system and the level of emergency assistance they may be able to rely on. The MEN Study is silent with respect to coordinated planning, design and allocation of costs with respect to the MI/ON PARs.

Q. Has NYISO ever participated in the MISO's MTEP planning process, whether with respect to the MI/ON PARs or otherwise?

A. No, as admitted by MISO in its response to NYISO/MISO 4-2 (Exhibit NYI-45).

VIII. <u>ALL PARS IN THE EASTERN INTERCONNECTION AFFECT POWER FLOWS OVER THE MI/ON INTERFACE</u>

Q. What does MISO claim the benefits of the MI/ON PARs will be?

A. MISO claims, without any practical operating experience, that the MI/ON PARs will provide a significant, unique, multi-region benefit. The unique benefit MISO claims the MI/ON PARs will provide is control of Lake Erie loop flow.

Q. Are the MI/ON PARs the only PARs in the Eastern Interconnection that mitigate Lake Erie loop flow?

A. No. All PARs in the Eastern Interconnection have an impact on Lake Erie loop flow, including PARs located in New York at the NYISO/PJM border, the NYISO/IESO border and in New York City.

Q. How did you test the theory that all PARs have an impact on Lake Erie loop flow?

A. To test the MISO's theory that the MI/ON PARs are the only PARs that mitigate Lake Erie loop flow, the NYISO re-ran MISO's DFAX analysis with one significant modification. Before performing the analysis, the NYISO set all PARs in the Eastern Interconnection to not control power flows (to be "inactive"). The results produced by the NYISO's modified DFAX analysis are included in the table below. The table provides (1) the weighted participation on the MI/ON Interface for each region based on the MISO's original DFAX analysis, which set all PARs *EXCEPT* the MI/ON PARs to be "active," and (2) the weighted participation on the MI/ON Interface for each region based on the NYISO's modified DFAX analysis with *ALL* PARs set to be "inactive."

RTO	Weighted Participation on the MI/ON Interface as Presented in MISO's DFAX Analysis	Weighted Participation on the MI/ON Interface with All Eastern Interconnection PARs Modeled as Inactive as Re-Ran by NYISO
MISO	190.59	307.20
PJM	96.82	182.89
NYISO	118.64	235.75
IESO	504.48	490.43
Total Participation on the MI/ON Interface	910.53	1216.27

Q. How did switching the PARs in the Eastern Interconnection (other than the MI/ON PARs) from "active" to "inactive" status in the DFAX analysis impact Lake Erie unscheduled power flows, measured at the MI/ON Interface?

A. The modified analysis, performed with all of the PARs in the Eastern Interconnection set to "inactive" produced significantly higher unscheduled Lake Erie power flows, measured at the MI/ON Interface. MISO's participation increased by approximately sixty percent, and PJM and NYISO's participation doubled. Overall, unscheduled power flows increased by approximately 33.6 percent.

Q. Please explain how you reached this conclusion.

A. The results of the NYISO's analysis indicate a much larger total weighted participation on the MI/ON Interface from three of the four regions studied (IESO's flows decreased slightly). The total weighted participation on the MI/ON Interface increased by approximately 33.6% when all the PARs were set to an inactive state.

Q. Are you surprised that the NYISO's weighted participation on the MI/ON Interface doubled as a result of representing all PARs in the Eastern Interconnection as "inactive"?

A. No. Other regions are shielded from NYISO unscheduled power flows (and the NYISO is shielded from their unscheduled power flows) by a string of PARs, Direct Current transmission lines, and a Variable Frequency Transformer controlled transmission line, that are all located on the eastern portion of the NYISO/PJM border, between the load centers of New York City and Northern New Jersey. A pair of PARs partially shields the NYISO's border with Ontario. In addition to these PARs, the NYISO has a number of PARs within New York City. It is not surprising to me that NYISO's weighted participation on the MI/ON Interface increases from 118.64 to 235.75 (as shown in the table above) when all of the NYISO's PARs are placed in an inactive state. The results of the NYISO's modified DFAX analysis show that the NYISO's PARs shield MISO, IESO and other Balancing Authority Areas from New York power flows. The very same sets of PARs likely reduce PJM's measured flows over the MI/ON Interface as well. The loop flow reduction benefits that PARs located in New York and PJM provide are the same benefit MISO claims its Ontario/Michigan PARs will provide to New York and PJM customers.

Q. Does MISO's weighted participation on the MI/ON Interface also increase?

A. Yes. MISO's weighted participation on the MI/ON Interface also increased significantly when the PARs in the Eastern Interconnection were modeled as "inactive." MISO's weighted participation increases by 61.2% from 190.59 to 307.2.

Q. What does the observed increase in weighted participation indicate?

PARs in the Eastern Interconnection tend to mitigate Lake Erie loop flows when they are being actively operated to better control power flows. The Replacement PARs and the MI/ON PARs are not unique in this regard. If the other PARs in the Eastern Interconnection were removed from service, the modified DFAX analysis that the NYISO performed suggests that Lake Erie loop flow would be substantially higher than it is today.

IX. CONCLUSION

Q. Does this conclude your testimony?

A. Yes.

AFFIDAVIT OF ZACHARY G. SMITH

State of New York §
§
County of Rensselaer §

I, Zachary G. Smith, being duly sworn, depose and state that I prepared the Testimony of Zachary G. Smith and the statements contained therein are true and correct, to the best of my knowledge, information and belief.

Zachary G. Smith
Zachary G. Smith
Manager, Transmission Studies
New York Independent System Operator, Inc.

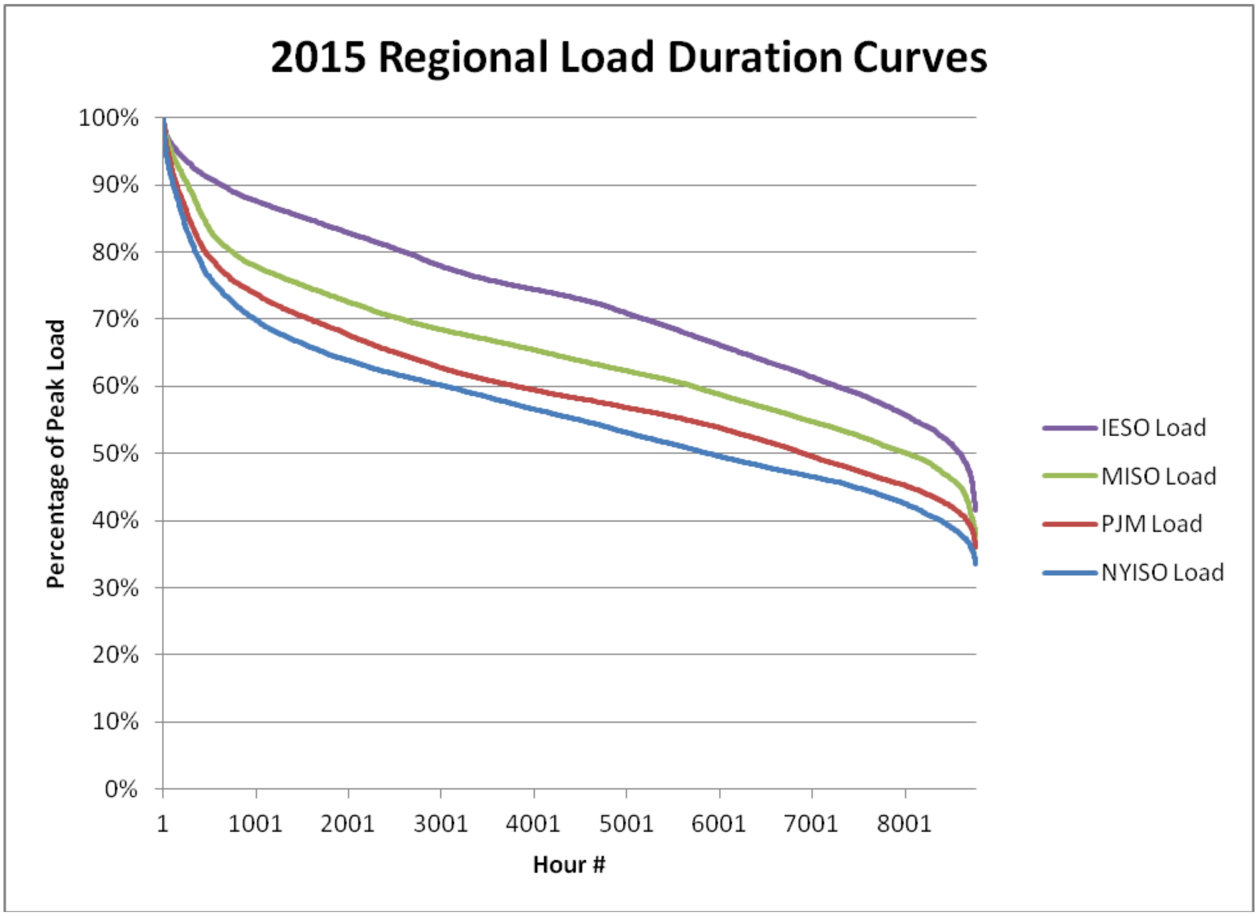
SUBSCRIBED AND SWORN BEFORE ME, this 11 day of May, 2012.

Diane L. Egan
Diane Egan
Notary Public for the State of New York

My Commission Expires on: March 21, 2013

DIANE L. EGAN
Notary Public, State of New York
Qualified in Schenectady County
No. 4924890
Commission Expires March 21, 20 13

DOCKET NO. ER11-1844
EXHIBIT NO. NYI-39


2015 Regional Load Duration Curves
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percentage of Peak Load
1
1001
2001
3001
4001
5001
6001
7001
8001
Hour #
IESO Load
MISO Load
PJM Load
NYISO Load

DOCKET NO. ER11-1844
EXHIBIT NO. NYI-40

<u>NYISO/MISO 9-1.</u> Please provide the load duration curve(s) used to prepare the DFAX analysis offered in support of the cost allocation reflected in the MISO/ITC Filing.

Response:

MISO sustains its prior objection to this request on the grounds previously raised and also due to the limitations imposed upon MISO pursuant to its software license agreement with Ventyx (formerly New Energy Associates LLC ("NEA")) which is now a subsidiary of ABB. The load duration curve used to prepare the Dfax analysis is derived through a Ventyx proprietary software application. Pursuant to MISO's license with Ventyx/NEA, MISO is not permitted to share this information without prior approval from Ventyx/NEA, or without being subject to a requirement of a governmental agency or law to disclose the information so long as Ventyx/NEA is afforded notice of such requirement to permit it to seek appropriate relief against such disclosure. However, the license agreement appears to permit MISO to share certain information with NYISO *if* NYISO is also licensed by Ventyx/NEA to use such information. NYISO has not demonstrated whether it is entitled to such information sharing privileges pursuant to its own software license. MISO suggests a meet and confer with NYISO counsel to determine a process for NYISO to receive the information it seeks, and this may not necessarily involve MISO. NYISO may be entitled to information pursuant to information sharing privileges it may already enjoy pursuant to its own Ventyx/NEA software license. MISO also believes that NYISO can procure a license directly from Ventyx/NEA to receive the information it seeks.

Sponsored by: Digaunto Chatterjee and Counsel

DOCKET NO. ER11-1844
EXHIBIT NO. NYI-41

From: DeSalle, David M.
To: Shafferman, Howard H. (DC);
cc: Schnell, Alex; Sweeney, James H.; Semrani, Jack N. (DC);
Subject: RE: Docket No. ER11-1844 -- NYISO Ninth Set of Data Requests to MISO
Date: Thursday, May 03, 2012 2:11:01 PM

Howard,

Thanks for verifying that NYISO does have a Ventyx software license for Simulation Ready Data per below.

Based upon further discussions, MISO believes that all the data inputs NYISO needs regarding load curve duration have already been provided with and can be extracted from the DFAX materials that were included in Digaunto Chatterjee's January 31, 2012 testimony, and in the first CD with DFAX data that MISO sent to all parties pursuant to the protective order (this was the Powerbase data set that MISO used, so recipients should be able to run their own simulations). NYISO can follow the steps indicated below which were the same steps MISO followed in the DFAX study materials and provided to the parties, and this information is noted on the DFAX sheet for 2015.

(1) aggregate MISO+PJM+NYISO load
(2) Note the peak, 85% of peak load and 50% of peak load.
(3) Look at the associated hours load is between peak and 85% of peak, hours between 85% peak and 50% of peak and then hours below 50% of peak.
(All of this as noted in the DFAX sheet for 2015 year.)

MISO believes that the data and instruction identified above should be responsive to NYISO's Data Request 9-1. Please let us know if NYISO has additional questions.

Best regards,

David

David M. DeSalle, Esq. | **Venable LLP**
t 202.344.4504 | **f** 202.344.8300 | **m** 240.994.8830
575 7th Street, NW, Washington , DC 20004

DMDeSalle@Venable.com | www.Venable.com

From: Shafferman, Howard H. (DC) [mailto:HHS@ballardspahr.com]
Sent: Wednesday, May 02, 2012 5:46 PM
To: DeSalle, David M.
Cc: Schnell, Alex (ASchnell@nyiso.com); James Sweeney (jsweeney@nyiso.com); Semrani, Jack N. (DC)
Subject: RE: Docket No. ER11-1844 -- NYISO Ninth Set of Data Requests to MISO

David -- "Simulation Ready Data" is the only software product identified by David below that is covered by the NYISO's Ventyx license.

From: DeSalle, David M. [mailto:DMDeSalle@Venable.com]
Sent: Wednesday, May 02, 2012 5:09 PM
To: Shafferman, Howard H. (DC)
Cc: Schnell, Alex (ASchnell@nyiso.com); James Sweeney (jsweeney@nyiso.com); Semrani, Jack N. (DC)
Subject: RE: Docket No. ER11-1844 -- NYISO Ninth Set of Data Requests to MISO

Howard,

Why didn't you say so!—that may significantly simplify things per my suggestion at (1) on the triage list below. Can you please indicate which software tools the NYISO license covers, or more to the point, whether the ProMod IV; Powerbase; and MarketVision Data (Simulation Ready Data) software products are covered? MISO and NYISO might be in a position to share Ventyx information directly. On your second point, the "all"s in NYISO/MISO 2-1 have been objected to due to the overly broad and burdensome nature of the general request, but notwithstanding its objection, MISO has been appropriately responsive as demonstrated yet again today. See response to NYISO/MISO 2-1 (attached).

Best regards,

David

David M. DeSalle, Esq. | **Venable LLP**
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From: Shafferman, Howard H. (DC) [mailto:HHS@ballardspahr.com]
Sent: Wednesday, May 02, 2012 1:25 PM
To: DeSalle, David M.
Cc: Schnell, Alex (ASchnell@nyiso.com); James Sweeney (jsweeney@nyiso.com); Semrani, Jack N. (DC)
Subject: RE: Docket No. ER11-1844 -- NYISO Ninth Set of Data Requests to MISO

David,

We have a Ventyx license, but we are not able to ensure that we will be able to describe the load duration curve actually utilized by MISO to prepare the DFAX analysis. So we will need MISO's assistance to obtain this document.

With respect to your other points, I note that on February 9, NYISO asked:

NYISO/MISO 2-1. For each MISO witness, provide copies of all Documents used or relied upon to prepare that witness's testimony, including all supporting studies/analyses and the underlying data.

The load duration curve was mentioned in Mr. Webb's testimony, but not identified or provided in your response. Nor is it "readily available" given the licensing circumstances.

Best regards,
Howard

From: DeSalle, David M. [mailto:DMDeSalle@Venable.com]
Sent: Wednesday, May 02, 2012 12:24 PM
To: Shafferman, Howard H. (DC)
Cc: Schnell, Alex (ASchnell@nyiso.com); James Sweeney (jsweeney@nyiso.com); Semrani, Jack N. (DC)
Subject: RE: Docket No. ER11-1844 -- NYISO Ninth Set of Data Requests to MISO

Howard,

I'm on an unrelated conf call (normally would call you) but given your indication of urgent need and threat of motion to compel, I'm typing a quick response. I can be available for a call early this afternoon, probably after 1pm.

As indicated in the response to 9-1, MISO is willing to work with NYISO as may be appropriate to get the information it seeks (consistent with the accommodating posture MISO has exhibited throughout this proceeding) but this must be within MISO's rights under the Commission's discovery rules not to be subject to burdensome discovery if a requestor already has access to information sought and also in compliance with MISO's obligations under its license agreement and the requirements of the Protective Order. MISO has identified several possible avenues for NYISO to get the information it seeks and will work with NYISO on this.

Have you checked yet whether NYISO has its own license from Ventyx that eliminates MISO as the middle man on what you seek or appears to allow MISO to provide the information directly to NYISO under the confidential information exception among licensees? MISO believes that many of the participants in this proceeding already do and already have access to the information sought in NYISO 9-1, thus MISO's response and objection.

Also, regarding your assumption as to ALJ Sterner's likely views, note that NYISO has had the DFAX study information in this proceeding for approximately a year and a half, but has waited until April 17, 2012 and NYISO's Ninth Set of Data Requests to request the information sought in NYISO 9-1. It has been solely up to NYISO to determine the timing and priority of information sought through its extremely wide ranging sets of data requests served on MISO over the past 4 months. That may also influence the ALJ's views.

In my opinion, the appropriate triage of approaches for NYISO to get the information it seeks in Set 9 is its data requests is to:

(1) Procure the information directly from Ventyx if NYISO has a license already or demonstrate that NYISO can receive the information from MISO directly pursuant to the exception provided in the license (NYISO has not yet provided any information along these lines)
(2) Have MISO request permission from Ventyx for the information to be shared per the license agreement and pursuant to the Protective Order (MISO will do so)
(3) Pursue a motion to compel

Rather than jumping directly to (3) as you indicate above, it seems reasonable that NYISO should first respond to MISO on (1) (MISO still awaits a response), and depending on NYISO's response, MISO will either share the confidential information or proceed with (2), then depending upon Ventyx's response, the parties can proceed to (3) if necessary, which provides appropriate protection for Ventyx's confidential information under the license agreement and ensures that MISO is not in violation of the license agreement.

Best regards,

David

David M. DeSalle, Esq. | **Venable LLP**
t 202.344.4504 | **f** 202.344.8300 | **m** 240.994.8830
575 7th Street, NW, Washington , DC 20004

DMDeSalle@Venable.com | www.Venable.com

From: Shafferman, Howard H. (DC) [mailto:HHS@ballardspahr.com]
Sent: Wednesday, May 02, 2012 11:16 AM
To: DeSalle, David M.
Cc: Schnell, Alex (ASchnell@nyiso.com); James Sweeney (jsweeney@nyiso.com); Semrani, Jack N. (DC)
Subject: RE: Docket No. ER11-1844 -- NYISO Ninth Set of Data Requests to MISO

Hi, David -- We need the MISO load duration curve immediately. Please obtain "prior approval" from MISO's vendor (as your response indicates is a possibility), and supply it today if possible. This is a key workpaper of your case/testimony (see Webb/Chatterjee at 9), as the DFAX analysis relies upon its use. I do not think Judge Sterner will view this situation favorably to MISO if presented with a motion to compel.

Thanks. Please let me know one way or the other as soon as possible.

Howard

From: DeSalle, David M. [mailto:DMDeSalle@Venable.com]
Sent: Tuesday, May 01, 2012 4:43 PM
To: Semrani, Jack N. (DC)
Cc: 'Adrienne Clair'; 'Alex Scnell'; 'Amy Blauman'; 'Andrew Dotterweich'; 'Andrew Jamieson'; 'Andrew Neuman'; 'AnJou Hsiung'; 'Anne Vogel'; 'Barry Spector'; 'Beth Roads'; 'Bill Booth'; 'Brian Drumm'; 'Bruce Bleiweis'; 'Carlo Capra'; 'Carrie Bumgarner'; 'Catherine McCarthy'; 'cbilke@misoenergy.com'; 'Chris Norton'; 'Craig Glazer'; 'Cynthia Crane'; 'Dana Horton'; Nosse, David A.; 'Dave Berman'; 'David Goroff'; 'David Grover'; 'David Zwergel'; 'Deborah Moss'; 'dhines@misoenergy.org'; 'dichatterjee@misoenergy.org'; 'Donna Zugris'; 'Ed Tatum'; 'Elias Farrah'; 'Eric Runge'; 'G. Philip Nowak'; 'Gary Guy'; 'Gary Newell'; 'Gregory Troxell'; 'Heather Curlee'; 'Jacqueline Hardy'; 'James Keegan'; 'James Musial'; 'Janine Leath'; 'Jeanne Dworetzky'; 'Jeff Schwarz'; 'Jeff Webb'; 'Jennifer Morrisey'; 'John Borchert'; 'John Staffier'; 'Joseph Nelson'; 'Karen Hill'; 'Kathleen Sherman'; 'Kelly Geer'; 'kfrankeny@misoenergy.org'; 'Kwafo Adarkwa'; 'Laura Sheppeard'; 'Leigh Chapman'; 'lieboc@pjm.com'; 'Michael Krauthamer'; 'Michael Moltane'; 'Michael Regulinski'; 'Mike Sheilds'; 'Miles Mitchell'; 'Molly Suda'; 'Neil Butterklee'; 'Nina Jenkins-Johnston'; 'Patricia Barone'; 'Patricia Hurt'; 'Paul Napoli'; 'Pauline Foley'; 'Purvi Patel'; 'R. Scott Mahoney'; 'Rajnish Barua'; 'Raymond Kershaw'; 'Rebecca Sterzinar'; 'Roni Epstein'; 'Roxane Maywalt'; 'Ryan Collins'; 'Scott Strauss'; Shafferman, Howard H. (DC); Simon, Daniel R. (DC); 'Stan Berman'; 'Steve Videto'; 'Stu Bresler'; 'Suketu Shah'; 'Takis Laios'; 'Ted Davis'; 'Theodore Paradise'; 'Thomas Wrenbeck'; 'Timothy Greenen'; 'tmallinger@misoenergy.org'; 'Tom Bainbridge'; 'Vilna Gaston'; 'Vis Tekumalla'; 'Walter Dorr'; 'Wendy Reed'; 'Wesley Walker'
Subject: RE: Docket No. ER11-1844 -- NYISO Ninth Set of Data Requests to MISO

Jack,

Attached please find MISO's Response to NYISO Set 9.

Best regards,

David

David M. DeSalle, Esq. | **Venable LLP**
t 202.344.4504 | **f** 202.344.8300 | **m** 240.994.8830
575 7th Street, NW, Washington , DC 20004

DMDeSalle@Venable.com | www.Venable.com

From: Semrani, Jack N. (DC) [mailto:SemraniJ@ballardspahr.com]
Sent: Tuesday, April 17, 2012 4:53 PM
To: DeSalle, David M.
Cc: 'Adrienne Clair'; 'Alex Scnell'; 'Amy Blauman'; 'Andrew Dotterweich'; 'Andrew Jamieson'; 'Andrew Neuman'; 'AnJou Hsiung'; 'Anne Vogel'; 'Barry Spector'; 'Beth Roads'; 'Bill Booth'; 'Brian Drumm'; 'Bruce Bleiweis'; 'Carlo Capra'; 'Carrie Bumgarner'; 'Catherine McCarthy'; 'cbilke@misoenergy.com'; 'Chris Norton'; 'Craig Glazer'; 'Cynthia Crane'; 'Dana Horton'; Nosse, David A.; 'Dave Berman'; DeSalle, David M.; 'David Goroff'; 'David Grover'; 'David Zwergel';

'Deborah Moss'; 'dhines@misoenergy.org'; 'dichatterjee@misoenergy.org'; 'Donna Zugris'; 'Ed Tatum'; 'Elias Farrah'; 'Eric Runge'; 'G. Philip Nowak'; 'Gary Guy'; 'Gary Newell'; 'Gregory Troxell'; 'Heather Curlee'; 'Jacqueline Hardy'; 'James Keegan'; 'James Musial'; 'Janine Leath'; 'Jeanne Dworetzky'; 'Jeff Schwarz'; 'Jeff Webb'; 'Jennifer Morrisey'; 'John Borchert'; 'John Staffier'; 'Joseph Nelson'; 'Karen Hill'; 'Kathleen Sherman'; 'Kelly Geer'; 'kfrankeny@misoenergy.org'; 'Kwafo Adarkwa'; 'Laura Sheppeard'; 'Leigh Chapman'; 'lieboc@pjm.com'; 'Michael Krauthamer'; 'Michael Moltane'; 'Michael Regulinski'; 'Mike Sheilds'; 'Miles Mitchell'; 'Molly Suda'; 'Neil Butterklee'; 'Nina Jenkins-Johnston'; 'Patricia Barone'; 'Patricia Hurt'; 'Paul Napoli'; 'Pauline Foley'; 'Purvi Patel'; 'R. Scott Mahoney'; 'Rajnish Barua'; 'Raymond Kershaw'; 'Rebecca Sterzinar'; 'Roni Epstein'; 'Roxane Maywalt'; 'Ryan Collins'; 'Scott Strauss'; Semrani, Jack N. (DC); Shafferman, Howard H. (DC); Simon, Daniel R. (DC); 'Stan Berman'; 'Steve Videto'; 'Stu Bresler'; 'Suketu Shah'; 'Takis Laios'; 'Ted Davis'; 'Theodore Paradise'; 'Thomas Wrenbeck'; 'Timothy Greenen'; 'tmallinger@misoenergy.org'; 'Tom Bainbridge'; 'Vilna Gaston'; 'Vis Tekumalla'; 'Walter Dorr'; 'Wendy Reed'; 'Wesley Walker'
Subject: Docket No. ER11-1844 -- NYISO Ninth Set of Data Requests to MISO

David -- Attached please find NYISO's Ninth Set of Data Requests to MISO. Please contact me if you have any questions.

Thanks,

Jack Semrani.

Counsel for NYISO

Jack Semrani, Esquire
Ballard Spahr LLP
601 13th St., N.W.
Suite 1000 South
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transmission and delete the message without copying or disclosing it.
****

OUR WASHINGTON, D.C., OFFICE HAS MOVED.
As of April 30, 2012, our new address will be 1909 K Street, N.W., 12th Floor, Washington, DC 20006-1157. Our telephone and fax numbers remain the same. Thank you.
****

U.S. Treasury Circular 230 Notice: Any tax advice contained in this communication (including any attachments) was not intended or written to be used,
and cannot be used, for the purpose of (a) avoiding penalties that may be imposed under the Internal Revenue
Code or by any other applicable tax authority; or (b) promoting, marketing or recommending to another party any tax-related matter addressed herein. We provide this disclosure on all outbound e-mails to assure compliance with new standards of professional practice, pursuant to which certain tax advice must satisfy requirements as to form and substance.
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OUR WASHINGTON, D.C., OFFICE HAS MOVED.
As of April 30, 2012, our new address will be 1909 K Street, N.W., 12th Floor, Washington, DC 20006-1157. Our telephone and fax numbers remain the same. Thank you.
****

U.S. Treasury Circular 230 Notice: Any tax advice contained in this communication (including any attachments) was not intended or written to be used,
and cannot be used, for the purpose of (a) avoiding penalties that may be imposed under the Internal Revenue
Code or by any other applicable tax authority; or (b) promoting, marketing or recommending to another party any tax-related matter addressed herein. We provide this disclosure on all outbound e-mails to assure compliance with new standards of professional practice, pursuant to which certain tax advice must satisfy requirements as to form and substance.
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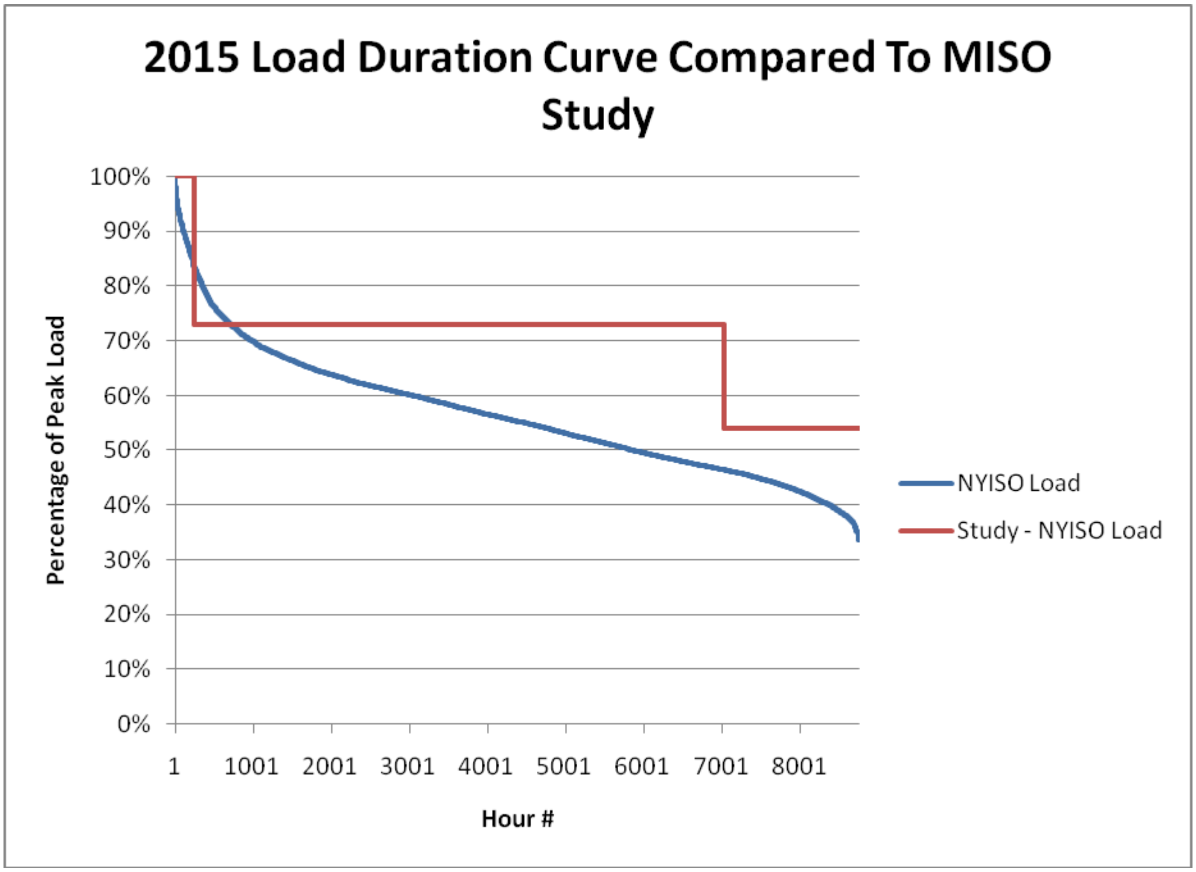
As of April 30, 2012, our new address will be 1909 K Street, N.W., 12th Floor, Washington, DC 20006-1157. Our telephone and fax numbers remain the same. Thank you.

DOCKET NO. ER11-1844
EXHIBIT NO. NYI-42


2015 Load Duration Curve Compared To MISO Study
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percentage of Peak Load
1
1001
2001
3001
4001
5001
6001
7001
8001
Hour #
NYISO Load
Study - NYISO Load

DOCKET NO. ER11-1844
EXHIBIT NO. NYI-43

<u>NYISO/MISO 2-2.</u> Is one-hundred percent (100%) of Lake Erie loop flow caused by NYISO, MISO, IESO, or PJM dispatch to meet their respective loads?

a. If not, what portion of Lake Erie loop flow, on average, is caused by other (non MISO, IESO, NYISO or PJM) balancing authority area's dispatch and/or sources of Lake Erie loop flow?

i. Please provide any studies, analysis or other Documents that support MISO's response to NYISO/MISO 2-2, sub part a.

b. Which other (non MISO, IESO, NYISO or PJM) balancing authority areas' dispatch cause Lake Erie loop flow?

i. For each balancing authority are identified, please provide its approximate Lake Erie loop flow impact.

ii. Provide any studies, analysis or other Documents that support MISO's response to NYISO/MISO 2-2 sub part b

c. Identify all other sources/causes of Lake Erie loop flow MISO is aware of.

i. For each source/cause of Lake Erie loop flow identified, please provide its approximate Lake Erie loop flow impact.

ii. Provide any studies, analysis or other Documents that support MISO's response to NYISO/ITC 2-2, sub part c.

d. Will the operation of the PARs at the interface between Michigan and Ontario (MISO and IESO), including both the Replacement PARs and the Hydro One PARs affect the Lake Erie loop flow impacts of other (non MISO, IESO, NYISO or PJM) balancing authority area's dispatch?

e. If the answer to NYISO/MISO 2-2, sub-part d is "yes" how will the operation of the PARs at the interface between Michigan and Ontario (MISO and IESO), including both the Replacement PARs and the Hydro One PARs, affect the Lake Erie loop flow impacts of other (non MISO, IESO, NYISO or PJM) balancing authority areas' dispatch?

Response: MISO objects to this request to the extent it is overly broad and unduly burdensome, presumes certain facts that do not exist or which have not been proven, and to the extent that it requires MISO to speculate or perform additional studies. Notwithstanding these objections, MISO states that it has not performed any studies regarding the contributions of other balancing authority area's dispatch causing loop flow or operation of the Michigan/Ontario PARs on Lake Erie loop flow impacts of other balancing authority area's dispatch.

Sponsored by: Counsel

Supplemental Response: (3/9/12) No, one hundred percent of Lake Erie loop flow is not caused by NYISO, MISO, IESO and PJM. However, professional judgment indicates that distribution factors of other Balancing Authorities outside of these would fall below modeling thresholds and have *de minimis* aggregate impacts therefore MISO did not include any in the DFAX study. MISO did not study and will not speculate with regard to the remaining parts of this request.

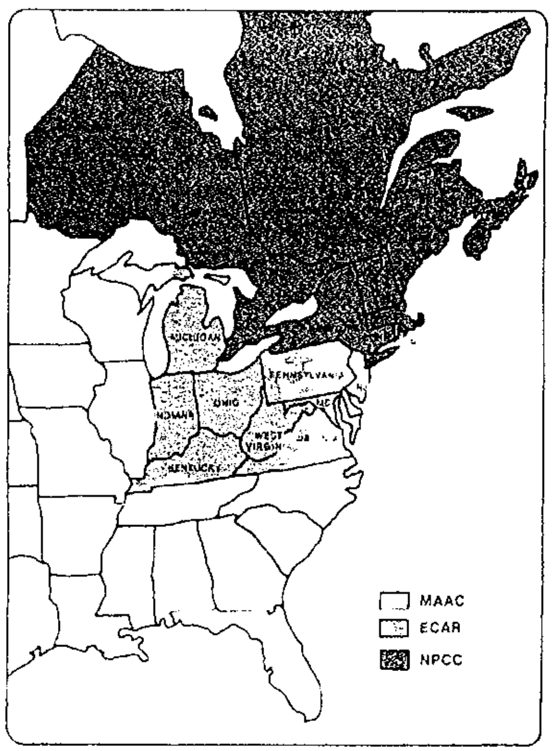
Sponsored by: Digaunto Chatterjee

DOCKET NO. ER11-1844
EXHIBIT NO. NYI-44

MAAC-ECAR-NPCC
Study Committee

Michigan-Ontario Phase Angle Regulator Study
An Interregional Perspective

November 1999



November 29, 1999

Karl Tammar
Chair Lake Erie Security Process Working Group
New York Independent System Operator
3890 Carman Road
Schenectady, NY 12303

As part of the ongoing responsibility of the interregional study committees, the Ad Hoc PAR Studies Working Group, under the direction of the MEN Study Committee, conducted a supplemental study to assess the interregional impact of the modifications to the Michigan-Ontario interface. This project, commonly referred to as the PAR project, expands the thermal capability of the ties between Ontario and Michigan by the addition of a 345/230-kV autotransformer, and three 230 kV phase angle regulating transformers to provide control. The normal mode of operation is to control the interface flow to the Ontario-MECS schedule.

At the November 1999 meeting of the Joint Interregional Review Committee (JIRC), the MEN Study Committee Chairman presented the report on the Michigan-Ontario Phase Angle Regulator (PAR) Study. The JIRC approved the Committee report and voted to forward this report to the Lake Erie Security Process Working Group (LESPWG), and request they review the existing operating procedures applicable to the PARs affecting bulk system operation in the northeast.

The JIRC request that the LESPWG review the attached report and develop, before the scheduled in-service date of the PARs, an overall operating philosophy for coordinated operation of all control devices including the new PARs from a good utility practice perspective. Their review should address issues such as:

- procedures during normal unconstrained conditions, including actions in the pre- and post-contingency states
- procedures during normal constrained conditions, including actions in the pre- and post-contingency states
- procedures during emergency conditions

These procedures are essential for the continued reliable operation of the eastern interconnected systems. They are also required to allow the regional reliability groups to accurately model the pre- and post-contingency as well as the emergency conditions in the MEN and VEM loadflow studies.

The JIRC request your concurrence with this action and a proposed date of completion for the procedures. Please feel free to contact me at anytime to clarify information in this request.

Sincerely yours,

Phillip W. Powell

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TABLE OF CONTENTS

1. Introduction

The purpose of this assessment, performed by the MAAC - ECAR - NPCC (MEN) Ad Hoc Phase Angle Regulator Studies Working Group, under the direction of the MEN Study Committee was to evaluate the effect of modifications to the Michigan-Ontario Interface from an interregional perspective. The modifications include the addition of transformers to increase the power flow capacity of the interface and the installation of phase angle regulating transformers (PARs), which will be operated to control circulating power flows that would otherwise interfere with the ability of the Michigan and Ontario control areas to carry out scheduled transactions. (See Section 4.1 for further background and details).

The study scope was created in outline form, by the MEN Study Committee (SC) at its April 7 & 9, 1999 meeting and a preliminary version of the scope was presented to the Joint Interregional Review Committee (JIRC) at its May 10, 1999 meeting. The scope was formulated to ascertain the continued reliable operation of the interconnected regional systems, and addressed four areas of study:

- Impact on interregional transfer capabilities
- Impact on interregional power flows
- Operational considerations (interactions among PARs)
- Impact on system dynamic performance

Details of the final scope & procedure can be found in Appendix D.

The transfer limits in this report are not the Available Transfer Capabilities (ATC) or the Total Transfer Capability (TTC) as referenced in FERC Order 888 and 889, and as posted on OASIS nodes. While ATC and transfer capabilities are both based on next-contingency analysis, numerous differences in the study scope and assumptions, such as different study periods and use of Transmission Reliability Margin (TRM) and Capacity Benefit Margin (CBM) that may vary with the time horizon, make valid comparison of these numbers impossible.

Additionally, as the assessment results documented in this report are based on only one set of "forecasted" conditions for the study period, they should not be considered absolute or optimal. They represent one possible method to compare and measure the relative strength of the system with and without the Michigan/Ontario interface modifications.

2. Conclusions

The Working Group found that:

1) the new Michigan-Ontario phase shifters do not significantly harm system reliability provided they will be operated in accordance with existing regional and interregional operating principles during emergencies.

2) the new Michigan-Ontario PARs will be capable of blocking approximately 600-700 MW of unscheduled flow in either direction across the Ontario-Michigan interface (as studied with an angle range of +/- 47 degrees). However, conditions often exist where unscheduled Ontario-Michigan flow exceeds that amount.

3) when the Michigan-Ontario PARs are actively controlling to hold the Ontario-Michigan flow to its schedule:

   A. Facilities in Ontario and on the Ontario-Michigan interface do not limit interregional transfers (these facilities limit transfers without the PARs and have had TLR declared repeatedly in 1999).

   B. Transfer factors (TDF and OTF) on facilities parallel with the Michigan-Ontario interface are higher. These parallel facilities include several ECAR facilities which have had TLR declared repeatedly in 1999.

   C. Essentially 100% of any unscheduled Ontario-Michigan flow being blocked by the new PARs flows across the NYPP/PJM interface.

   D. The ability of the PJM SENY PARs to hold scheduled flow is diminished (similarly, active control of the PJM/NYPP PARs affects the ability of the Michigan-Ontario PARs to hold their schedule).

4) the new M/O PARs do have sufficient operating range to produce similar FCITCs to those reported in previous MEN studies without the PARs in service, and active scheduling of transactions through Ontario (through buy/re-sell arrangements with Ontario, or, in an emergency, by off-schedule operation) would result in system transfer capabilities comparable to those currently observed.

5) FCITCs will decrease for transfers in the same direction as the prevailing unscheduled Ontario-Michigan flow being blocked by the PARs. FCITCs will increase for transfers in the opposite direction as the prevailing unscheduled Ontario-Michigan flow being blocked by the PARs.

6) analysis performed by Ontario under the auspices of the NPCC Task Force on System Studies demonstrates that, for typical system conditions, the Michigan-Ontario interface modifications and controlled operation thereof do not significantly affect the system dynamic response.

3. Results

3.1 Impact on Interregional Transfer Capabilities

Table 3-1 provides a summary of the FCITC results as obtained from the TLTG analysis. A more detailed presentation of the FCITC results, limiting facilities, and corresponding distribution factors is given in Tables A-1 through A-3 in Appendix A.

NPCC (NYPP) to ECAR

Without the Michigan-Ontario PARs, the FCITC for NPCC to ECAR transfers is 4050 MW. The limit is due to a pre-contingency overload on Lambton-St. Clair 345 kV L51D.

With the PARs attempting to control the Ontario to Michigan flow to the original schedule of 600 MW (the actual Ontario to Michigan flow could only be reduced to about 1300 MW, due to PAR angle limits), the resulting FCITC decreases to 3350 MW. Additionally, the limit moves off the Michigan-Ontario interface and becomes the Homer City – Shelocta 230 kV line for the loss of Wayne – Erie West 345 kV. This decrease of 700 MW is due to the higher pre-contingency loadings resulting from blocked Ontario to Michigan flow being redistributed on parallel facilities.

With the PARs controlling the Ontario to Michigan flow to a schedule of 2100 MW, simulating either a portion of the transfer being scheduled through Ontario or the PARs being adjusted to aid the interconnected system during an emergency, the resulting FCITC increases slightly to 4100 MW. Again, the limit moves off the Michigan-Ontario interface and becomes the Homer City – Shelocta 230 kV line for the loss of Wayne – Erie West 345 kV. This slight increase of 50 MW is due to the ability of the PARs to hold the Ontario to Michigan interface flow to a value that is slightly higher than the 2017 MW in the case without the new PARs. Operation in this manner provides an optimizing effect.

MAAC to ECAR

Without the Michigan-Ontario PARs, the FCITC for MAAC to ECAR transfers is 4450 MW. The limit is due to a post-contingency overload on the South Canton – Star 345 kV line for the loss of Sammis – Star 345 kV, which is an internal ECAR limit.

With the PARs attempting to control the Ontario to Michigan flow to the original schedule of 600 MW (the actual Ontario to Michigan flow could only be reduced to about 700 MW, due to PAR angle limits), the resulting FCITC decreases to 4250 MW, with the limiting facility remaining the same. This decrease of 200 MW is due to the higher pre-contingency loadings resulting from blocked Ontario to Michigan flow being redistributed on parallel facilities.

ECAR to NPCC (NYPP 50%/OH 50%)

Without the Michigan-Ontario PARs, the FCITC for ECAR to NPCC transfers is 2800 MW. The limit is due to a post-contingency overload on the North Meshoppen 230/115 kV transformer for the loss of Homer City – Watercure 345 kV.

With the PARs controlling the Ontario to Michigan flow to the new scheduled value of -900 MW, the resulting FCITC increases to 3000 MW, with the limiting facility remaining the same. This increase of 200 MW is due to the lower pre-contingency loadings (for this transfer) on parallel facilities resulting from increasing the Michigan to Ontario flow to its scheduled value.

Table 3-1
Comparisons of FCITC results in MW

NPCC (NYPP) to ECAR 4000 MW (see Table A-1 for details)				
FCITC for Limit on	**Existing System**	**Maximum Angle ***	**Minimum Angle**	**Ontario to Michigan scheduled @2100 MW ****
Michigan-Ontario Interface	4050	5000+	2950	5000+
NYPP/PJM Interface	4100	3350	5000+	4100
MAAC to ECAR 4000 MW (see Table A-2 for details)				
FCITC for Limit on	**Existing System**	**Maximum Angle ***	**Minimum Angle**	
Michigan-Ontario Interface	5000+	5000+	5000+	
NYPP/PJM Interface	5000+	5000+	5000+	
Other Limiting Facilities	4450	4250	4600	
ECAR to NPCC (Ontario 50%/NYPP 50%) 3000 MW (see Table A-3 for details)				
FCITC for Limit on	**Existing System**	**Maximum Angle**	**Minimum Angle**	**Michigan to Ontario scheduled @900 MW ***
Michigan-Ontario Interface	5000+	4800	5000+	5000+
NYPP/PJM Interface	2800	3200	2400	3000

* Denotes the conditions under which the M/O PARs would be operating for the given transfer.
** Simulates a portion of the transfer being scheduled through Ontario.

3.2 Impact on Interregional Power Flows

Table 3-2 displays both scheduled and actual net Ontario to Michigan interface flows for the base case and the three transfer cases studied. The actual solved interface flows include scenarios for the cases without the Michigan-Ontario PARs, with the Michigan-Ontario PARs at maximum angles (Decreasing Ontario to Michigan flow), and with the Michigan-Ontario PARs at minimum angles (Increasing Ontario to Michigan flow).

Table 3-2
Net Ontario to Michigan flows in MW

Test Transfer Level	MEN Base Case 0 MW*	NPCC to ECAR 4,000 MW	MAAC to ECAR 4,000 MW	ECAR to NPCC 3,000 MW*
Scheduled Ontario to Michigan flow	600	600	600	-900
Without Michigan-Ontario PARs	867	2,017	1,432	-543
With Michigan-Ontario PARs at Maximum Angles (i.e. Decreasing Ontario-Michigan flow)	236	1,294	749	-1,206
With Michigan-Ontario PARs at Minimum Angles (i.e. Increasing Ontario-Michigan flow)	1,463	2,505	2,003	118

* Indicates transfer scenarios in which the Michigan-Ontario PARs would have sufficient angle range to hold the actual Ontario to Michigan flow to the scheduled value.

These tabulated results illustrate that the Michigan-Ontario PARs are capable of varying the Ontario to Michigan flow by as much as 600 to 700 MW in either direction from what the interface flow would be without the additional PAR control (as studied with an **no-load** angle range of +/- 47 degrees). This amount of flow control corresponds to the amount of unscheduled Ontario-Michigan flow the new PARs will be capable of blocking.

Due to the interconnected nature of the transmission network, all Ontario-Michigan flow blocked by the new PARs will redistribute on parallel facilities. Table 3-3 displays distribution factors for some selected key facilities as a percentage of blocked Ontario-Michigan flow. See Table C-1 in Appendix C for a more extensive list, which was prepared by inserting the Michigan-Ontario PARs at maximum angle into the MEN Summer 1999 system representation and observing flow changes. The PJM-NYPP phase shifters are able to hold their scheduled flows in both cases.

Table 3-3
Response of Key Facilities to Michigan-Ontario PARs
(As Percent of Michigan-Ontario Interface Flow Change)

MAAC Facilities	
Keystone #1 500/230 kV	-12.5%
Peach Bottom – Conastone 500 kV	12.3%
Conastone – Brighton 500 kV	11.4%
Sunbury – Juniata 500 kV	6.7%
Burches Hill – Possum Point (VP) 500 kV	6.2%
Wescosville – Alburtis 500 kV	5.3%
Keystone – Juniata 500 kV	-4.2%
Conemaugh – Juniata 500 kV	-3.6%
Keystone – Conemaugh 500 kV	-3.3%
NYPP/PJM Interface	100.0%
Erie West (GPU) - Ashtabula (FE) 345 kV	33.7%
South Ripley (NMPC) - Erie East (GPU) 230 kV	27.6%
Homer City - Shelocta 230 kV	25.2%
Stolle Rd. (NYSEG) - Homer City (GPU) 345 kV	19.6%
Oxbow – Lackawanna 230 kV	18.0%
Watercure (NYSEG) - Homer City (GPU) 345 kV	17.3%
Hillside (NYSEG) - East Towanda (GPU) 230 kV	16.7%
Homer City #1 345/230 kV	16.2%
Homer City #2 345/230 kV	15.8%
North Meshoppen 230/115 kV	-4.9%
ECAR Facilities	
Ashtabula – Perry 345 kV	28.6%
Beaver – Davis Besse 345 kV	24.5%
Hatfield – Ft. Martin 500 kV	18.6%
Keystone (PJM) – Yukon 500 kV	18.0%
Cabot – Wylie Ridge 500 kV	17.8%
Yukon – Hatfield 500 kV	17.0%
Davis Besse – Bay Shore 345 kV	16.8%
Ft. Martin – 502 J 500 kV	16.2%
Keystone (PJM) – Cabot 500 kV	14.5%
Kammer 500/765 kV*	14.2%
Cook 765/345 kV*	13.5%
Fostoria Central – Lemoyne 345 kV	12.5%
Harrison – Belmont 500 kV	12.4%

Table 3-3 - Continued
Response of Key Facilities to Michigan-Ontario PARs
(As Percent of Michigan-Ontario Interface Flow Change)

ECAR Facilities - continued	
Juniper – Avon 345 kV	12.3%
Belmont 500/765 kV*	12.2%
Fostoria Central – Bay Shore 345 kV	11.8%
Midway – N Tap 345 kV	11.8%
Perry – East Lake 345 kV	11.6%
Central Ohio Flowgate*	11.0%
Lemoyne – Midway 345 kV	10.0%
Dumont 765/345 kV*	9.0%
Brighton (PJM) – Doubs 500 kV*	8.4%
Marysville – E. Lima 345 kV*	7.8%
Wylie Ridge #2 500/345 kV	6.9%
Grover (GPU) – Moshannon 230 kV	6.7%
Wylie Ridge #1 500/345 kV	6.6%
Pruntytown – Harrison 500 kV	5.9%
Forest (GPU) – Elko 230 kV	4.9%
NPCC Facilities	
Beck B (OH) – Niagara (NYPP) 345 kV*	30.1%
Beck A (OH) – Niagara (NYPP) 345 kV*	30.0%
PA 27 (OH) – Niagara 2W (NYPP) 230 kV*	20.9%
BP 76 (OH) – Packard 2 (NYPP) 230 kV*	19.5%
Pannell Road – Clay #1 345 kV	11.6%
Pannell Road – Clay #2 345 kV	11.6%
Stolle Road – Meyer 230 kV	5.5%
Edic – Fraser 345 kV	4.7%
Marcy – New Scotland 345 kV	0.8%
Beck – Hanlon Jct. 220 kV	-20.8%
Beck – Neale Jct. 220 kV	-19.5%
Allanburg Jct. – Middleport 220 kV	-19.4%
Buchanan-Longwood Input (BLIP)	-100%

*Facility had TLR level 2 or higher declared during January - July 1999.

3.3 Effects of New Ontario-Michigan PARs on Ramapo and Other PARs

The Northeastern New Jersey (PJM)-Southeastern New York (SENY - NYPP) interface has several phase angle regulators (PARs) that help the control scheduled flows across the two Control Areas. The PARs are located at Ramapo 345 kV, Waldwick 230 kV, Farragut 345 kV and Goethals 345 kV.

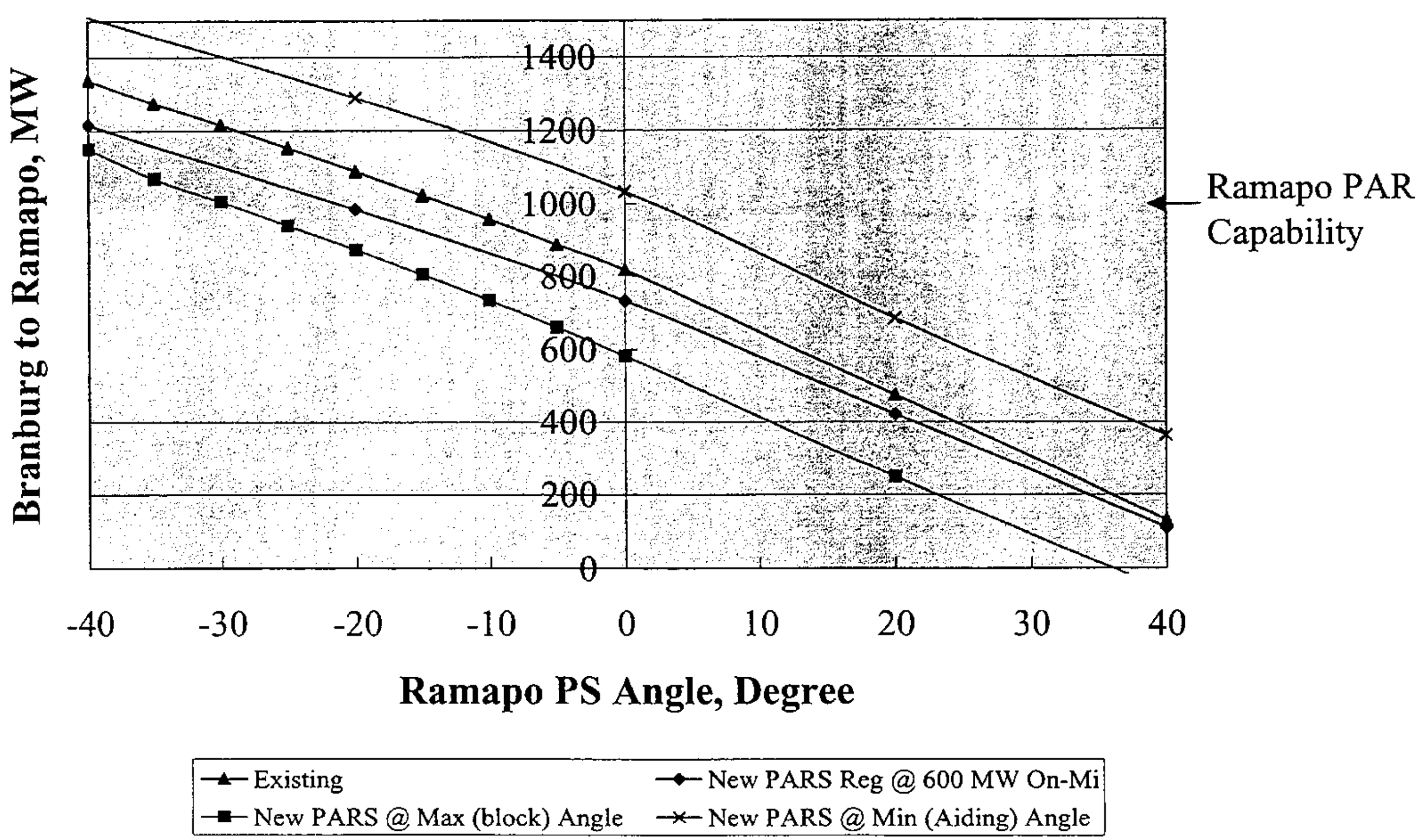
The following load flow cases were used to evaluate the effects on the existing PARs of the installation of the new PARs in the Ontario-Michigan interface:

1) MEN/VEM 1999 Summer base case without the new PARs.
2) Case (1) with new PARs controlling the Ontario to Michigan flow to 600 MW.
3) Case (1) with new PARs at maximum angles (decreasing Ontario to Michigan interface flows.
4) Case (1) with new PARs at minimum angles (increasing Ontario to Michigan interface flows.

Figure 3-1 is a plot of the Branchburg to Ramapo power flows as a function of the Ramapo PAR angles for each of the four load flow cases described above. For the transfer from PJM to NYPP as modeled in the cases, the graph shows a maximum shift of plus or minus 240 MW in the operating range of the Ramapo PARs depending on whether the Michigan-Ontario PARs are set at minimum angles (increasing Ontario to Michigan flows) or at maximum angles (decreasing Ontario to Michigan flows). In effect, as shown in Figure 3-1, the new Michigan-Ontario PARs can either assist or impede the ability of the Ramapo PARs to control scheduled flow by about 240 MW. For transfers from NYPP to PJM, the reverse would apply.

Table F-1 in Appendix F presents detailed results, comparing the operating angles and flows of the new and existing PARs in the four cases listed above. The table also shows the change in flow through each PAR caused by a change of one tap position on each of the other PARs (MW/tap).

Figure 3-1
Effect of New Phase Shifters on Ramapo Pars



3.4 NPCC Assessment of System Dynamic Response

As part of NPCC's ongoing Reliability Assessment Program, Ontario Hydro Services Company has presented to NPCC the report: *Reliability Assessment of the Planned Modifications on the Ontario-Michigan Interconnections*, dated June 1999. The report includes load flow and transient stability studies as well as generation shift and outage distribution factors of relevant NPCC, ECAR and MAAC interfaces.

The study was conducted on a base case developed to model typical peak load conditions for the Summer 2002 period, and included selected contingencies from the NPCC, ECAR, and MAAC Regions. In addition, the effects of the Ontario-Michigan planned modifications on the existing PARs were also examined. The report was approved by the NPCC Reliability Coordinating Committee at its June 29, 1999 meeting.

The MEN Study Committee and Michigan-Ontario PAR Working Group have reviewed the results of these studies for interregional impact, and it is judged that no further dynamic studies are necessary at this time.

A copy of the report can be downloaded from the NPCC Home Page. The link to the report is:

ftp://www.npcc.org/bbs/NPCC_task_forces/TFSS/XmissionReview/on/par-oh-stdy.pdf

4. Background Information

4.1 Planned Modifications to the Michigan-Ontario Interface

In January 1999, Detroit Edison and Ontario Hydro announced plans to modify the existing interconnection facilities between Michigan and Ontario. The planned modifications, with an in-service date of May 31, 2000, are described as follows:

In Michigan:
- Install a 345/230 kV 1,000 MVA autotransformer on interconnection L51D
- Install a 230 kV, 675 MVA phase shifting transformer on interconnection B3N

In Ontario:
- Parallel the existing two 345/230 kV autotransformers T7 and T8 for connection on interconnection L4D
- Install two 230 kV, 845 MVA phase shifting transformers, one on interconnection L4D and one on interconnection L51D

The planned modifications will increase the nominal summer rating of the Ontario-Michigan interconnections from 2200 MVA to 2580 MVA. However, the Michigan to Ontario limit remains at 2200 MVA as per the existing limit granted by the Presidential Permit. The new phase shifting transformers, with effective phase angle control ranges of at least +/- 40 degrees under **full load,** are expected to provide the capability of controlling unscheduled Lake Erie Circulation (LEC) in either direction by approximately 600 MW.

4.2 Operating Philosophy

The new phase shifters being installed by Ontario Hydro Service Company (OHSC) and Detroit Edison will be operated to prevent unscheduled parallel power flows from circulating through the two systems by controlling the flow across the Ontario-Michigan interface to the amount that is scheduled across that interface. Therefore, during normal conditions, the new PARs will be operated such that the Michigan-Ontario interface flow will match the Michigan-Ontario scheduled transactions across the interface.

However, Ontario and Detroit have both agreed that during declared emergencies on either of their respective systems, the new Phase Angle Regulators (PARs) will be operated in a manner that will help alleviate the emergencies. This provision is described in the "Basic Principles of Ontario-Michigan Phase Shifter Operation," (Schedule A to the Interconnection Expansion Facilities Agreement) included in Appendix E. Additionally, in keeping with NERC guidelines to ensure the reliable operation of the interconnected system, measures would be taken in the operation of the Michigan-Ontario PARs commensurate and reciprocal to emergency measures taken in other systems to relieve emergency conditions in those systems.

4.3 Study Procedure

The transfer capability results from the 1999 Summer MEN Assessment formed the benchmark for this study.

As a method to study the impact on transfer capability of the new phase angle regulating transformers (PARs), the new Michigan-Ontario PARs were added to the 1999 Summer MEN/VEM Assessment load flow base case. Selected transfers were then re-tested with the PARs set to control the Ontario-Michigan flow to the scheduled value. Testing was performed by establishing the same high test transfer cases as were used in the MEN Assessment. All operating procedures employed in the course of the 1999 Summer MEN Assessment were similarly employed, if necessary, for this study.

For the NYPP to ECAR transfer, the FCITC was also re-evaluated with the Ontario-Michigan schedule changed to 2100 MW from the original 600 MW value. This was done to simulate a situation were either a portion of the transfer was scheduled through Ontario, or where Ontario and DECO had agreed to adjust the PARs to aid the interconnected system during a declared emergency.

Additionally, in order to evaluate the full range of the potential impact of the new PARs on existing facilities, transfer limitation sensitivities were performed with the new PARs set at upper and lower angular limits, i.e. with:

1) The Michigan-Ontario PARs set to **no-load** "ideal" maximum angles (+47 degrees). This corresponds to minimizing (decreasing or blocking) the Ontario to Michigan flows.

2) The Michigan-Ontario PARs set to **no-load** "ideal" minimum angles (-47 degrees). This corresponds to maximizing (increasing or aiding) the Ontario to Michigan flows.

AC load flow studies were also performed to determine the effects of the new Michigan-Ontario PARs on existing PARs. Particular attention has been paid to the effects of the new PARs on the Ramapo PARs in the 500 kV Branchburg-Ramapo PJM-NYPP interconnection.

Appendix A

Results of Transfer Analysis: Linear results and FCITCs

Table A-1
FCITCs, Transfer Case Loadings and Response Factors for Facilities Limiting in the 1999 Summer MEN Assessment

Transfer NPCC(NYPP)-ECAR 4000 MW	FCITC [1]	Limiting Facility / Contingency [6]	Loading[8] (MW)	Rating (MVA)	TDF %	ODF %	OTF %
		FCITCs for Limits on Michigan-Ontario Interface					
Without new PARs – 1999 Summer MEN Assessment [7]	4050[4]	[5]Lambton – St. Clair 345 kV L51D (OH/MECS)/ Base	636	645	15.8	----	----
New PARs @ Maximum Angle[7]	5000+	None	----	----	----	----	----
New PARs @ Minimum Angle[7] **Note: Different contingency**	2950[4,10]	[5]Scott – Bunce 230 kV B3N (OH/MECS) / [5,11]Lambton – St. Clair 345 kV L4D (OH/MECS)	511 872	482	7.7 15.5	18.1	10.5
With new PARs controlling O-M flows to 2100 MW[9]	5000+	None	----	----	----	----	----
		FCITCs for Limits on NYPP/PJM Interface					
Without new PARs – 1999 Summer MEN Assessment [7]	4100[4]	[5]Homer City - Shelocta 230 kV (GPU) / Wayne - Erie 345 kV (GPU)	615 448	854	13.9 6.9	46.4	17.1
New PARs @ Maximum Angle[7]	3350[4]	[5]Homer City - Shelocta 230 kV (GPU) / Wayne - Erie 345 kV (GPU)	734 481	854	13.8 6.9	46.4	17.0
New PARs @ Minimum Angle[7]	5000+	None	----	----	----	----	----
With new PARs controlling O-M flows to 2100 MW[9]	4100[4]	[5]Homer City - Shelocta 230 kV (GPU) / Wayne - Erie 345 kV (GPU)	599 445	854	23.7 8.9	46.1	27.8

Continued…

Table A-1 - continued
Notes

1. **The transfer limits shown here are NOT the Available Transfer Capabilities (ATC) as posted on OASIS nodes.**
2. Warren-Falconer 115 kV circuit opened.
3. 3000 MW Incremental Transfer Test Level
4. 4000 MW Incremental Transfer Test Level
5. East Sayre-North Waverly and Laurel Lake-Goudey opened. St. Clair G6 connected to 120 kV system.
6. Stated limits are thermal unless otherwise noted.
7. The Ramapo PAR is regulating the Ramapo to Branchburg flow to 1000 MW in all three cases
8. Loading in NPCC (NYPP) to ECAR 4000 MW transfer cases (no outages)
9. The 2100 MW transfer level was chosen to be close to the 2017 MW flow from Ontario to Michigan in the NPCC to ECAR 4000 MW transfer case without improvements.
10. This result is for the study case with the new Michigan-Ontario PARs at minimum angle. For this study case, if the B3N PAR had been set slightly above its minimum angle (with the other PARs still at their minimum angles) a better balance of flows across the four Michigan-Ontario ties would have been achieved. This would have significantly increased the FCITC limit for this facility (B3N) while the total flow through the Michigan-Ontario interface would have remained essentially unchanged.
11. 500 MW of Lambton generation is also rejected for this contingency.

Table A-2

FCITCs, Transfer Case Loadings and Response Factors. Results from Studies Performed by the MEN Michigan-Ontario PAR WG

Transfer MAAC to ECAR 4000 MW	FCITC [1]	Limiting Facility / Contingency [2]	Loading[4] (MW)	Rating (MVA)	TDF %	ODF %	OTF %
		FCITCs for Limits on Michigan-Ontario Interface					
Without new PARs - 1999 Summer - MEN MO-PAR WG	5000+	None	----	----	----	----	----
New PARs @ Maximum Angle[3]	5000+	None	----	----	----	----	----
New PARs @ Minimum Angle[3]	5000+	None	----	----	----	----	----
		FCITCs for Limits on NYPP/PJM Interface					
Without new PARs - 1999 Summer - MEN MO-PAR WG	5000+	None	----	----	----	----	----
New PARs @ Maximum Angle[3]	5000+	None	----	----	----	----	----
New PARs @ Minimum Angle[3]	5000+	None	----	----	----	----	----
		FCITCs for Limits on Other Facilities					
Without new PARs - 1999 Summer - MEN MO-PAR WG	4450	South Canton – Star 345 kV (AEP-FE)/ Sammis -Star 345 kV (FE)	1036 *	1076	6.2 5.1	41.2	8.3
New PARs @ Maximum Angle[3]	4250	South Canton – Star 345 kV (AEP-FE)/ Sammis -Star 345 kV (FE)	1053 *	1076	6.2 5.2	40.4	8.3
New PARs @ Minimum Angle[3]	4600	South Canton – Star 345 kV (AEP-FE)/ Sammis -Star 345 kV (FE)	1025 *	1076	6.3 5.2	38.5	8.3

1. **The transfer limits shown here are NOT the Available Transfer Capabilities (ATC) as posted on OASIS nodes.**
2. Stated limits are thermal unless otherwise noted.
3. The Ramapo PAR is regulating the Ramapo to Branchburg flow to 820 MW in all four cases
4. Loading in MAAC to ECAR 4000 MW transfer cases (no outages)

* To be added after the ECAR transcription diagrams have been completed

Table A-3
FCITCs, Transfer Case Loadings and Response Factors for Facilities Limiting in the 1999 Summer MEN Assessment

Transfer ECAR-NPCC (NYPP-50%/OH-50%) - 3000 MW	FCITC[1]	Limiting Facility / Contingency[5]	Loading[6] (MW)	Rating (MVA)	TDF %	ODF %	OTF %
		FCITCs for Limits on Michigan-Ontario Interface					
Without new PARs - 1999 Summer MEN Assessment[7]	5000+	None	----	----	----	----	----
New PARs @ Maximum Angle[7]	4800[3]	[2] Keith – Waterman 230 kV J5D (OH/MECS) / Lambton – St. Claire 345 kV L4D (OH/MECS)	232 474	430	12.3 15.0	16.0	14.7
New PARs @ Minimum Angle[7]	5000+	None	----	----	----	----	----
With new PARs controlling M-O flows to 900 MW[7]	5000+	None	----	----	----	----	----
		FCITCs for Limits on NYPP/PJM Interface					
Without new PARs - 1999 Summer MEN Assessment[7]	2800[3]	[2]North Meshoppen 230/115 kV (GPU) / Homer City - Watercure 345 kV (GPU/NYSEG)	149 589	141	3.6 12.3	2.4	3.9
New PARs @ Maximum Angle[7]	3200[3]	[2]North Meshoppen 230/115 kV (GPU) / Homer City - Watercure 345 kV (GPU/NYSEG)	133 540	141	3.6 12.4	3.2	4.0
New PARs @ Minimum Angle[7]	2400[3]	[2]North Meshoppen 230/115 kV (GPU) / Homer City - Watercure 345 kV (GPU/NYSEG)	165 629	141	3.6 12.4	3.2	4.0
With new PARs controlling M-O flows to 900 MW[7]	3000[3]	[2]North Meshoppen 230/115 kV (GPU) / Homer City - Watercure 345 kV (GPU/NYSEG)	140 565	141	6.2 21.0	3.3	6.9

1. **The transfer limits shown here are NOT the Available Transfer Capabilities (ATC) as posted on OASIS nodes.**
2. Warren-Falconer 115 kV circuit opened.
3. 3000 MW Incremental Transfer Test Level
4. 4000 MW Incremental Transfer Test Level
5. Stated limits are thermal unless otherwise noted.
6. Loading in ECAR to NPCC (NYPP-50%/OH-50%) 3000 MW transfer cases (no outages)
7. The Ramapo PAR is regulating the Branchburg to Ramapo flow to 1000 MW in all four cases

Appendix B

Distribution Factors for Selected Interfaces

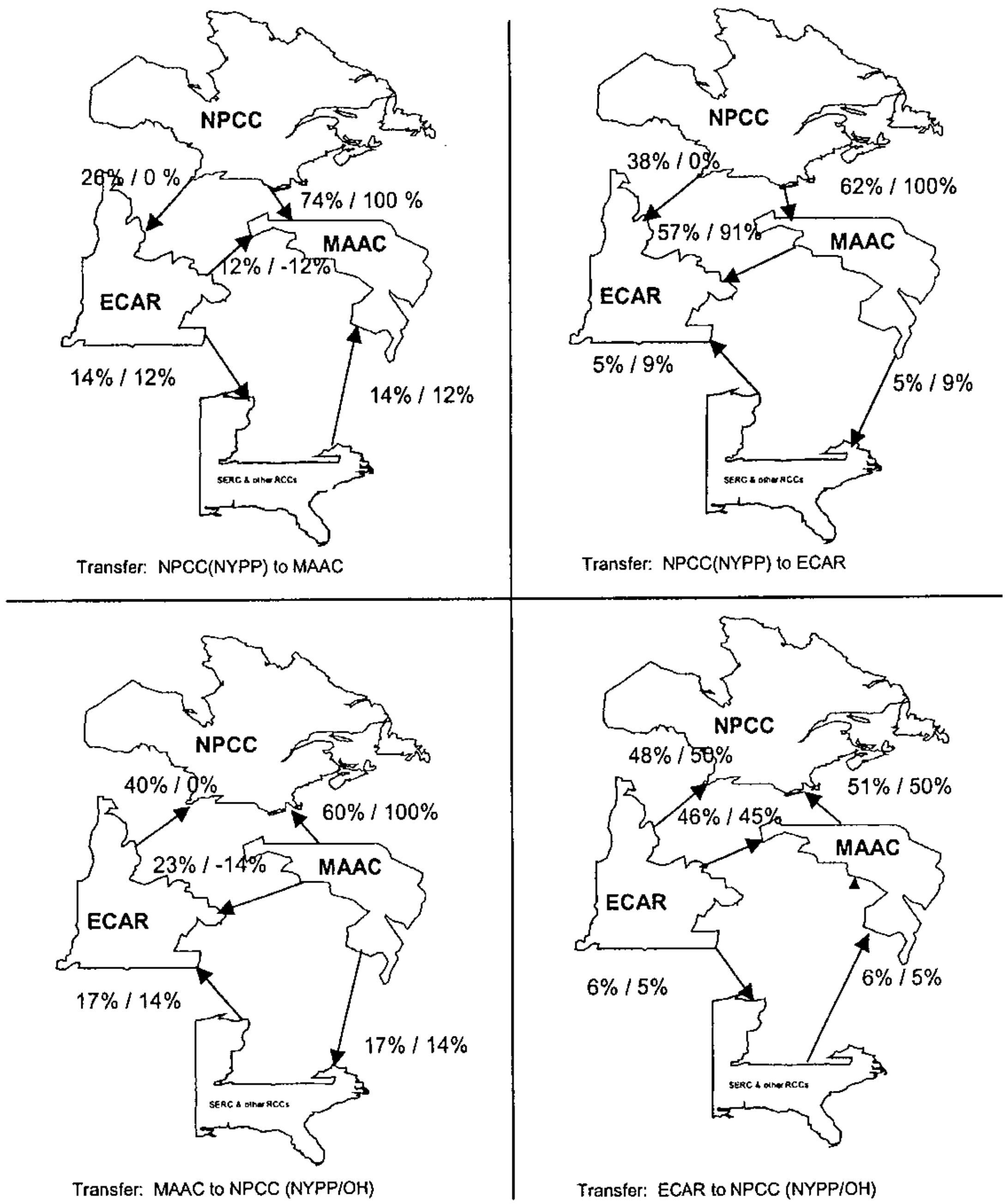
Interregional distribution factors are illustrated for selected transfers without (e.g. existing system) and with the Michigan-Ontario PARs in service. The Michigan-Ontario PARs have been assumed to hold flow at the Michigan-Ontario interface to schedule and the Michigan-Ontario interface responds accordingly. For example, in the ECAR to NPCC transfer, 50% is assumed to be scheduled between Michigan and Ontario, and the interface response is 50%. Similarly, for transfers without a direct schedule between Michigan and Ontario, the interface response is zero.

When the Michigan-Ontario PARs are operated at fixed angle (i.e. not holding schedule), the interregional distribution factors will revert to values very close to those shown for the existing case. Fixed angle operation will occur when the Michigan-Ontario PARs are at the end of the tap range or when Michigan and Ontario agree to deviate from their schedule. Deviations from the schedule to relieve emergencies are permitted in the Michigan-Ontario operating agreement.

APPENDIX B - DISTRIBUTION FACTORS FOR SELECTED INTERFACES

Figure B-1

MAAC - ECAR - NPCC
Interregional Transfer Distribution Factors

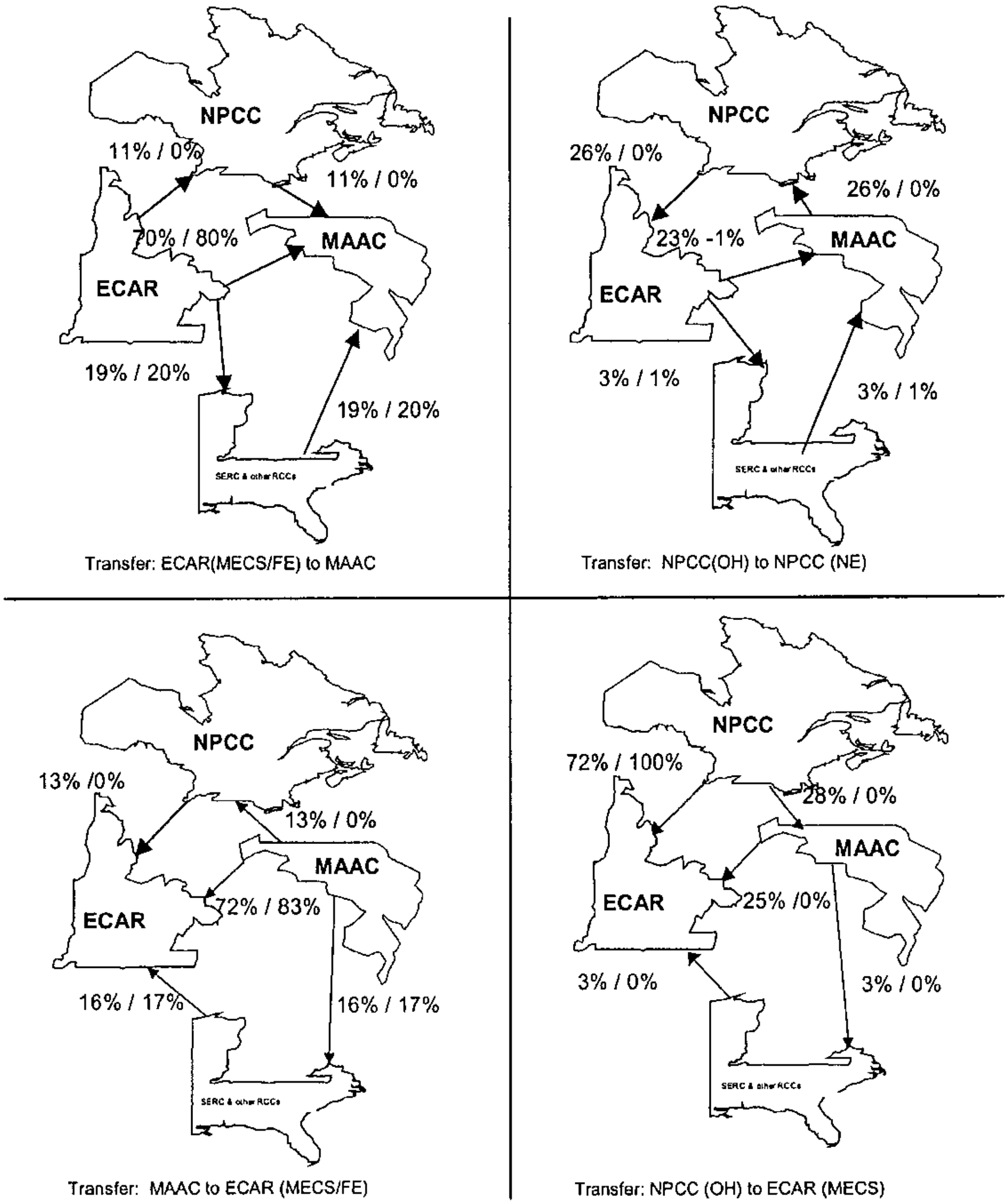


Response Factors without PARs/with PARs controlling M-O schedule

APPENDIX B - DISTRIBUTION FACTORS FOR SELECTED INTERFACES

Figure B-2

MAAC - ECAR - NPCC
Interregional Transfer Distribution Factors

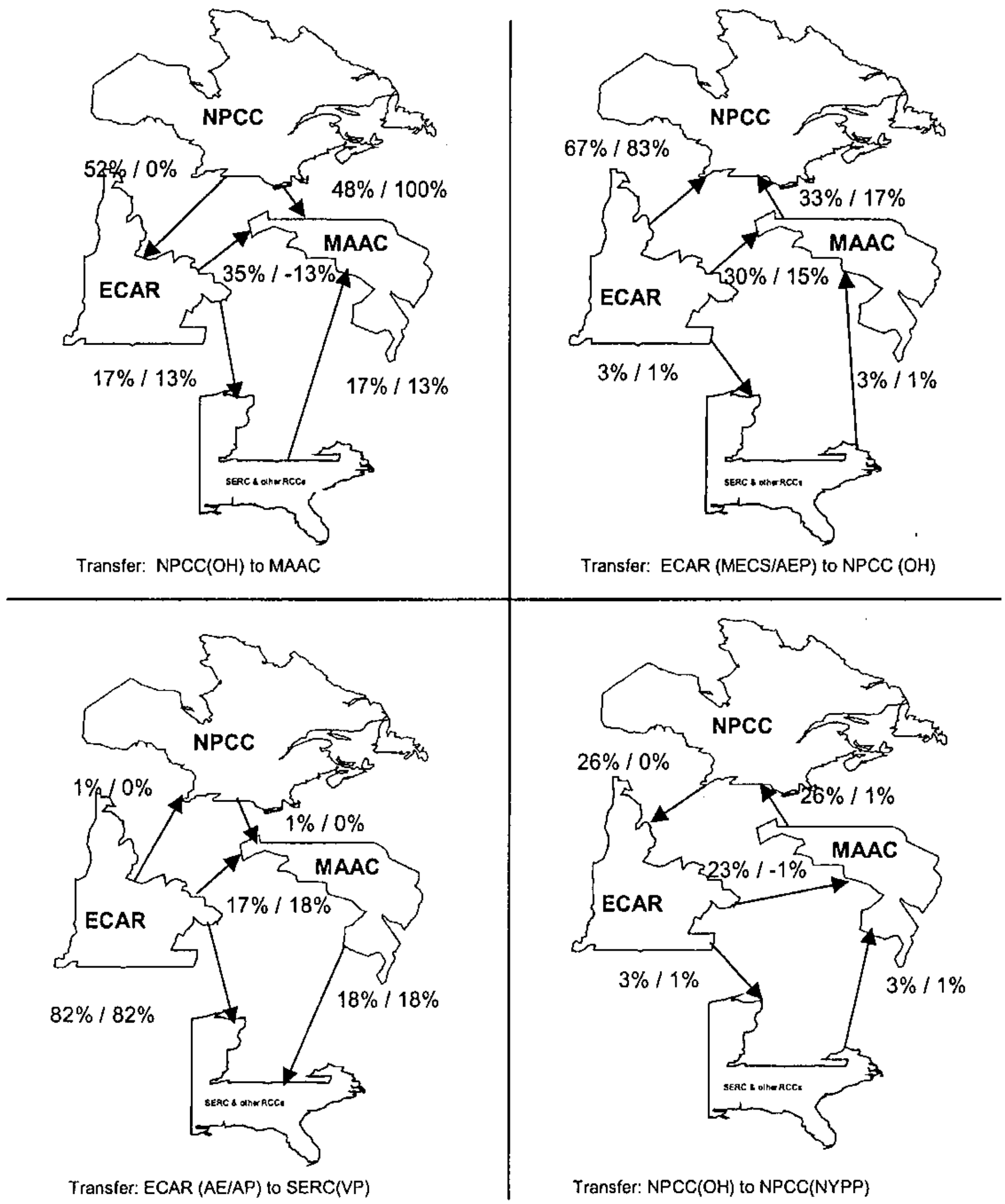


Response Factors without PARs/with PARs controlling M-O schedule

APPENDIX B - DISTRIBUTION FACTORS FOR SELECTED INTERFACES

Figure B-3

MAAC - ECAR - NPCC
Interregional Transfer Distribution Factors



Transfer: NPCC(OH) to MAAC

Transfer: ECAR (MECS/AEP) to NPCC (OH)

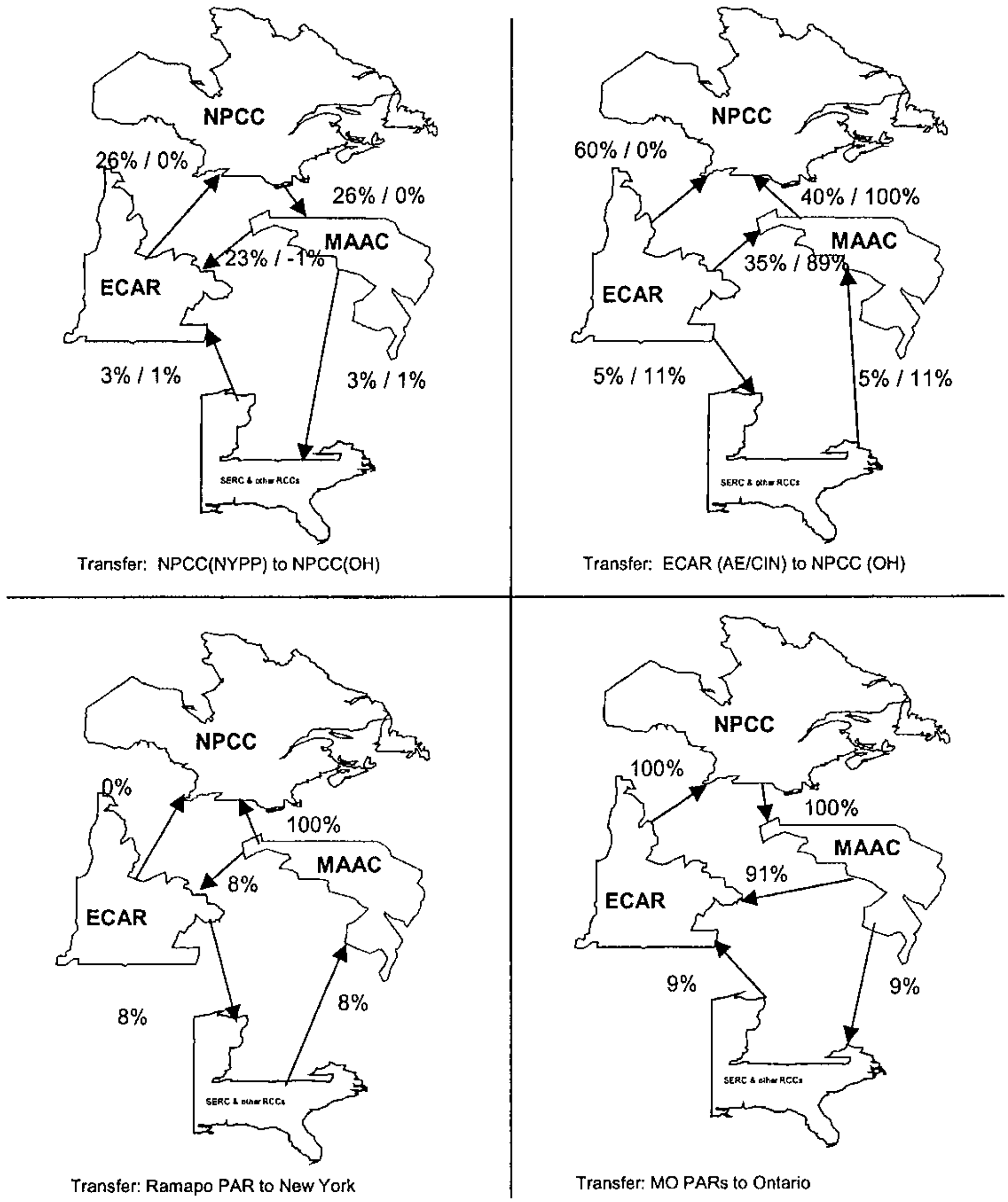
Transfer: ECAR (AE/AP) to SERC(VP)

Transfer: NPCC(OH) to NPCC(NYPP)

Response Factors without PARs/with PARs controlling M-O schedule

Figure B-4

MAAC - ECAR - NPCC
Interregional Transfer Distribution Factors



Response Factors without PARs/with PARs controlling M-O schedule
(Last two diagrams: with PARs only)

APPENDIX B - DISTRIBUTION FACTORS FOR SELECTED INTERFACES

Table B-1
Influence of New Michigan-Ontario PARs on Generation Shift and Outage Factors

	Lambton Shift		L51D Outage		PAR Response	
	PARs	No PARs	PARs	No PARs	Regulating	Fixed
OH-MECS	71.9,	72.8,	-11.3,	-12.5,	0.0,	0.0,
LAMB L4D19STCPP 1	25.8,	26.0,	63.8,	58.7,	0.0,	0.0,
LAMB L5119STCPP 1	25.7,	29.2,	-100.0,	-100.0,	0.0,	0.0,
SCOTT 19BUNCE 1	10.6,	8.6,	13.7,	16.5,	0.0,	0.0,
J5D PS 19WTRMN 1	9.9,	9.0,	11.1,	12.3,	0.0,	0.0,
BLIP	-28.1,	-27.2,	-11.3,	-12.5,	-100.0,	-100.0,
OH-NYPP	25.8,	24.9,	10.5,	11.6,	100.0,	100.0,
CENT-EAST	7.1,	6.9,	2.7,	3.0,	4.8,	20.7,
PJM-NYPP	-17.7,	-17.0,	-7.4,	-8.3,	-100.0,	-75.2,
ERIE E S RIPLEY1	-4.1,	-3.9,	-1.9,	-2.1,	-28.3,	-21.2,
WARREN FALCONER1	-1.4,	-1.4,	-0.6,	-0.7,	-9.3,	-6.9,
HOMER CYSTOLE3451	-3.1,	-3.0,	-1.3,	-1.4,	-19.5,	-14.5,
HOMER CYWATRC3451	-1.9,	-1.8,	-0.9,	-1.0,	-16.5,	-7.7,
E.TWANDAHILSD2301	-1.9,	-1.9,	-0.8,	-0.8,	-16.7,	-7.6,
E.SAYRE N.WAV1151	-0.6,	-0.6,	-0.3,	-0.3,	-5.7,	-2.5,
LAUREL LGOUDY1151	-0.4,	-0.4,	-0.2,	-0.2,	-4.0,	-1.3,
BRANCHBGRAMAPO 51	-4.2,	-4.0,	-1.5,	-1.7,	0.0,	-13.5,
ERIE W 02AT 1	3.6,	3.4,	2.6,	2.9,	34.8,	26.9,
ERIE SO ERIE SO.1	-3.4,	-3.2,	-1.9,	-2.1,	-26.3,	-20.0,
02DAV-BE02BEAVER1	8.7,	8.9,	-2.4,	-2.6,	-24.3,	-23.3,
02OTTAWA02LAKVEW1	1.6,	1.6,	-0.4,	-0.5,	-4.4,	-4.2,
APSWEST-EAST	-5.8,	-5.4,	-4.9,	-5.4,	-36.7,	-44.8,
01CABOT KEYSTONE1	-1.5,	-1.4,	-1.9,	-2.1,	-14.0,	-17.0,
01YUKON KEYSTONE1	-5.0,	-4.9,	-1.9,	-2.1,	-17.0,	-17.9,
01BLACKO01BEDNGT1	2.1,	2.1,	-0.4,	-0.5,	-1.3,	-3.8,
8MT STM 01DOUBS 1	-1.3,	-1.2,	-0.7,	-0.8,	-4.4,	-6.2,
01HATFLD01YUKON 1	-5.8,	-5.7,	-1.6,	-1.7,	-16.0,	-14.9,
01HATFLD01BLACKO1	1.7,	1.8,	-0.4,	-0.5,	-1.6,	-3.5,
01PRNTY 8MT STM 1	6.2,	6.3,	-0.6,	-0.7,	-2.1,	-5.3,
PJM-WEST	-7.1,	-6.8,	-3.8,	-4.2,	-15.2,	-32.7,
PJM-CENT	-11.3,	-11.0,	-4.4,	-4.9,	-19.1,	-38.3,
PJM-EAST	-8.7,	-8.4,	-3.3,	-3.7,	-2.8,	-27.5,
DICK-DOUBS	-0.3,	-0.3,	0.2,	0.2,	0.7,	1.7,
ERIE W ERIE WST1	-0.4,	-0.4,	-0.3,	-0.3,	-3.6,	-2.8,
HOMER CYHOMER CT2	2.5,	2.5,	0.9,	0.9,	15.4,	9.1,
HOMER CTSHELOCTA1	3.9,	3.8,	1.4,	1.5,	23.9,	14.5,
N.MESHPNNO MESHO1	-0.5,	-0.5,	-0.2,	-0.2,	-5.1,	-1.9,

The generation shift and line outage factors depend on the PAR impedance.
The PAR impedance is a function of phase angle. The PARs were set to regulate the Ontario to Michigan flow to schedule in the MEN summer 1999 case. In the MEN case the initial Ontario to Michigan flow was 867 MW while the Ontario to Michigan schedule is 600 MW. When the flow is reduced to 600 MW, the angles on B3N, L4D, L51D and J5D are 27?,19?,19?, and 15?.

The PAR response was calculated by installing regulating phase shifters on all 4 Michigan-Ontario ties and executing a generation shift from the Ontario terminals of the ties to the Michigan terminals. The participation factors were 16%,35%,35%,14% for B3N, L4D, L51D and J5D.

Table B-2
TDFs for Incremental Transfers at Peak Load Conditions

MEN 1999 Summer Operating Study Transfer Distribution Factors (%) with Phase Angle Regulators (Fixed MW Flow)	ECAR (MECS/AEP) to NPCC (OH)	MAAC to NPCC (OH)	ECAR (AEP/AP) to SERC	NPCC (OH) to NPCC (NYPP)	NPCC (NYPP) to NPCC (OH)	ECAR (AEP/CIN) to NPCC (OH)	RESPONSE FACTOR RAMAPO PAR (CON ED)	RESPONSE FACTOR MICH-ONT PARS
Transfer Test Level (MW)	500	500	500	500	500	500	**	**
Selected Transmission Facilities *								
OH-MECS Interface	-66.6	-52.7	-0.7	26.3	-26.0	-59.6	-26.1	100.0
Lambton (OH) - St Clair (DECO) 345 kV L4D	-26.7	-21.2	-0.3	10.6	-10.4	-23.9	-10.5	33.0
Lambton (OH) - St Clair (DECO) 345 kV L51D	-26.5	-21.0	-0.3	10.5	-10.4	-23.8	-10.4	33.0
Scott (OH) - Bunce (DECO) 230 kV	-13.4	-10.5	-0.1	5.2	-5.2	-11.9	-5.3	17.0
Keith (OH) - Waterman (DECO) 230 kV	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0
OH Buchanan-Longwood Input	-66.6	-52.7	-0.7	26.3	-26.0	-59.6	-26.1	100.0
OH-NYPP Interface	-33.5	-47.4	0.7	73.7	-74.0	-40.5	26.1	-100.0
New York Central - East Interface	-1.6	-2.6	0.1	23.7	-40.6	-2.0	42.0	-4.8
MAAC - NPCC Ties	33.5	47.4	-0.7	26.3	-25.9	40.5	-26.1	100.0
Erie South (GPU) - South Ripley (NMPC) 230kV	9.4	10.9	0.3	2.5	-1.0	11.1	11.3	28.3
Warren (GPU) - Falconer (NMPC) 115 kV	3.1	4.2	0.0	0.2	0.0	3.7	3.8	9.3
Homer City (GPU) - Stolle Rd. (NYSEG) 345 kV	6.6	9.1	-0.1	-0.6	0.5	8.0	8.0	19.5
Homer City (GPU) - Watercure (NYSEG) 345 kV	5.5	6.4	0.2	10.7	-11.4	6.7	18.8	16.5
E Towanda (GPU) - Hillside (NYSEG) 230 kV	5.7	10.6	-0.7	7.6	-8.0	6.9	19.2	16.7
E. Sayre (GPU) - N Waverly (NYSEG) 115 kV	1.9	3.5	-0.2	3.1	-3.2	2.4	7.0	5.7
Laurel Lake (GPU) - Goudey (NYSEG) 115 kV	1.4	2.6	-0.2	2.8	-2.9	1.7	5.8	4.0
Branchburg (PJM) - Ramapo (CON ED) 500 kV	0.0	0.0	0.0	0.0	0.0	0.0	-100.0	0.0
Erie West (GPU)-Ashtabula (CEI) 345 kV	-11.0	-6.1	-1.9	-6.4	5.7	-12.2	-11.7	-34.8
Erie South 345/230 kV (GPU)	8.5	7.7	0.8	3.3	-2.3	9.9	9.6	26.3
Davis - Besse (TE) - Beaver (OE) 345 kV	3.5	-9.5	-0.9	6.0	-5.9	-4.0	-3.5	24.4
Ottawa (TE) - Lakeview (OE) 138 kV	0.7	-1.7	-0.2	1.1	-1.1	-0.8	-0.6	4.4
APS West to East 500 kV Interface	11.2	-43.4	32.3	11.9	-12.3	13.1	-31.1	36.7
Cabot (APS) - Keystone (PJM) 500 kV	4.0	-16.3	6.9	4.7	-4.9	4.2	-11.6	14.0
Yukon (APS) - Keystone (PJM) 500 kV	5.9	-11.7	6.5	5.1	-5.2	7.6	-6.7	17.0
Black Oak - Bedington (APS) 500 kV	-0.2	-7.7	13.5	0.7	-0.7	-0.6	-6.8	1.3
Mt. Storm (VP) - Doubs (APS) 500 kV	1.5	-7.7	5.4	1.5	-1.5	1.9	-6.1	4.4
Hatfield - Yukon 500 kV (APS)	5.9	-5.8	-6.7	4.4	-4.5	8.1	-1.4	16.0
Hatfield - Black Oak 500 kV (APS)	0.0	-6.4	11.4	0.7	-0.7	-0.3	-5.5	1.6
Pruntytown (APS) - Mt. Storm (VP) 500 kV	-0.9	-10.3	27.7	1.1	-1.1	-2.0	-9.0	2.1
PJM West Interface	4.6	-55.7	11.8	6.7	-6.9	5.3	-50.1	15.2
PJM Central Interface	6.4	-52.4	1.2	7.8	-8.1	7.9	-56.4	19.1
PJM East Interface	0.9	-34.9	0.6	1.3	-1.4	1.1	-74.7	2.8
Dickerson (PEPCO)-Doubs (APS) 230 kV (2-ckts)	-0.1	3.0	-4.2	-0.3	0.3	-0.1	2.8	-0.7
Erie W 230/115 kV (GPU)	1.2	0.8	0.2	0.5	-0.4	1.3	1.2	3.6
Homer City No. 2 345/230 kV (GPU)	-5.3	-8.6	0.4	-3.7	3.8	-6.7	-12.5	-15.8
Homer City - Shelocta 230 kV (GPU)	-8.3	-12.0	0.3	-5.9	6.0	-10.3	-18.6	-23.9
N. Meshoppen 230/115 kV (GPU)	1.7	3.6	-0.3	2.9	-3.0	2.1	6.9	5.1

* Interfaces are defined on page B-2
** Response factors listed are for a increasing MW flow from CONED to PJM.

Appendix C

Facilities Affected by New Michigan-Ontario PARs

APPEXDIX C - FACILITIES AFFECTED BY NEW MICHIGAN-ONTARIO PARs

Table C-1
Summary of Flow Differences Greater than 20 MW or 20 MVAr

*Change in % of Ontario-Michigan inerface flow change (631 MW)

					WITH PARS		WITHOUT PARS		Flow Changes		
									Delta		Delta
X----	FROM BUS ----X	X-----	TO BUS -----X	CKT	MW	MVAR	MW	MVAR	MW	%*	MVAR
MAAC - PJM 500 kV											
11	[KEYSTONE 500]	521	[KEYSTONE 230]	1	-247.2	35.6	-168.6	21.1	78.6	12.5	-14.6
11	[KEYSTONE 500]	521	[KEYSTONE 230]	2	-245.0	35.3	-167.1	20.9	77.9	12.3	-14.5
4	[CNASTONE 500]	13	[PEACHBTM 500]	1	-423.8	-108.8	-346.3	-108.6	77.5	12.3	0.2
3	[BRIGHTON 500]	4	[CNASTONE 500]	1	-343.2	-170.2	-271.1	-179.4	72.0	11.4	-9.2
9	[JUNIATA 500]	21	[SUNBURY 500]	1	-465.3	-31.1	-423.1	-36.5	42.2	6.7	-5.5
22	[SUSQHANA 500]	3090	[SUSQ T21 230]	1	-293.5	123.6	-251.6	123.7	41.9	6.6	0.1
1	[ALBURTIS 500]	23	[WESCOVLE 500]	1	-1325.5	367.3	-1292.2	359.7	33.4	5.3	-7.6
13	[PEACHBTM 500]	16	[3 MILE I 500]	1	-119.5	5.1	-86.6	1.5	32.9	5.2	-3.6
8	[HOSENSAK 500]	1	[ALBURTIS 500]	1	-565.7	95.2	-534.0	88.8	31.7	5.0	-6.4
19	[BURCHES 500]	18	[CHALK PT 500]	1	-885.4	-5.5	-856.4	-7.1	29.0	4.6	-1.6
15	[WHITPAIN 500]	7	[ELROY 500]	1	207.9	170.5	236.0	162.4	28.1	4.5	-8.1
11	[KEYSTONE 500]	9	[JUNIATA 500]	1	1006.6	-145.1	1033.2	-154.6	26.6	4.2	-9.5
21	[SUNBURY 500]	3084	[SUNBURY 230]	1	-447.2	-50.2	-421.1	-50.7	26.1	4.1	-0.6
13	[PEACHBTM 500]	24	[LIMERICK 500]	1	845.3	-32.5	871.0	-31.1	25.7	4.1	1.5
23	[WESCOVLE 500]	22	[SUSQHANA 500]	1	-1382.0	-22.6	-1356.3	-16.8	25.7	4.1	5.8
18	[CHALK PT 500]	20	[CLVT CLF 500]	1	-173.8	-3.1	-151.1	-4.0	22.8	3.6	-0.9
5	[CONEM-GH 500]	9	[JUNIATA 500]	1	922.4	-67.0	945.1	-62.7	22.6	3.6	4.3
11	[KEYSTONE 500]	5	[CONEM-GH 500]	1	396.8	-162.9	417.9	-164.2	21.1	3.3	-1.3
MAAC - other											
361	[ERIE E 230]	76501	[S RIPLEY 230]	1	-353.7	73.5	-179.4	40.8	174.3	27.6	-32.6
270	[ERIE SO. 230]	361	[ERIE E 230]	1	-333.9	93.4	-161.8	41.3	172.2	27.3	-52.2
505	[SHELOCTA 230]	477	[HOMER CT 230]	1	-618.4	-34.7	-459.3	-21.1	159.1	25.2	13.6
303	[ERIE SO 345]	270	[ERIE SO. 230]	1	-76.7	123.5	81.9	87.2	158.6	25.1	-36.3
302	[ERIE W 345]	303	[ERIE SO 345]	1	-76.5	112.6	82.0	74.3	158.5	25.1	-38.3
521	[KEYSTONE 230]	505	[SHELOCTA 230]	1	-492.9	27.2	-336.0	22.2	156.9	24.9	-5.0
479	[HOMER CY 345]	75406	[STOLE345 345]	1	-1.6	-28.1	122.0	-54.9	123.6	19.6	-26.8
3070	[LACKAWNA 230]	417	[OXBOW 230]	1	-67.2	44.7	46.5	24.1	113.7	18.0	-20.6
417	[OXBOW 230]	415	[ETP LINE 230]	1	-80.2	45.9	31.7	26.9	111.9	17.7	-19.0
479	[HOMER CY 345]	75407	[WATRC345 345]	1	279.1	6.8	387.9	42.9	108.9	17.3	36.1
382	[E.TWANDA 230]	75413	[HILSD230 230]	1	-168.2	-23.9	-63.2	-44.6	105.1	16.7	-20.7
477	[HOMER CT 230]	479	[HOMER CY 345]	1	-352.7	-20.6	-250.5	-26.5	102.3	16.2	-5.9
477	[HOMER CT 230]	479	[HOMER CY 345]	2	-343.8	-20.4	-244.1	-26.1	99.7	15.8	-5.7
415	[ETP LINE 230]	382	[E.TWANDA 230]	1	-118.1	8.9	-37.0	-1.1	81.1	12.9	-10.0
3082	[STANTON 230]	3070	[LACKAWNA 230]	1	229.6	45.7	288.8	31.1	59.2	9.4	-14.6
281	[WARREN 115]	76527	[FALCONER 115]	1	0.6	18.7	54.3	-0.5	53.7	8.5	-19.2
214	[LEWISTWN 230]	20248	[01SHINGL 230]	1	-194.1	23.3	-148.2	17.5	45.9	7.3	-5.8
3069	[JUNIATA 230]	214	[LEWISTWN 230]	1	-231.5	-11.8	-185.7	-20.9	45.8	7.3	-9.1
522	[WARREN 230]	530	[WARREN 2 115]	1	-7.7	-1.0	35.9	-6.4	43.6	6.9	-5.4
530	[WARREN 2 115]	281	[WARREN 115]	1	-21.9	7.4	21.7	1.8	43.6	6.9	-5.6
3090	[SUSQ T21 230]	3085	[SUSQHNA 230]	1	-293.6	105.7	-251.7	110.0	41.9	6.6	4.3
409	[GROVER 230]	382	[E.TWANDA 230]	1	67.8	30.6	109.2	16.4	41.4	6.6	-14.2
383	[E.SAYRE 115]	75486	[N.WAV115 115]	1	-59.8	41.5	-26.3	33.3	33.5	5.3	-8.2
381	[TOWANDA 115]	383	[E.SAYRE 115]	1	-5.5	63.2	27.9	54.5	33.4	5.3	-8.7
302	[ERIE W 345]	298	[WAYNE 345]	1	-234.7	-45.0	-203.4	-42.0	31.3	5.0	3.0
415	[ETP LINE 230]	414	[N.MESHPN 230]	1	37.4	38.6	68.7	33.7	31.3	5.0	-4.9
414	[N.MESHPN 230]	384	[NO MESHO 115]	1	37.3	36.5	68.5	29.6	31.2	4.9	-6.9
298	[WAYNE 345]	479	[HOMER CY 345]	1	-282.0	-64.9	-252.0	-62.9	30.1	4.8	2.0
283	[FOREST 230]	290	[GLADE TP 230]	1	-225.1	14.7	-196.3	9.5	28.8	4.6	-5.2
290	[GLADE TP 230]	296	[GLADE 230]	1	-345.0	3.6	-316.5	3.0	28.6	4.5	-0.6
296	[GLADE 230]	522	[WARREN 230]	1	60.3	8.8	88.9	-11.1	28.6	4.5	-19.9
3077	[PECKVLLE 230]	3070	[LACKAWNA 230]	1	-230.0	27.5	-202.5	28.3	27.5	4.4	0.8
3053	[BLMNG GR 230]	3077	[PECKVLLE 230]	1	-210.4	45.0	-183.7	40.2	26.7	4.2	-4.8
3055	[BUSHKILL 230]	3053	[BLMNG GR 230]	1	-188.3	31.2	-161.6	26.3	26.7	4.2	-4.9
473	[BLAIRSVL 138]	450	[BLRSVL E 115]	1	-159.9	-27.7	-133.7	-31.6	26.2	4.2	-3.9
387	[LAUREL L 115]	75457	[GOUDY115 115]	1	-50.0	19.4	-24.8	13.9	25.1	4.0	-5.5
384	[NO MESHO 115]	385	[LENOX 115]	1	-1.6	15.2	23.3	9.0	24.9	3.9	-6.3
386	[TIFFANY 115]	387	[LAUREL L 115]	1	-45.5	17.2	-20.7	10.8	24.8	3.9	-6.4
3085	[SUSQHNA 230]	3082	[STANTON 230]	2	193.3	30.3	218.1	27.5	24.8	3.9	-2.8
385	[LENOX 115]	386	[TIFFANY 115]	1	-10.8	14.2	12.9	7.8	23.7	3.8	-6.4
302	[ERIE W 345]	339	[ERIE WST 115]	1	54.6	22.3	77.6	21.1	23.0	3.6	-1.2
3085	[SUSQHNA 230]	3082	[STANTON 230]	1	175.4	18.4	197.6	14.9	22.2	3.5	-3.5

APPEXDIX C - FACILITIES AFFECTED BY NEW MICHIGAN-ONTARIO PARs

Table C-1
Summary of Flow Differences Greater than 20 MW or 20 MVAr

*Change in % of Ontario-Michigan inerface flow change (631 MW)

					WITH PARS		WITHOUT PARS		Flow Changes		
X----	FROM BUS ----X	X----	TO BUS -----X	CKT	MW	MVAR	MW	MVAR	Delta MW	%*	Delta MVAR
3075	[MOUNTAIN 230]	3070	[LACKAWNA 230]	1	155.1	2.4	177.0	-5.0	21.9	3.5	-7.4
476	[FLORENCE 115]	451	[SEWARD 115]	1	-108.3	-20.6	-87.7	-20.4	20.6	3.3	0.2
3074	[MONTOUR 230]	3089	[SUSQ T10 230]	1	262.1	38.5	282.4	40.7	20.3	3.2	2.2
450	[BLRSVL E 115]	476	[FLORENCE 115]	1	-104.3	-13.0	-84.1	-15.5	20.1	3.2	-2.5
373	[SHAWVL 422.0]	435	[SHAWVL 2 230]	1	148.0	52.5	148.0	26.4	0.0	0.0	-26.1
477	[HOMER CT 230]	601	[HOMER C122.0]	1	-617.7	-110.2	-617.7	-74.2	0.0	0.0	36.1
VACAR											
14922	[8POSSUM 500]	19	[BURCHES 500]	1	-483.1	-2.1	-444.2	-5.4	38.9	6.2	-3.3
14908	[8ELMONT 500]	14911	[8LDYSMTH 500]	1	78.9	-68.1	115.2	-69.8	36.3	5.8	-1.6
14912	[8LEXNGTN 500]	14907	[8DOOMS 500]	1	546.4	58.7	579.8	56.2	33.4	5.3	-2.5
14913	[8LOUDOUN 500]	20105	[01DOUBS 500]	1	-585.4	-91.2	-555.7	-90.5	29.8	4.7	0.8
10183	[8WAKE 500]	14902	[8CARSON 500]	1	7.8	-143.8	37.5	-145.1	29.7	4.7	-1.3
14914	[8MDLTHAN 500]	14918	[8NO ANNA 500]	1	-244.8	70.0	-215.7	68.0	29.1	4.6	-2.0
14911	[8LDYSMTH 500]	14922	[8POSSUM 500]	1	548.1	-77.7	576.7	-76.7	28.6	4.5	1.0
14916	[8MORRSVL 500]	14913	[8LOUDOUN 500]	1	1071.7	-4.2	1100.3	-7.0	28.6	4.5	-2.8
14917	[8MT STM 500]	20105	[01DOUBS 500]	1	1359.2	-39.7	1387.3	-29.2	28.1	4.5	10.5
14902	[8CARSON 500]	14914	[8MDLTHAN 500]	1	-39.6	54.4	-12.0	52.5	27.6	4.4	-2.0
14926	[8VALLEY 500]	14917	[8MT STM 500]	1	-499.4	140.3	-473.4	139.6	26.0	4.1	-0.7
14911	[8LDYSMTH 500]	14905	[8CHANCE 500]	1	632.1	-48.1	652.6	-47.7	20.5	3.2	0.4
14918	[8NO ANNA 500]	14916	[8MORRSVL 500]	1	464.7	-157.2	485.2	-153.6	20.5	3.2	3.6
14905	[8CHANCE 500]	14919	[8OX 500]	1	632.2	-48.1	652.6	-47.7	20.4	3.2	0.4
ECAR AP											
20106	[01FMARTN 500]	20108	[01HATFLD 500]	1	830.9	-38.3	948.5	-39.7	117.6	18.6	-1.4
20116	[01YUKON 500]	11	[KEYSTONE 500]	1	62.0	-56.2	175.3	-64.8	113.3	18.0	-8.6
20115	[01WYLIER 500]	20104	[01CABOT 500]	1	513.9	88.0	626.2	74.3	112.3	17.8	-13.7
20108	[01HATFLD 500]	20116	[01YUKON 500]	1	764.4	204.2	871.6	208.9	107.2	17.0	4.7
20111	[01 502 J 500]	20106	[01FMARTN 500]	1	277.9	105.5	380.1	101.4	102.2	16.2	-4.1
20104	[01CABOT 500]	11	[KEYSTONE 500]	1	11.1	-115.5	102.7	-125.2	91.6	14.5	-9.7
20117	[01KAMMER 500]	20111	[01 502 J 500]	1	-1.5	101.4	87.9	99.0	89.4	14.2	-2.4
20102	[01BELMNT 500]	20107	[01HARRSN 500]	1	350.6	-62.2	428.8	-61.9	78.2	12.4	0.3
20105	[01DOUBS 500]	3	[BRIGHTON 500]	1	433.9	69.0	486.8	59.1	52.9	8.4	-9.9
20114	[01WYLIER 345]	20115	[01WYLIER 500]	2	119.7	-47.5	163.2	-45.8	43.4	6.9	1.7
20220	[01MOSHAN 230]	409	[GROVER 230]	1	92.2	29.7	134.4	17.7	42.2	6.7	-12.0
20114	[01WYLIER 345]	20115	[01WYLIER 500]	1	114.5	-45.3	156.0	-43.7	41.5	6.6	1.6
20107	[01HARRSN 500]	20112	[01PRNTY 500]	1	1705.2	194.3	1742.2	196.8	37.0	5.9	2.5
20175	[01ELKO 230]	283	[FOREST 230]	1	-213.6	33.6	-182.6	29.2	31.0	4.9	-4.4
20107	[01HARRSN 500]	20115	[01WYLIER 500]	1	281.6	-28.5	309.7	-25.6	28.1	4.5	2.9
20248	[01SHINGL 230]	20220	[01MOSHAN 230]	1	-171.9	-10.7	-145.6	-5.9	26.3	4.2	4.8
20253	[01SOCIAL 138]	473	[BLAIRSVL 138]	1	-159.6	-22.2	-133.5	-27.7	26.1	4.1	-5.5
20248	[01SHINGL 230]	435	[SHAWVL 2 230]	1	-230.7	-25.4	-209.3	-19.2	21.4	3.4	6.2
ECAR FE											
21475	[02AT 345]	302	[ERIE W 345]	1	-255.8	80.2	-43.2	40.1	212.6	33.7	-40.1
21650	[02PERRY 345]	21475	[02AT 345]	1	-140.6	123.6	39.8	82.4	180.4	28.6	-41.2
21630	[02DAV-BE 345]	21800	[02BEAVER 345]	1	-198.4	71.6	-44.0	59.8	154.4	24.5	-11.8
21455	[02BAY SH 345]	21630	[02DAV-BE 345]	1	-343.8	96.9	-237.8	77.9	106.1	16.8	-19.0
21460	[02LEMOYN 345]	22606	[05FOSTOR 345]	1	-110.5	31.5	-31.8	22.9	78.6	12.5	-8.6
21660	[02AVON 345]	22149	[02JUNIPE 345]	1	-152.4	51.6	-75.0	39.1	77.4	12.3	-12.5
21455	[02BAY SH 345]	22606	[05FOSTOR 345]	1	150.3	66.9	224.7	58.2	74.4	11.8	-8.8
21465	[02ALLEN 345]	22054	[02NTAP 345]	1	24.9	49.2	99.2	35.1	74.3	11.8	-14.2
22054	[02NTAP 345]	22051	[02MIDWAY 345]	1	-111.1	69.1	-36.8	55.1	74.3	11.8	-14.0
21680	[02EASTLK 345]	21650	[02PERRY 345]	1	-344.3	-59.8	-271.1	-64.8	73.2	11.6	-5.0
22051	[02MIDWAY 345]	21460	[02LEMOYN 345]	1	-304.8	30.0	-242.0	21.0	62.8	10.0	-9.0
22149	[02JUNIPE 345]	22146	[02HARDIN 345]	1	390.2	-34.7	451.1	-45.1	60.9	9.7	-10.4
22149	[02JUNIPE 345]	21680	[02EASTLK 345]	1	-464.6	-26.6	-406.8	-23.3	57.8	9.2	3.3
21800	[02BEAVER 345]	21801	[02CARLIL 345]	1	-71.6	78.0	-15.7	69.5	55.9	8.9	-8.5
21801	[02CARLIL 345]	21355	[02STAR 345]	1	-363.0	58.5	-307.4	57.7	55.6	8.8	-0.8
22146	[02HARDIN 345]	21650	[02PERRY 345]	1	-484.6	-40.6	-429.3	-35.1	55.3	8.8	5.5
21800	[02BEAVER 345]	21660	[02AVON 345]	1	-229.7	-22.0	-176.5	-18.1	53.2	8.4	3.9
21800	[02BEAVER 345]	21660	[02AVON 345]	2	-226.6	-24.6	-174.1	-20.1	52.5	8.3	4.5
22148	[02INLAND 345]	21650	[02PERRY 345]	1	-480.4	-32.4	-428.7	-27.0	51.7	8.2	5.4
22146	[02HARDIN 345]	22148	[02INLAND 345]	1	-89.0	-94.2	-40.2	-100.0	48.8	7.7	-5.8
21460	[02LEMOYN 345]	21630	[02DAV-BE 345]	1	-721.9	2.3	-674.7	-4.2	47.3	7.5	-6.4

APPEXDIX C - FACILITIES AFFECTED BY NEW MICHIGAN-ONTARIO PARs

Table C-1
Summary of Flow Differences Greater than 20 MW or 20 MVAr

					WITH PARS		WITHOUT PARS		Flow Changes		
									Delta		Delta
X------	FROM BUS ------X	X------	TO BUS ------X	CKT	MW	MVAR	MW	MVAR	MW	%*	MVAR
21360	[02GALION 345]	22618	[05OHIOCT 345]	1	-432.8	44.9	-386.8	39.3	46.0	7.3	-5.7
21355	[02STAR 345]	22149	[02JUNIPE 345]	1	139.1	-49.3	179.1	-50.3	40.0	6.3	-0.9
21465	[02ALLEN 345]	22055	[02 ALLEN 138]	1	285.5	118.7	317.4	116.0	31.9	5.1	-2.8
21690	[02ASHTBL 138]	21475	[02AT 345]	8	-114.5	-54.0	-83.0	-59.9	31.5	5.0	-5.9
21320	[02SAMMIS 345]	20114	[01WYLIER 345]	1	464.5	76.2	496.0	82.3	31.5	5.0	6.1
21660	[02AVON 345]	21665	[02AVON 138]	91	292.0	82.7	320.3	81.8	28.3	4.5	-0.9
21899	[02LAKVEW 138]	21879	[02GRNFLD 138]	1	-45.3	7.8	-19.9	2.3	25.4	4.0	-5.5
22114	[02TOUSNT 138]	22101	[02OTTAWA 138]	1	24.9	32.1	50.2	25.8	25.3	4.0	-6.3
22101	[02OTTAWA 138]	21899	[02LAKVEW 138]	1	24.7	33.5	49.9	26.8	25.2	4.0	-6.7
21640	[02BAYSHO 138]	22114	[02TOUSNT 138]	1	57.8	30.6	80.3	26.8	22.4	3.5	-3.8
ECAR AEP											
22568	[05MOUNTN 765]	22610	[05BELMON 765]	1	573.8	-102.5	680.8	-102.5	107.1	17.0	0.0
22615	[05MARYSV 765]	22611	[05KAMMER 765]	1	-896.6	17.9	-790.5	45.6	106.1	16.8	27.7
22660	[05DUMONT 765]	22615	[05MARYSV 765]	1	-811.6	173.8	-717.5	181.8	94.1	14.9	8.0
22611	[05KAMMER 765]	20117	[01KAMMER 500]	1	-1.5	16.9	88.0	15.1	89.5	14.2	-1.8
22655	[05COOK 765]	22660	[05DUMONT 765]	1	-793.5	38.5	-708.2	37.1	85.3	13.5	-1.3
22654	[05COOK 345]	22655	[05COOK 765]	1	-792.8	85.1	-707.7	74.1	85.1	13.5	-11.0
22610	[05BELMON 765]	20102	[01BELMNT 500]	1	-357.1	-43.9	-280.0	-45.0	77.1	12.2	-1.1
22607	[05GAVIN 765]	22568	[05MOUNTN 765]	1	-144.9	-69.0	-71.5	-71.1	73.4	11.6	-2.1
22606	[05FOSTOR 345]	22603	[05E LIMA 345]	1	-96.9	90.2	-26.5	85.4	70.4	11.2	-4.8
22652	[05BENTON 345]	22654	[05COOK 345]	1	-129.6	58.3	-60.1	49.8	69.5	11.0	-8.5
22606	[05FOSTOR 345]	21360	[02GALION 345]	1	-208.8	64.7	-139.3	56.7	69.5	11.0	-8.0
22667	[05JEFRSO 765]	22608	[05HANG R 765]	1	128.2	77.7	193.8	78.9	65.6	10.4	1.2
22614	[05MARYSV 345]	22615	[05MARYSV 765]	1	-1827.7	61.2	-1762.9	56.2	64.9	10.3	-5.0
22661	[05DUMTEQ 999]	22660	[05DUMONT 765]	1	-967.8	-10.0	-911.0	-11.3	56.8	9.0	-1.3
22659	[05DUMONT 345]	22661	[05DUMTEQ 999]	1	-966.7	60.4	-910.0	50.7	56.7	9.0	-9.7
22665	[05GRNTWN 765]	22667	[05JEFRSO 765]	1	-1794.6	151.6	-1739.5	151.3	55.1	8.7	-0.3
22615	[05MARYSV 765]	22607	[05GAVIN 765]	1	-1762.9	-313.3	-1707.9	-277.7	55.0	8.7	35.6
22608	[05HANG R 765]	22560	[05BAKER 765]	1	218.7	20.8	269.5	24.9	50.8	8.1	4.1
22603	[05E LIMA 345]	22614	[05MARYSV 345]	1	-628.4	72.3	-579.2	57.0	49.2	7.8	-15.4
22554	[05BROADF 765]	22562	[05J.FERR 765]	1	1241.0	-164.9	1290.2	-164.0	49.1	7.8	0.8
22660	[05DUMONT 765]	22665	[05GRNTWN 765]	1	-1018.3	381.5	-970.4	378.0	47.9	7.6	-3.5
22556	[05CLOVRD 500]	14912	[8LEXNGTN 500]	1	-199.0	-5.7	-153.6	-8.4	45.4	7.2	-2.7
22623	[05TIDD 345]	20114	[01WYLIER 345]	1	193.1	-25.1	238.4	-27.3	45.3	7.2	-2.2
22608	[05HANG R 765]	22617	[05NPROCT 765]	1	-661.1	15.5	-621.1	13.9	40.1	6.4	-1.6
22654	[05COOK 345]	22668	[05OLIVE 345]	1	-129.2	47.6	-90.3	46.7	38.9	6.2	-0.9
22617	[05NPROCT 765]	22564	[05AMOS 765]	1	-1095.1	-17.1	-1056.3	-14.9	38.8	6.1	2.2
22603	[05E LIMA 345]	22622	[05SW LIM 345]	1	-86.1	-8.1	-49.1	-10.1	37.0	5.9	-2.0
22611	[05KAMMER 765]	22620	[05SCANTO 765]	1	944.5	-111.7	980.9	-110.6	36.4	5.8	1.1
22620	[05SCANTO 765]	22619	[05SCANTO 345]	1	941.2	110.1	977.3	101.2	36.1	5.7	-8.9
22618	[05OHIOCT 345]	22616	[05MUSKNG 345]	1	-729.2	-57.7	-693.4	-42.2	35.8	5.7	15.5
22562	[05J.FERR 765]	22557	[05CLOVRD 765]	1	517.6	-10.2	553.0	-14.2	35.4	5.6	-4.0
22609	[05KAMMER 345]	22624	[05WBELLA 345]	1	157.9	17.4	193.1	15.5	35.2	5.6	-1.9
22564	[05AMOS 765]	22568	[05MOUNTN 765]	1	-580.7	-259.5	-547.1	-261.7	33.6	5.3	-2.2
22675	[05TWIN B 345]	22659	[05DUMONT 345]	1	-371.9	20.3	-338.6	21.2	33.3	5.3	0.9
22675	[05TWIN B 345]	22659	[05DUMONT 345]	2	-371.9	20.3	-338.6	21.2	33.3	5.3	0.9
22616	[05MUSKNG 345]	22623	[05TIDD 345]	1	-130.5	-14.0	-97.9	-18.8	32.6	5.2	-4.9
22616	[05MUSKNG 345]	22609	[05KAMMER 345]	1	-240.3	33.2	-208.0	32.4	32.3	5.1	-0.8
22624	[05WBELLA 345]	22623	[05TIDD 345]	1	-44.2	-14.1	-13.6	-17.4	30.6	4.8	-3.3
22560	[05BAKER 765]	22554	[05BROADF 765]	1	1518.9	-158.3	1549.1	-159.8	30.2	4.8	-1.5
22557	[05CLOVRD 765]	22555	[05CLOVRD 345]	1	247.2	103.3	277.1	99.5	29.9	4.7	-3.8
22610	[05BELMON 765]	22611	[05KAMMER 765]	1	929.9	218.6	959.4	213.8	29.6	4.7	-4.8
22622	[05SW LIM 345]	22614	[05MARYSV 345]	1	-518.8	-16.6	-489.7	-14.4	29.1	4.6	2.2
22619	[05SCANTO 345]	21320	[02SAMMIS 345]	1	-577.6	-99.3	-551.5	-95.3	26.1	4.1	4.0
22622	[05SW LIM 345]	26640	[09SHELBY 345]	1	-63.3	7.9	-37.9	8.5	25.4	4.0	0.6
22613	[05MARQUI 345]	22602	[05MARQUI 765]	1	-569.9	-322.6	-544.8	-321.7	25.1	4.0	0.9
22602	[05MARQUI 765]	22608	[05HANG R 765]	1	-569.9	-322.6	-544.8	-321.7	25.1	4.0	1.0
22601	[05CANTNC 345]	21350	[02HANNA 345]	1	135.2	23.8	159.8	21.9	24.6	3.9	-1.9
22674	[05TANNER 345]	24958	[06DEARBN 345]	1	-298.2	49.0	-274.9	46.4	23.2	3.7	-2.6
22555	[05CLOVRD 345]	22556	[05CLOVRD 500]	1	-99.8	-42.6	-77.1	-45.1	22.7	3.6	-2.5
22623	[05TIDD 345]	27634	[15COLLIE 345]	1	185.9	-33.6	208.7	-34.1	22.7	3.6	-0.5
22560	[05BAKER 765]	22558	[05CULLOD 765]	1	-1338.6	129.0	-1316.1	126.0	22.5	3.6	-3.0
22555	[05CLOVRD 345]	22556	[05CLOVRD 500]	2	-98.9	-42.2	-76.4	-44.6	22.5	3.6	-2.5

*Change in % of Ontario-Michigan inerface flow change (631 MW)

Table C-1
Summary of Flow Differences Greater than 20 MW or 20 MVAr

			*Change in % of Ontario-Michigan inerface flow change (631 MW)		WITH PARS		WITHOUT PARS		Flow Changes Delta		Delta
X------	FROM BUS ------X	X------	TO BUS ------X	CKT	MW	MVAR	MW	MVAR	MW	%*	MVAR
22706	[05HYATT 345]	22625	[05WMILLP 345]	1	-309.6	45.5	-288.9	47.8	20.7	3.3	2.3
22670	[05ROB PK 345]	22651	[05ALLEN 345]	1	-138.4	39.1	-118.0	36.1	20.4	3.2	-3.0
23132	[05E LIMA 138]	23277	[05ELIMEQ 999]	2	-249.9	-9.6	-247.7	14.0	2.2	0.3	23.6
22660	[05DUMONT 765]	36260	[WILTO; 765]	1	62.0	-276.9	63.5	-251.9	1.6	0.3	25.0
23277	[05ELIMEQ 999]	23279	[05ELIMA 13.2]	2	0.0	19.4	0.1	48.6	0.1	0.0	29.2
ECAR OVEC											
24951	[06KYGER 345]	22570	[05SPORN 345]	1	125.0	-47.0	152.2	-48.9	27.2	4.3	-1.9
ECAR DPL											
26640	[09SHELBY 345]	26618	[09MIAMI 345]	1	-342.3	79.4	-319.5	83.1	22.8	3.6	3.7
ECAR DLCO											
27625	[15ELRM 3 138]	20124	[01MITCHL 138]	1	144.4	3.8	165.0	1.3	20.6	3.3	-2.5
ECAR CP											
28289	[18PALISA 345]	22652	[05BENTON 345]	1	140.2	116.4	225.6	107.4	85.4	13.5	-9.0
28289	[18PALISA 345]	22654	[05COOK 345]	1	-47.1	94.4	27.5	86.8	74.6	11.8	-7.6
28197	[18ARGENT 345]	22675	[05TWIN B 345]	1	-174.5	52.8	-113.9	49.7	60.6	9.6	-3.1
28314	[18TOMPKN 345]	28197	[18ARGENT 345]	1	-202.6	2.4	-149.6	-0.2	53.0	8.4	-2.6
28312	[18TITBAW 345]	28258	[18KENOWA 345]	1	51.6	50.4	103.3	44.1	51.7	8.2	-6.3
28285	[18ONEIDJ 345]	28202	[18BATTLE 345]	1	-17.9	54.6	33.3	47.1	51.2	8.1	-7.5
28202	[18BATTLE 345]	28197	[18ARGENT 345]	1	-404.2	-38.2	-353.9	-40.1	50.3	8.0	-1.9
28241	[18GOSS 345]	28317	[18VERGEN 345]	1	-34.5	-56.2	14.2	-60.9	48.7	7.7	-4.7
28309	[18THETFR 345]	28241	[18GOSS 345]	1	231.3	31.8	275.7	27.3	44.4	7.0	-4.5
28307	[18TALLMA 345]	28289	[18PALISA 345]	1	43.1	24.5	85.8	15.5	42.7	6.8	-9.0
28317	[18VERGEN 345]	28289	[18PALISA 345]	1	-53.8	38.1	-13.0	32.5	40.8	6.5	-5.6
28197	[18ARGENT 345]	22670	[05ROB PK 345]	1	48.8	61.9	86.9	55.8	38.1	6.0	-6.1
28197	[18ARGENT 345]	28289	[18PALISA 345]	1	-325.8	-42.0	-287.8	-48.4	38.0	6.0	-6.4
28197	[18ARGENT 345]	28289	[18PALISA 345]	2	-325.8	-42.0	-287.8	-48.4	38.0	6.0	-6.4
28258	[18KENOWA 345]	28307	[18TALLMA 345]	1	143.9	31.8	178.5	28.7	34.6	5.5	-3.1
28245	[18HAMPTO 345]	28312	[18TITBAW 345]	1	81.5	-16.9	114.5	-18.3	33.0	5.2	-1.4
28258	[18KENOWA 345]	28197	[18ARGENT 345]	1	302.7	44.8	327.8	35.3	25.1	4.0	-9.5
28307	[18TALLMA 345]	28197	[18ARGENT 345]	1	342.0	38.1	364.8	28.2	22.8	3.6	-9.9
28309	[18THETFR 345]	28270	[18MANNIN 345]	1	-102.0	-12.3	-79.3	-14.1	22.7	3.6	-1.8
28267	[18LIVINS 345]	28260	[18KEYSTO 345]	1	-110.4	61.3	-88.8	58.4	21.6	3.4	-2.9
28309	[18THETFR 345]	28312	[18TITBAW 345]	1	-181.7	-57.5	-160.5	-60.2	21.2	3.4	-2.7
28260	[18KEYSTO 345]	28268	[18LUDING 345]	1	-330.9	1.1	-310.7	-1.7	20.1	3.2	-2.8
28237	[18GALLAG 345]	28267	[18LIVINS 345]	1	117.7	-27.3	137.8	-28.9	20.0	3.2	-1.6
ECAR DECO											
28786	[19STCPP 345]	28756	[19BLRPP 345]	1	-247.5	41.6	73.7	-11.8	321.2	50.9	-53.4
28761	[19MON12 345]	21455	[02BAY SH 345]	1	107.8	182.3	299.7	154.0	191.9	30.4	-28.3
28745	[19JEWEL 345]	28774	[19PONTC 345]	1	429.3	98.6	608.5	87.1	179.2	28.4	-11.5
28756	[19BLRPP 345]	28774	[19PONTC 345]	1	532.1	125.5	670.1	133.8	138.0	21.9	8.3
28753	[19MADRD 345]	28754	[19MAJTC 345]	1	-108.5	-18.5	7.7	-36.0	116.2	18.4	-17.6
28774	[19PONTC 345]	28753	[19MADRD 345]	1	10.1	14.0	123.5	-3.4	113.4	18.0	-17.4
28774	[19PONTC 345]	28775	[19PLACD 345]	1	72.0	-28.9	178.9	-46.4	107.0	17.0	-17.5
28750	[19LULU 345]	21465	[02ALLEN 345]	1	310.5	168.0	416.6	151.1	106.1	16.8	-16.9
28848	[19QUATP 345]	28807	[19WAYNE 345]	1	-462.1	-66.0	-356.9	-81.7	105.2	16.7	-15.7
28831	[19BR-G-J 345]	28745	[19JEWEL 345]	1	901.6	185.3	1006.5	181.9	104.9	16.6	-3.4
28745	[19JEWEL 345]	28309	[18THETFR 345]	1	-314.9	14.4	-212.2	7.6	102.7	16.3	-6.8
28775	[19PLACD 345]	28807	[19WAYNE 345]	1	-74.1	-23.8	24.7	-41.9	98.8	15.7	-18.2
28817	[19BNSTNS 345]	28761	[19MON12 345]	1	-645.5	-197.0	-547.3	-200.5	98.2	15.6	-3.5
28756	[19BLRPP 345]	28831	[19BR-G-J 345]	1	58.1	51.3	155.1	57.5	97.0	15.4	6.2
28774	[19PONTC 345]	28812	[19WIXOM 345]	1	276.9	18.7	372.4	4.9	95.6	15.2	-13.8
28812	[19WIXOM 345]	28848	[19QUATP 345]	1	-38.3	37.0	56.3	15.3	94.6	15.0	-21.7
28807	[19WAYNE 345]	28761	[19MON12 345]	1	-756.9	-174.9	-662.5	-175.7	94.4	15.0	-0.8
28786	[19STCPP 345]	28745	[19JEWEL 345]	1	458.7	101.0	549.7	94.8	91.0	14.4	-6.2
28756	[19BLRPP 345]	28745	[19JEWEL 345]	1	510.0	105.4	595.0	100.8	85.0	13.5	-4.6
28762	[19MON34 345]	28750	[19LULU 345]	1	496.7	171.9	577.4	161.2	80.7	12.8	-10.7
28754	[19MAJTC 345]	21460	[02LEMOYN 345]	1	-124.0	71.7	-55.7	65.8	68.3	10.8	-5.9
28830	[19BNSTNN 345]	28762	[19MON34 345]	1	-334.1	-206.4	-267.8	-207.8	66.3	10.5	-1.4
28786	[19STCPP 345]	28791	[19STEPH 345]	1	520.4	85.5	580.8	95.2	60.4	9.6	9.7
28807	[19WAYNE 345]	28754	[19MAJTC 345]	1	52.1	-38.2	107.6	-43.5	55.5	8.8	-5.3
28720	[19BUNCE 120]	28799	[19WABASH 120]	1	9.1	18.8	61.8	11.0	52.7	8.4	-7.8
28791	[19STEPH 345]	28836	[19CANIF 345]	1	393.7	-218.7	445.8	-217.3	52.1	8.3	1.4
28836	[19CANIF 345]	28826	[19CANIFP 120]	1	392.2	-123.8	443.9	-134.4	51.7	8.2	-10.6

APPEXDIX C - FACILITIES AFFECTED BY NEW MICHIGAN-ONTARIO PARs

Table C-1
Summary of Flow Differences Greater than 20 MW or 20 MVAr

X------	FROM BUS ----X	X------	TO BUS ------X	CKT	WITH PARS MW	WITH PARS MVAR	WITHOUT PARS MW	WITHOUT PARS MVAR	Flow Changes Delta MW	%*	Delta MVAR
28826	[19CANIFP 120]	28721	[19CANIF 120]	1	391.9	-136.0	443.5	-150.0	51.6	8.2	-14.0
28754	[19MAJTC 345]	28314	[18TOMPKN 345]	1	173.1	51.9	224.3	43.5	51.2	8.1	-8.4
28805	[19WTRMN 230]	28764	[19NAVAR 230]	1	-104.8	-1.0	-56.8	-3.4	48.0	7.6	-2.4
28807	[19WAYNE 345]	28817	[19BNSTNS 345]	1	-470.4	-57.7	-425.5	-65.3	44.9	7.1	-7.7
28754	[19MAJTC 345]	28285	[18ONEIDJ 345]	1	95.5	24.8	139.1	18.3	43.6	6.9	-6.5
28720	[19BUNCE 120]	28785	[19SC45 120]	EQ	-45.9	-50.1	-3.7	-53.9	42.2	6.7	-3.7
28804	[19WTRMN 120]	28805	[19WTRMN 230]	1	-162.0	12.7	-126.7	4.1	35.2	5.6	-8.6
28833	[19L-N-NW 120]	28768	[19NWEST 120]	1	66.1	-22.0	100.2	-33.7	34.1	5.4	-11.7
28720	[19BUNCE 120]	28788	[19SPKNE 120]	EQ	110.7	5.1	144.5	4.2	33.8	5.4	-0.9
28799	[19WABASH 120]	28741	[19HUNTC 120]	EQ	31.6	9.2	63.8	0.6	32.2	5.1	-8.6
28807	[19WAYNE 345]	28830	[19BNSTNN 345]	1	-407.8	-71.8	-377.1	-74.4	30.7	4.9	-2.5
28828	[19BNSTNN 230]	28830	[19BNSTNN 345]	1	-347.0	-94.9	-317.1	-93.8	30.0	4.8	1.1
28764	[19NAVAR 230]	28828	[19BNSTNN 230]	1	-344.5	-76.2	-314.9	-78.8	29.6	4.7	-2.6
28788	[19SPKNE 120]	28715	[19BLMFD 120]	EQ	-123.2	-20.8	-93.8	-34.2	29.4	4.7	-13.4
28726	[19CVTRY 120]	28835	[19CVTRY 345]	1	-391.9	-78.9	-362.7	-83.9	29.1	4.6	-5.0
28774	[19PONTC 345]	28245	[18HAMPTO 345]	1	-458.2	-57.2	-430.3	-56.9	27.9	4.4	0.3
28829	[19BNSTNS 230]	28817	[19BNSTNS 345]	1	-318.3	-91.1	-291.7	-89.3	26.6	4.2	1.8
28842	[19ROTUN 230]	28829	[19BNSTNS 230]	1	-318.1	-81.5	-291.5	-81.1	26.6	4.2	0.4
28785	[19SC45 120]	28744	[19S-SP-J 120]	1	180.3	41.6	206.7	36.2	26.4	4.2	-5.4
28840	[19WAREN 230]	28842	[19ROTUN 230]	1	-283.6	-59.2	-257.4	-62.9	26.2	4.2	-3.7
28715	[19BLMFD 120]	28738	[19HANCK 120]	EQ	-66.0	-13.1	-40.1	-22.4	25.8	4.1	-9.3
28754	[19MAJTC 345]	28750	[19LULU 345]	1	-185.6	-10.2	-159.8	-10.1	25.8	4.1	0.1
28716	[19BRSTL 120]	28734	[19FRISB 120]	1	40.0	-69.6	65.7	-76.5	25.6	4.1	-7.0
28721	[19CANIF 120]	28716	[19BRSTL 120]	1	75.0	-52.6	100.6	-59.6	25.6	4.1	-7.0
28721	[19CANIF 120]	28725	[19CORTL 120]	1	99.9	-22.7	122.7	-27.6	22.8	3.6	-4.9
28758	[19MIDTN 120]	28804	[19WTRMN 120]	EQ	-22.8	-34.6	-1.3	-39.0	21.5	3.4	-4.5
28734	[19FRISB 120]	28804	[19WTRMN 120]	1	-19.2	-45.2	2.2	-50.5	21.4	3.4	-5.3
28791	[19STEPH 345]	28841	[19STEPH 230]	1	357.5	39.3	378.6	41.6	21.1	3.3	2.3
28770	[19NEAST 230]	28769	[19NEAST 120]	1	356.3	-7.2	377.3	-10.9	21.0	3.3	-3.7
28841	[19STEPH 230]	28770	[19NEAST 230]	1	356.7	23.2	377.7	23.3	21.0	3.3	0.1
28738	[19HANCK 120]	28811	[19WIXOM 120]	1	-155.3	30.8	-134.7	25.0	20.6	3.3	-5.8
28869	[19SC6 120]	28786	[19STCPP 345]	1	292.3	105.0	292.6	-15.4	0.3	0.0	-120.4
28863	[19SC G7 18.0]	28786	[19STCPP 345]	1	434.2	125.4	434.3	1.2	0.1	0.0	-124.2
28756	[19BLRPP 345]	28861	[19BR G1 26.0]	1	-633.1	-118.6	-633.0	-156.3	0.1	0.0	-37.7
28756	[19BLRPP 345]	28862	[19BR G2 26.0]	1	-643.0	-116.7	-643.0	-154.4	0.1	0.0	-37.7
28864	[19SC G6 18.0]	28869	[19SC6 120]	1	294.0	170.1	294.0	42.5	0.0	0.0	-127.6
MAIN - CE											
36255	[COLLI; 765]	36002	[COLLI;1M 765]	1	-1065.0	-192.8	-1063.9	-168.8	1.1	0.2	24.0
36260	[WILTO; 765]	36255	[COLLI; 765]	1	-747.2	-215.0	-746.4	-190.6	0.8	0.1	24.4
NPCC - New York											
79584	[NIAG 345 345]	81508	[BECK B 345]	1	-153.6	-20.2	36.1	-34.6	189.7	30.1	-14.3
79584	[NIAG 345 345]	81509	[BECK A 345]	1	-153.4	-21.5	36.1	-35.9	189.5	30.0	-14.3
76501	[S RIPLEY 230]	76500	[DUNKIRK 230]	1	-284.3	31.1	-106.1	28.3	178.2	28.2	-2.8
79592	[NIAGAR2W 230]	81516	[PA27 REG 230]	1	4.0	-20.7	135.6	3.6	131.6	20.9	24.4
76665	[PACKARD2 230]	81515	[BP76 REG 230]	1	-59.9	-10.7	63.3	-14.4	123.3	19.5	-3.7
75407	[WATRC345 345]	75405	[OAKDL345 345]	1	102.9	-68.7	223.4	-94.6	120.5	19.1	-25.9
79800	[ROCH 345 345]	79584	[NIAG 345 345]	1	-652.5	-6.8	-534.3	20.6	118.2	18.7	27.4
76664	[HUNTLEY2 230]	76665	[PACKARD2 230]	2	-318.9	-4.7	-207.0	4.9	111.9	17.7	9.7
76664	[HUNTLEY2 230]	76665	[PACKARD2 230]	1	-317.1	-4.9	-205.9	4.8	111.3	17.6	9.7
76668	[SUNY-79 230]	76664	[HUNTLEY2 230]	1	-375.6	-38.4	-269.8	-28.0	105.8	16.8	10.4
76669	[SUNY-80 230]	76664	[HUNTLEY2 230]	1	-375.6	-38.4	-269.8	-28.0	105.8	16.8	10.4
76663	[GRDNVL2 230]	76668	[SUNY-79 230]	1	-351.6	5.4	-247.9	-5.9	103.7	16.4	-11.3
76663	[GRDNVL2 230]	76669	[SUNY-80 230]	1	-351.6	5.4	-247.9	-5.9	103.7	16.4	-11.3
75405	[OAKDL345 345]	77403	[LAFAYTTE 345]	1	-654.2	47.6	-560.5	12.1	93.6	14.8	-35.5
76500	[DUNKIRK 230]	76663	[GRDNVL2 230]	1	-89.8	83.9	0.3	73.4	90.1	14.3	-10.5
76500	[DUNKIRK 230]	76663	[GRDNVL2 230]	2	-89.8	83.9	0.3	73.4	90.1	14.3	-10.5
79592	[NIAGAR2W 230]	79584	[NIAG 345 345]	1	203.4	-148.9	291.7	-168.6	88.3	14.0	-19.7
79801	[PANNELL3 345]	79800	[ROCH 345 345]	2	-412.5	69.0	-328.8	57.3	83.7	13.3	-11.7
79801	[PANNELL3 345]	79800	[ROCH 345 345]	1	-411.3	68.3	-327.8	56.6	83.5	13.2	-11.7
75404	[KINTI345 345]	79584	[NIAG 345 345]	1	-70.3	33.3	12.3	15.0	82.6	13.1	-18.3
79800	[ROCH 345 345]	75404	[KINTI345 345]	1	-716.1	-51.5	-633.5	-18.0	82.6	13.1	33.5
75405	[OAKDL345 345]	75403	[FRASR345 345]	1	427.0	-98.8	508.4	-109.1	81.4	12.9	-10.3

*Change in % of Ontario-Michigan inerface flow change (631 MW)

Table C-1
Summary of Flow Differences Greater than 20 MW or 20 MVAr

*Change in % of Ontario-Michigan inerface flow change (631 MW)

					WITH PARS		WITHOUT PARS		Flow Changes		
X------	FROM BUS ------X	X------	TO BUS ------X	CKT	MW	MVAR	MW	MVAR	Delta MW	%*	Delta MVAR
76665	[PACKARD2 230]	79592	[NIAGAR2W 230]	2	-334.8	-188.1	-253.6	-186.4	81.2	12.9	1.7
76665	[PACKARD2 230]	79592	[NIAGAR2W 230]	1	-327.9	-184.9	-248.3	-183.2	79.6	12.6	1.8
75416	[ROBIN230 230]	79591	[NIAGAR2E 230]	1	-307.9	-80.3	-231.8	-78.7	76.1	12.1	1.6
77400	[CLAY 345]	79801	[PANNELL3 345]	2	-245.9	40.6	-172.4	14.3	73.5	11.6	-26.3
77400	[CLAY 345]	79801	[PANNELL3 345]	1	-245.2	40.2	-171.9	14.1	73.3	11.6	-26.2
75417	[STOLE230 230]	75416	[ROBIN230 230]	1	-243.7	-1.1	-177.5	12.4	66.2	10.5	13.5
77403	[LAFAYTTE 345]	77401	[DEWITT 3 345]	1	-340.8	36.1	-274.6	37.9	66.2	10.5	1.8
75406	[STOLE345 345]	75507	[STOLE115 115]	1	-1.1	73.0	60.6	55.9	61.7	9.8	-17.1
77401	[DEWITT 3 345]	77400	[CLAY 345]	1	-557.4	-138.3	-495.7	-136.4	61.7	9.8	1.9
75406	[STOLE345 345]	75507	[STOLE115 115]	2	-1.0	72.4	60.2	55.4	61.2	9.7	-17.0
74002	[ROSETON 345]	74190	[ROSE GN124.0]	1	-484.1	-147.9	-429.4	-153.2	54.7	8.7	-5.4
75507	[STOLE115 115]	75456	[GARDV115 115]	1	-53.7	31.6	0.4	18.6	54.1	8.6	-13.0
79600	[NIAG115E 115]	79592	[NIAGAR2W 230]	1	-65.7	63.0	-14.1	50.2	51.6	8.2	-12.8
75451	[PAVMT115 115]	75449	[ERIE 115 115]	1	-24.3	47.6	21.5	35.5	45.8	7.3	-12.1
75507	[STOLE115 115]	75451	[PAVMT115 115]	1	-4.8	55.2	40.6	43.0	45.4	7.2	-12.2
79591	[NIAGAR2E 230]	79584	[NIAG 345 345]	1	106.2	22.2	151.3	12.4	45.1	7.1	-9.8
79591	[NIAGAR2E 230]	79584	[NIAG 345 345]	2	106.2	22.2	151.3	12.4	45.1	7.1	-9.8
75456	[GARDV115 115]	76700	[GRDNVL1 115]	1	-6.1	119.7	37.7	123.9	43.8	6.9	4.2
75413	[HILSD230 230]	75418	[WATRC230 230]	1	-116.4	-87.0	-72.8	-53.2	43.6	6.9	33.8
75457	[GOUDY115 115]	75488	[OAKDL115 115]	1	-135.7	17.7	-93.6	11.2	42.1	6.7	-6.5
75413	[HILSD230 230]	75414	[MEYER230 230]	99	-175.5	96.6	-137.2	62.4	38.3	6.1	-34.3
76710	[PACK(N)E 115]	76665	[PACKARD2 230]	1	-87.0	-126.9	-49.0	-138.8	38.0	6.0	-11.9
75414	[MEYER230 230]	75417	[STOLE230 230]	1	-273.1	59.8	-238.2	51.7	34.8	5.5	-8.1
75403	[FRASR345 345]	79581	[GILB 345 345]	1	362.2	-38.4	395.9	-37.9	33.6	5.3	0.5
77403	[LAFAYTTE 345]	77402	[ELBRIDGE 345]	1	-323.1	-49.6	-293.0	-46.2	30.1	4.8	3.4
76708	[NI.B-181 115]	76710	[PACK(N)E 115]	1	-141.5	-22.6	-111.9	-23.9	29.6	4.7	-1.3
76692	[ECWA-181 115]	76708	[NI.B-181 115]	1	-124.8	-13.0	-95.3	-14.8	29.5	4.7	-1.8
75403	[FRASR345 345]	78450	[EDIC 345]	1	-664.3	89.7	-634.9	70.6	29.4	4.7	-19.1
75484	[N.BRW115 115]	76692	[ECWA-181 115]	99	-108.8	0.2	-79.9	-5.2	29.0	4.6	-5.4
75488	[OAKDL115 115]	75489	[OAK2M115 115]	1	-171.0	19.2	-142.4	16.6	28.5	4.5	-2.6
75489	[OAK2M115 115]	75405	[OAKDL345 345]	1	-171.1	8.8	-142.6	9.4	28.5	4.5	0.6
75403	[FRASR345 345]	75400	[COOPC345 345]	1	650.7	-108.2	678.7	-115.1	28.0	4.4	-6.9
75449	[ERIE 115 115]	75484	[N.BRW115 115]	1	-61.3	19.5	-33.2	13.3	28.0	4.4	-6.2
75488	[OAKDL115 115]	75490	[OAK3M115 115]	1	-124.0	29.5	-96.1	26.4	27.9	4.4	-3.0
75490	[OAK3M115 115]	75405	[OAKDL345 345]	1	-154.8	11.5	-127.3	11.8	27.5	4.4	0.3
75412	[GARDV230 230]	75417	[STOLE230 230]	1	42.7	14.2	69.7	1.4	27.1	4.3	-12.8
75415	[OAKDL230 230]	75488	[OAKDL115 115]	1	53.6	45.5	79.4	47.3	25.9	4.1	1.8
75418	[WATRC230 230]	75415	[OAKDL230 230]	1	53.6	45.5	79.4	47.3	25.8	4.1	1.8
76699	[GR.I-182 115]	76710	[PACK(N)E 115]	1	-144.1	-38.9	-119.3	-34.2	24.8	3.9	4.6
76722	[S129-38 115]	76701	[HUNTLEY1 115]	1	-114.0	-24.8	-89.2	-23.4	24.8	3.9	1.4
76723	[S129-39 115]	76701	[HUNTLEY1 115]	1	-111.7	-23.5	-86.9	-22.3	24.8	3.9	1.2
76729	[S154-38 115]	76722	[S129-38 115]	99	-99.4	-15.6	-75.0	-16.0	24.4	3.9	-0.4
76693	[ECWA-182 115]	76699	[GR.I-182 115]	99	-119.7	-18.8	-95.4	-17.5	24.2	3.8	1.3
74331	[FISHKILL 345]	74002	[ROSETON 345]	1	-1375.5	-98.9	-1351.5	-96.4	24.0	3.8	2.5
76682	[AM.S-182 115]	76693	[ECWA-182 115]	99	-88.8	-1.4	-65.1	-1.9	23.7	3.8	-0.6
76700	[GRDNVL1 115]	76723	[S129-39 115]	99	-89.7	-2.7	-66.0	-7.1	23.7	3.8	-4.4
76700	[GRDNVL1 115]	76682	[AM.S-182 115]	1	-69.6	7.0	-45.9	6.3	23.7	3.8	-0.7
76742	[WALDENTP 115]	76729	[S154-38 115]	1	-77.7	-1.1	-54.0	-4.7	23.7	3.8	-3.6
76700	[GRDNVL1 115]	76742	[WALDENTP 115]	99	-59.1	7.0	-36.5	2.6	22.6	3.6	-4.4
75473	[GUARD115 115]	75426	[BORDR115 115]	1	-70.6	16.6	-48.9	11.8	21.7	3.4	-4.8
76117	[LANGN115 115]	75456	[GARDV115 115]	1	-84.7	-12.9	-63.0	-16.7	21.7	3.4	-3.8
75425	[BIGTR115 115]	76117	[LANGN115 115]	1	-65.3	-9.9	-43.6	-15.2	21.6	3.4	-5.3
75459	[HALEY115 115]	75473	[GUARD115 115]	1	-70.3	18.5	-48.7	12.4	21.6	3.4	-6.2
75891	[GRNDG115 115]	75459	[HALEY115 115]	1	-48.2	27.1	-26.6	20.9	21.6	3.4	-6.2
76116	[DAVIS115 115]	75425	[BIGTR115 115]	1	-20.1	15.5	1.4	10.1	21.5	3.4	-5.4
76703	[LONGTAP 115]	79600	[NIAG115E 115]	1	-118.4	-25.6	-96.9	-19.8	21.5	3.4	5.7
77402	[ELBRIDGE 345]	77404	[OSWEGO 345]	1	-432.5	-84.5	-411.0	-80.9	21.5	3.4	3.6
74001	[ROCK TAV 345]	74002	[ROSETON 345]	1	117.2	-139.8	138.6	-139.9	21.4	3.4	-0.1
75507	[STOLE115 115]	76116	[DAVIS115 115]	1	4.4	23.3	25.9	17.5	21.4	3.4	-5.8
77447	[FRMGTN-4 115]	79825	[PANNELLI 115]	1	-146.7	-8.5	-125.3	-11.1	21.4	3.4	-2.6
75426	[BORDR115 115]	77447	[FRMGTN-4 115]	1	-107.1	7.2	-86.5	0.0	20.7	3.3	-7.2
76705	[MLPN-130 115]	76711	[PACK(S)W 115]	1	-135.6	-26.2	-114.8	-20.6	20.7	3.3	5.6
76691	[DURZ-130 115]	76705	[MLPN-130 115]	99	-110.2	-11.5	-89.8	-7.6	20.4	3.2	3.8

APPEXDIX C - FACILITIES AFFECTED BY NEW MICHIGAN-ONTARIO PARs

Table C-1
Summary of Flow Differences Greater than 20 MW or 20 MVAr

*Change in % of Ontario-Michigan inerface flow change (631 MW)

					WITH PARS		WITHOUT PARS		Flow Changes		
X-----	FROM BUS ----X	X-----	TO BUS ----X	CKT	MW	MVAR	MW	MVAR	Delta MW	%*	Delta MVAR
76748	[ZRMN-130 115]	76691	[DURZ-130 115]	1	-104.6	-8.7	-84.2	-4.9	20.4	3.2	3.8
76700	[GRDNVL1 115]	76703	[LONGTAP 115]	1	-106.0	-3.2	-85.7	-4.4	20.3	3.2	-1.2
75495	[RIDGT115 115]	75480	[MONTR115 115]	1	-66.8	-15.4	-46.6	-20.7	20.2	3.2	-5.3
76701	[HUNTLEY1 115]	76748	[ZRMN-130 115]	1	-70.4	14.3	-50.3	16.7	20.1	3.2	2.5
79601	[NIAG115W 115]	79592	[NIAGAR2W 230]	1	33.8	13.7	53.8	-6.7	20.0	3.2	-20.4
75418	[WATRC230 230]	75407	[WATRC345 345]	1	-170.5	-132.9	-152.9	-100.1	17.6	2.8	32.8
79592	[NIAGAR2W 230]	79591	[NIAGAR2E 230]	1	-190.0	3.7	-177.1	-27.9	12.9	2.0	-31.6
79600	[NIAG115E 115]	79503	[NIAG. 4 13.8]	1	-215.1	-69.4	-215.0	-43.7	0.1	0.0	25.7
79600	[NIAG115E 115]	79505	[NIAG. 6 13.8]	1	-215.1	-69.4	-215.0	-43.7	0.1	0.0	25.7
75404	[KINTI345 345]	75523	[KINTIG2424.0]	1	-322.4	-42.5	-322.4	-16.7	0.0	0.0	25.9
75404	[KINTI345 345]	75523	[KINTIG2424.0]	2	-323.4	-42.3	-323.4	-16.4	0.0	0.0	25.9
76523	[DUNKIRK1 115]	76642	[DUNK115G13.8]	1	-122.0	-76.7	-122.0	-35.6	0.0	0.0	41.1
77405	[SCRIBA 345]	77950	[9M PT 2G25.0]	1	-1028.9	-114.7	-1028.9	-79.7	0.0	0.0	35.0
NPCC-ONTARIO											
82695	[LAMB L4D 345]	28786	[19STCPP 345]	1	3.8	11.4	241.5	105.1	237.7	37.7	93.7
82696	[LAMB L51 345]	28786	[19STCPP 345]	1	4.2	-11.2	240.0	102.6	235.8	37.4	113.8
81501	[BECK2PA2 220]	81500	[BECK2 DK 220]	1	-153.9	14.9	35.9	3.4	189.8	30.1	-11.5
81508	[BECK B 345]	81501	[BECK2PA2 220]	2	-153.9	14.9	35.9	3.3	189.8	30.1	-11.6
81502	[BECK2PA1 220]	81500	[BECK2 DK 220]	1	-153.7	14.9	35.9	3.4	189.6	30.0	-11.5
81509	[BECK A 345]	81502	[BECK2PA1 220]	1	-153.7	14.9	35.9	3.3	189.6	30.0	-11.6
80116	[NANTICOK 500]	80121	[LONGWOOD 500]	1	245.9	-180.2	422.1	-163.7	176.2	27.9	16.5
82645	[SCOTT 220]	28837	[19BUNCE 230]	1	171.4	27.0	315.6	26.8	144.2	22.9	-0.2
82620	[LONGWOOD 220]	82600	[LAMBTON 220]	1	-5.3	53.9	134.6	27.2	139.9	22.2	-26.7
82620	[LONGWOOD 220]	82600	[LAMBTON 220]	2	-5.3	53.9	134.6	27.3	139.9	22.2	-26.6
81500	[BECK2 DK 220]	81596	[HANONJ29 220]	1	106.8	-20.7	239.0	-17.7	132.2	21.0	3.0
81516	[PA27 REG 230]	81500	[BECK2 DK 220]	27	3.9	-17.8	135.4	2.9	131.5	20.8	20.7
81500	[BECK2 DK 220]	81595	[HANONJ24 220]	1	106.3	-20.4	237.3	-17.4	131.0	20.8	3.0
81500	[BECK2 DK 220]	81598	[NEALJQ25 220]	1	75.3	-23.8	199.7	-23.3	124.4	19.7	0.5
81515	[BP76 REG 230]	81500	[BECK2 DK 220]	76	-60.0	-13.1	63.3	-16.9	123.3	19.5	-3.8
81500	[BECK2 DK 220]	81597	[NEALJQ23 220]	1	75.1	-23.1	198.1	-22.5	123.1	19.5	0.6
81484	[ALANJQ30 220]	81615	[MIDDLEPT 220]	1	6.0	-44.6	128.7	-54.6	122.7	19.4	-10.0
82631	[LUCASJ22 220]	82645	[SCOTT 220]	1	-135.0	10.3	-36.2	-2.0	98.8	15.7	-12.3
82630	[LUCASJ21 220]	82645	[SCOTT 220]	1	-134.4	10.5	-35.7	-1.7	98.7	15.6	-12.2
82546	[BOSTJN22 220]	82631	[LUCASJ22 220]	1	-71.3	32.6	27.1	16.6	98.4	15.6	-16.0
82550	[BUCHANAN 220]	82546	[BOSTJN22 220]	1	-11.1	67.2	87.3	51.4	98.4	15.6	-15.8
82545	[BOSTJN21 220]	82630	[LUCASJ21 220]	1	-71.3	32.5	27.0	16.5	98.3	15.6	-16.0
82550	[BUCHANAN 220]	82545	[BOSTJN21 220]	1	-11.0	67.3	87.3	51.6	98.3	15.6	-15.7
81500	[BECK2 DK 220]	81484	[ALANJQ30 220]	1	146.0	38.9	242.9	27.7	96.9	15.4	-11.2
80001	[BRUCE B 500]	80121	[LONGWOOD 500]	1	436.9	-111.6	521.3	-91.2	84.4	13.4	20.4
80002	[BRUCE A 500]	80121	[LONGWOOD 500]	1	394.7	-122.9	478.9	-103.4	84.3	13.4	19.5
80101	[MILTON 500]	80001	[BRUCE B 500]	1	-615.8	-103.0	-535.3	-101.4	80.5	12.8	1.6
81598	[NEALJQ25 220]	81615	[MIDDLEPT 220]	1	-173.9	-47.8	-94.2	-61.7	79.8	12.6	-13.8
81597	[NEALJQ23 220]	81615	[MIDDLEPT 220]	1	-172.2	-45.4	-94.2	-59.7	78.0	12.4	-14.2
81615	[MIDDLEPT 220]	81527	[NEWPTJ33 220]	1	167.5	45.7	244.7	48.7	77.2	12.2	3.0
82615	[COWALJ44 220]	82555	[CHATHAM 220]	1	151.0	-4.1	226.5	-19.0	75.5	12.0	-14.9
82616	[COWALJ45 220]	82555	[CHATHAM 220]	1	150.8	-4.0	226.2	-19.0	75.4	11.9	-15.0
81527	[NEWPTJ33 220]	82585	[SALFDJ33 220]	1	94.4	-5.1	169.8	-2.6	75.3	11.9	2.5
82585	[SALFDJ33 220]	82550	[BUCHANAN 220]	1	63.3	-7.5	137.1	-17.0	73.8	11.7	-9.5
80121	[LONGWOOD 500]	82620	[LONGWOOD 220]	T3	229.1	73.6	301.8	73.8	72.7	11.5	0.2
80121	[LONGWOOD 500]	82620	[LONGWOOD 220]	T7	228.8	73.4	301.5	73.7	72.6	11.5	0.2
80121	[LONGWOOD 500]	82620	[LONGWOOD 220]	T4	228.7	73.2	301.3	73.3	72.5	11.5	0.1
80121	[LONGWOOD 500]	82620	[LONGWOOD 220]	T5	227.9	73.3	300.2	73.6	72.3	11.5	0.2
81591	[NEBO Q29 220]	81615	[MIDDLEPT 220]	1	-175.3	-42.0	-105.8	-54.8	69.5	11.0	-12.8
81594	[NEBOJQ29 220]	81591	[NEBO Q29 220]	1	-128.2	-14.1	-58.7	-26.8	69.5	11.0	-12.7
81596	[HANONJ29 220]	81594	[NEBOJQ29 220]	1	-128.2	-14.0	-58.7	-26.8	69.5	11.0	-12.8
82595	[LYNWDJ28 220]	82600	[LAMBTON 220]	1	-280.8	71.9	-212.0	46.3	68.8	10.9	-25.6
82596	[LYNWDJ29 220]	82600	[LAMBTON 220]	1	-280.9	71.9	-212.0	46.3	68.8	10.9	-25.6
82555	[CHATHAM 220]	82595	[LYNWDJ28 220]	1	-200.2	123.8	-131.4	97.2	68.7	10.9	-26.6
82555	[CHATHAM 220]	82596	[LYNWDJ29 220]	1	-199.9	123.6	-131.2	97.0	68.7	10.9	-26.6
81589	[NEBOJQ24 220]	81590	[NEBO Q24 220]	1	-125.5	-13.3	-57.4	-25.8	68.1	10.8	-12.5
81590	[NEBO Q24 220]	81615	[MIDDLEPT 220]	1	-172.7	-41.4	-104.6	-53.9	68.0	10.8	-12.5
81595	[HANONJ24 220]	81589	[NEBOJQ24 220]	1	-125.4	-13.3	-57.4	-25.8	68.0	10.8	-12.5
80121	[LONGWOOD 500]	82620	[LONGWOOD 220]	T6	214.1	68.2	282.0	68.2	67.9	10.8	0.1

APPEXDIX C - FACILITIES AFFECTED BY NEW MICHIGAN-ONTARIO PARs

Table C-1
Summary of Flow Differences Greater than 20 MW or 20 MVAr

*Change in % of Ontario-Michigan inerface flow change (631 MW)

					WITH PARS		WITHOUT PARS		Flow Changes		
X-----	FROM BUS -----X	X-----	TO BUS -----X	CKT	MW	MVAR	MW	MVAR	Delta MW	%*	Delta MVAR
80041	[CLAIRVIL 500]	80002	[BRUCE A 500]	1	-468.3	1.7	-400.6	2.2	67.7	10.7	0.5
81528	[NEWPTJ32 220]	82586	[SALFDJ32 220]	1	74.2	-11.2	140.1	-10.6	65.9	10.4	0.6
82586	[SALFDJ32 220]	82550	[BUCHANAN 220]	1	46.2	-10.9	112.0	-19.0	65.8	10.4	-8.1
81615	[MIDDLEPT 220]	81528	[NEWPTJ32 220]	1	140.1	36.5	204.2	36.8	64.1	10.2	0.3
81615	[MIDDLEPT 220]	82550	[BUCHANAN 220]	1	70.1	-12.8	132.5	-12.4	62.4	9.9	0.4
81615	[MIDDLEPT 220]	80111	[MIDD8086 500]	T3	-520.2	-486.1	-459.9	-497.2	60.3	9.6	-11.1
81595	[HANONJ24 220]	81490	[BEACH 220]	1	230.4	-2.4	290.1	-14.8	59.7	9.5	-12.4
81615	[MIDDLEPT 220]	80112	[MIDD8185 500]	T6	-484.1	-469.8	-424.4	-481.3	59.7	9.5	-11.5
81596	[HANONJ29 220]	81490	[BEACH 220]	1	233.6	-2.0	293.1	-14.3	59.5	9.4	-12.3
80111	[MIDD8086 500]	80116	[NANTICOK 500]	1	-796.4	-442.3	-741.7	-451.4	54.7	8.7	-9.0
80112	[MIDD8185 500]	80116	[NANTICOK 500]	1	-885.1	-451.3	-832.4	-459.2	52.7	8.4	-8.0
81570	[DETWEILE 220]	82550	[BUCHANAN 220]	1	-47.1	-33.3	-1.4	-37.0	45.6	7.2	-3.7
81570	[DETWEILE 220]	82550	[BUCHANAN 220]	2	-47.1	-33.3	-1.4	-37.0	45.6	7.2	-3.7
81490	[BEACH 220]	81496	[BEA RD18 220]	1	104.8	70.8	149.7	60.6	44.9	7.1	-10.2
81496	[BEA RD18 220]	81535	[BURLINGT 220]	1	29.0	24.6	73.8	14.2	44.9	7.1	-10.4
81490	[BEACH 220]	81495	[BEA RD20 220]	1	101.8	68.9	146.3	59.0	44.5	7.1	-9.9
81495	[BEA RD20 220]	81535	[BURLINGT 220]	1	29.3	24.7	73.8	14.6	44.5	7.1	-10.1
81585	[GALTJM20 220]	81608	[DETWJM20 220]	1	142.3	9.7	185.7	7.1	43.4	6.9	-2.6
81586	[GALTJM21 220]	81607	[DETWJM21 220]	1	132.3	3.4	175.7	0.6	43.4	6.9	-2.7
81615	[MIDDLEPT 220]	81586	[GALTJM21 220]	1	258.9	68.8	302.3	66.2	43.4	6.9	-2.6
81615	[MIDDLEPT 220]	81585	[GALTJM20 220]	1	244.9	61.2	288.2	58.7	43.3	6.9	-2.5
81607	[DETWJM21 220]	81570	[DETWEILE 220]	1	107.2	-10.0	150.3	-16.4	43.1	6.8	-6.4
81608	[DETWJM20 220]	81570	[DETWEILE 220]	1	116.9	-4.5	160.0	-11.0	43.1	6.8	-6.5
81597	[NEALJQ23 220]	81535	[BURLINGT 220]	1	245.7	28.0	288.0	18.3	42.3	6.7	-9.7
81598	[NEALJQ25 220]	81535	[BURLINGT 220]	1	247.7	29.7	289.4	19.4	41.7	6.6	-10.3
82550	[BUCHANAN 220]	82615	[COWALJ44 220]	1	-169.1	-11.9	-129.6	-14.5	39.4	6.2	-2.6
82550	[BUCHANAN 220]	82616	[COWALJ45 220]	1	-169.1	-11.9	-129.7	-14.5	39.4	6.2	-2.6
82620	[LONGWOOD 220]	82615	[COWALJ44 220]	1	322.0	6.7	359.4	6.9	37.4	5.9	0.2
82620	[LONGWOOD 220]	82616	[COWALJ45 220]	1	321.9	6.7	359.2	6.9	37.3	5.9	0.2
80106	[TRAFALH2 500]	80101	[MILTON 500]	1	-591.3	-195.0	-554.3	-198.6	37.0	5.9	-3.6
80731	[TRAFALGA 220]	80106	[TRAFALH2 500]	15	-590.8	-208.2	-553.9	-212.4	36.9	5.8	-4.2
80107	[TRAFALH1 500]	80101	[MILTON 500]	1	-583.2	-196.4	-546.6	-199.8	36.6	5.8	-3.4
80731	[TRAFALGA 220]	80107	[TRAFALH1 500]	14	-582.7	-209.7	-546.1	-213.7	36.6	5.8	-4.0
81535	[BURLINGT 220]	80652	[PALRMT36 220]	1	-15.5	-45.9	20.6	-56.2	36.1	5.7	-10.3
80588	[LANTZJ38 220]	80731	[TRAFALGA 220]	1	-126.1	-118.6	-90.1	-129.0	36.0	5.7	-10.3
80651	[PALRMT37 220]	80731	[TRAFALGA 220]	1	-28.5	-52.9	7.5	-63.2	36.0	5.7	-10.3
80652	[PALRMT36 220]	80731	[TRAFALGA 220]	1	-28.5	-53.2	7.5	-63.5	36.0	5.7	-10.3
81535	[BURLINGT 220]	80588	[LANTZJ38 220]	1	-19.7	-46.2	16.3	-56.6	36.0	5.7	-10.4
81535	[BURLINGT 220]	80589	[LANTZJ39 220]	1	-19.7	-46.2	16.3	-56.6	36.0	5.7	-10.4
81535	[BURLINGT 220]	80651	[PALRMT37 220]	1	-15.4	-46.1	20.6	-56.4	36.0	5.7	-10.3
80589	[LANTZJ39 220]	80731	[TRAFALGA 220]	1	-126.1	-118.7	-90.1	-129.0	35.9	5.7	-10.3
81620	[NANTICOK 220]	80116	[NANTICOK 500]	12	-0.1	146.5	34.2	145.4	34.3	5.4	-1.1
81620	[NANTICOK 220]	80116	[NANTICOK 500]	11	-0.3	143.2	33.2	142.1	33.5	5.3	-1.1
81490	[BEACH 220]	81615	[MIDDLEPT 220]	1	-190.5	-26.3	-160.7	-32.2	29.8	4.7	-5.9
81481	[ALANBQ30 220]	81484	[ALANJQ30 220]	1	-139.9	-83.5	-114.3	-82.3	25.7	4.1	1.2
81680	[ALLANB60 118]	81481	[ALANBQ30 220]	T3	-139.9	-83.6	-114.2	-82.3	25.7	4.1	1.3
80002	[BRUCE A 500]	80001	[BRUCE B 500]	1	-1739.0	-508.2	-1735.7	-530.7	3.3	0.5	-22.5
82600	[LAMBTON 220]	82766	[LAMBTNG124.0]	T1	-483.4	-18.3	-483.3	-130.5	0.0	0.0	-112.2
82600	[LAMBTON 220]	82767	[LAMBTNG324.0]	T3	-483.4	-17.6	-483.4	-129.8	0.0	0.0	-112.2
82600	[LAMBTON 220]	82768	[LAMBTNG224.0]	T2	-483.4	-18.3	-483.3	-130.5	0.0	0.0	-112.2

Appendix D

Scope of Study

August 5, 1999

Michigan-Ontario Phase Angle Regulators

Scope of Study

The incorporation of Phase Angle regulators on all Michigan-Ontario Tielines is intended to be complete by summer of the year 2000. The addition of these facilities will allow control of up to 600 MW of Lake Erie circulation.

In order to ensure continued reliable operation of the interconnected regional systems, the MEN Study Committee has initiated a PAR study with the following Scope. The study can be broken into four areas;

- Impact on Interregional Transfer Capabilities
- Impact on Interregional power flows
- Operational considerations
- Impact on system dynamic performance

1. Impact on Interregional Transfer Capabilities

The following Inter-regional transfer capabilities will be determined based on the summer 1999 models and Michigan - Ontario Phase Angle Regulators (PAR) in service:

Transfer Capability	Base Transfer Case	Sensitivity Cases
NPCC to ECAR	4000 MW transfer	1. New PARs at Maximum Angle 2. New PARs at Minimum Angle 3. M/O PARs set at fixed flow
MAAC to ECAR	4000 MW Transfer	1. New PARs at Maximum Angle 2. New PARs at Minimum Angle
ECAR to NPCC	3000 MW transfer	1. New PARs at Maximum Angle 2. New PARs at Minimum Angle

2. Impact on Interregional Power Flows

The impact of the Michigan-Ontario PARs on power flows within the MEN regions will be evaluated. This will be based in large part on work already completed and reviewed by the MEN SC at its April meeting.

3. Operational Considerations

The interaction between all PARs in the MEN areas will be reported.

4. Impact on System Dynamic Response

NPCC is performing a full range of dynamic simulations on the system with the Michigan-Ontario PARs incorporated. MEN will review the results of these studies for inter-regional impact.

Appendix E

Basic Principles of Ontario-Michigan Phase Shifter Operation
Schedule A to the Interconnection Expansion Facilities Agreement

Standard Operating Practice MH-D1
Michigan-Hydro Interconnection
Agreement of January 1, 1975, as amended

Basic Principles of Ontario-Michigan Phase Shifter Operation

General

Hydro and Edison intend to improve reliability of bulk power supply by adding and modifying transmission facilities pursuant to an Interconnection Facilities Expansion Agreement dated December 21, 1998 to control circulating power flows that would otherwise interfere with the ability to carry out scheduled transactions. Through the additions and modifications of transmission facilities detailed in the Interconnection Facilities Expansion Agreement, Hydro and Edison also intend to increase the capability of the transmission facilities between Hydro and Edison for the purpose of expanding opportunities for transactions involving the use of those facilities.

Therefore, in accordance with the provisions of the Interconnection Agreement, the parties hereby agree to modify existing operating practices to accommodate the additions and modifications of transmission facilities detailed in the Interconnection Facilities Expansion Agreement in a manner consistent with the principles set forth herein.

Terms not defined in this Operating Practice will have the same meaning defined in the Interconnection Facilities Expansion Agreement.

Operating Principles:

1. Phase-Shifting Transformers shall be operated primarily to control power flow circulating through the electrical systems of the parties in order to protect the parties' respective transmission facilities and to facilitate transactions between and among the parties. Control strategies for the operation of such facilities shall recognize the following objectives, in descending order of priority:

    a. the resolution of declared emergency operating situations or conditions affecting Ontario or Michigan,

    b. the relief of reliability constraints in Michigan or Ontario affecting the use of transmission facilities of the parties,

    c. the facilitation of scheduled transfers of electric power and energy between Ontario and Michigan, and

    d. the facilitation of scheduled transfers of electric power and energy between Ontario, Michigan and third party systems.

2. In the absence of the need for corrective action to achieve the objectives set forth in Section 1, a Base Control Strategy shall be employed. When there is a need for corrective action, deviations from the Base Control Strategy shall be limited to the amount of phase angle adjustment required to achieve the objectives set forth in Section 1 above. The Base Control Strategy is the requirement that the Phase-Shifting Transformer taps shall be set to control power flow on the Ontario-Michigan Interface to the net scheduled power exchange between Ontario and Michigan.

    (a) An operating "Dead Band" shall be established in order to preserve the life expectancy of the Phase-Shifting Transformers by avoiding an excessive number of tap changes. The initial Dead Band shall be +/- 50 MW for the entire Ontario-Michigan Interface and tap changes on Phase-Shifting Transformers would not be signaled until the registered deviation between the target setting and the actual flow exceeds 50 MW. The Dead Band amount may be modified upon written agreement of Hydro and Edison.

    (b) Deviations from the Base Control Strategy may be requested at any time by transmission system operators in Ontario or Michigan to support the objectives established in Section 1 so long as the deviations from the Base Control Strategy are limited to the amount of phase angle adjustment required to achieve the objectives set forth in Section 1 above. Such requests shall be honored unless the requested change:

(i) creates reliability problems on the power systems in Ontario or Michigan;
(ii) or interferes with existing firm transactions or committed firm transmission service in Ontario or Michigan.

3. Upon mutual agreement of the parties, in writing, the Base Control Strategy established in Section 2 shall be revised, as necessary, to accommodate changes in transmission or transaction scheduling arrangements adopted by the parties.

4. Subject to applicable transmission orders or regulation issued by government agencies, if emergency conditions are declared in both Ontario and Michigan, tap positions for the Phase-Shifting Transformers shall be set in accordance with the following criteria in descending order of priority:

   a. first, to minimize the interruption of firm customer load in Ontario and Michigan and other firm customer load solely dependent upon firm transmission services provided by Ontario and Michigan,

   b. second, to minimize the interruption or curtailment of firm transmission services on a scheduled MW basis,

   c. third, to minimize the interruption of non-firm customer load in Michigan and Ontario on a MW basis, and

   d. fourth, to minimize the interruption of non-firm transmission service on a scheduled MW basis.

5. The Standard Operating Practice - Procedures shall comply with the priorities and procedures set forth on the Flow Diagram on Attachment A and shall be consistent with the Situational Examples set forth on Attachment B.

6. The Voltage-Regulating Autotransformers installed in the J5D, L4D, L51D and B3N interconnections shall normally be controlled and operated to minimize the exchange of VARS over these interconnections.

7. This Operating Practice is based on the existing transmission reservation and energy scheduling method. If in the future other methods are mandated by regulating authorities that exercise control over how the Eastern Interconnection will be operated, then this Operating Practice will be revised to reflect the new mandated methods.

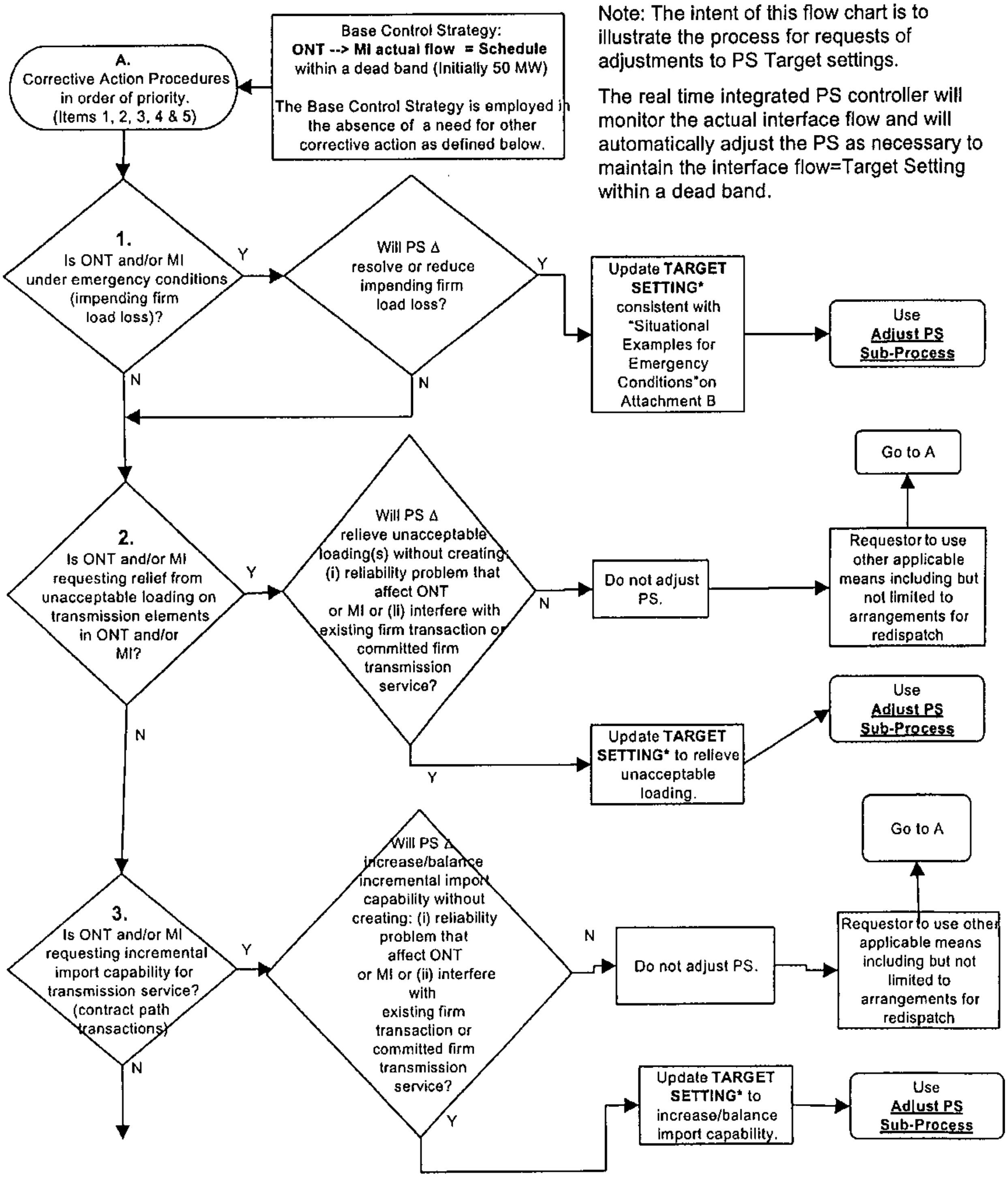
Attachment A
December 21, 1998

Main Process

Control Strategy For Phase Shifters In Ontario - Michigan Interface

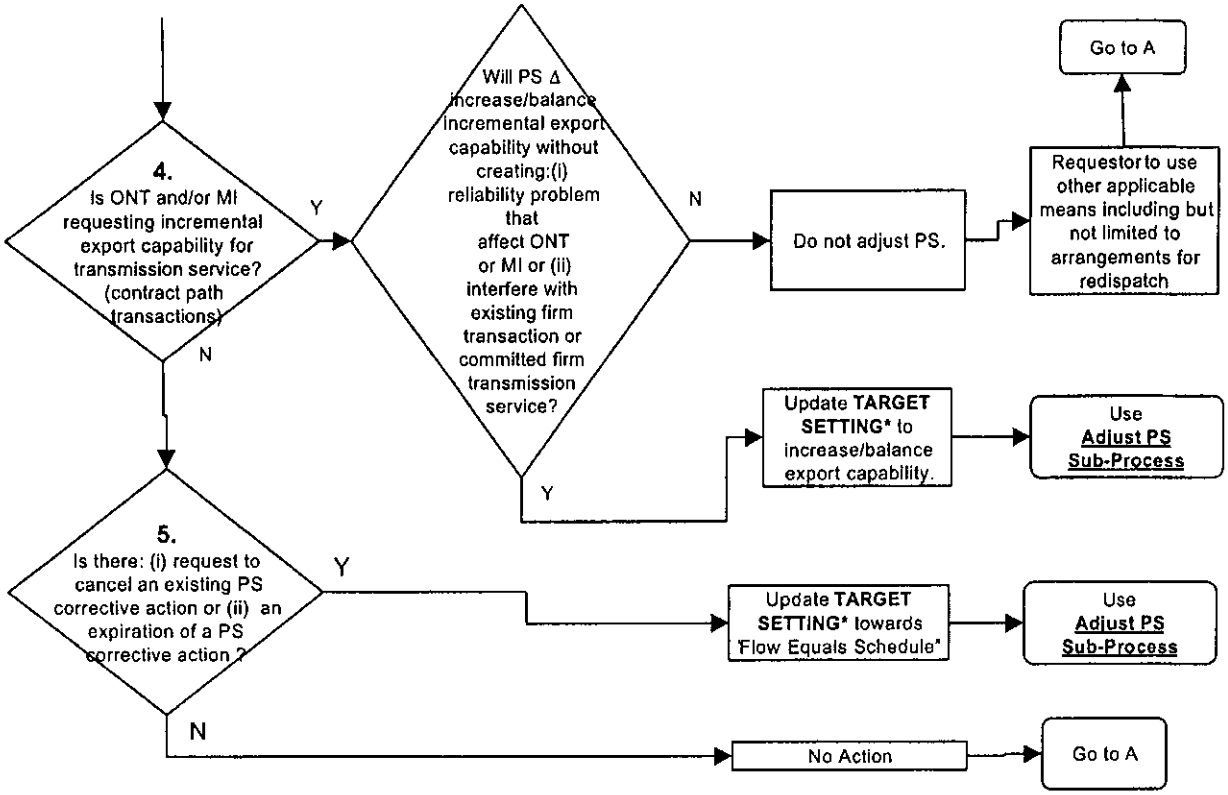
Note: The intent of this flow chart is to illustrate the process for requests of adjustments to PS Target settings.

The real time integrated PS controller will monitor the actual interface flow and will automatically adjust the PS as necessary to maintain the interface flow=Target Setting within a dead band.

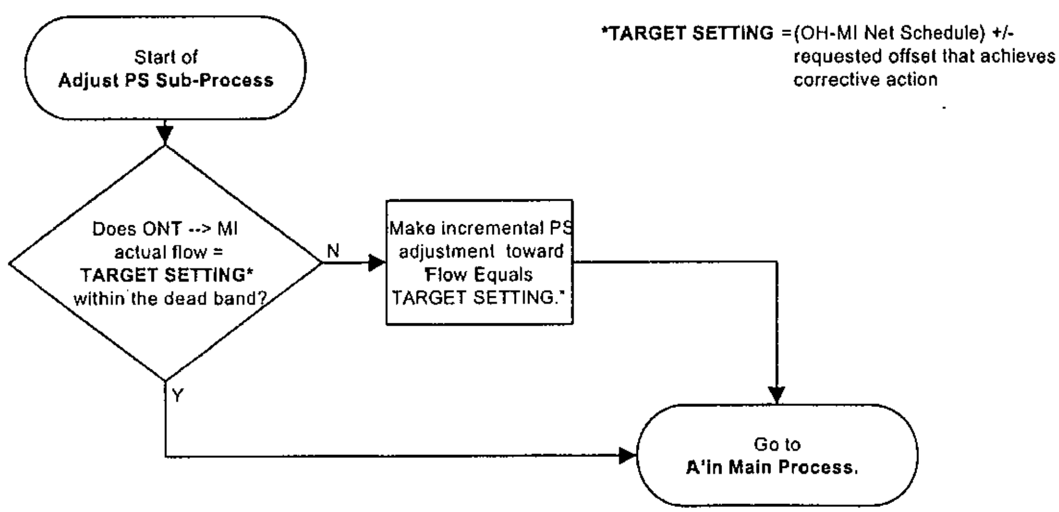


*TARGET SETTING =(OH-MI Net Schedule) +/- requested offset that achieves corrective action

Main Process (Continued)
Control Strategy For Phase Shifters In Ontario - Michigan Interface



Adjust PS Sub-Process



Situational Examples

The situational examples are based on the following assumptions under emergency conditions:

1) Once an emergency is declared by one party, then the other party will do whatever it can, up to but not including shedding of load in their own system, to assist the other.

2) Based on existing operating procedures, when either Ontario or Michigan declares an emergency, then both transmission systems would be operated to provide relief. For example, if the Queenston Flow West (QFW) flow gate is a limit, then the QFW will be operated to the emergency rating, and an increase of about 400 MW of transfer capability is expected.

3) If one party requests the QFW relief and associated phase shifter change, then this party is solely responsible for all firm load loss due to any further contingencies on that party's system. The one party is also responsible for one half of the firm load loss of the other party affected by the phase shifter deviation as follows:

Under emergency conditions and after all remedies to reduce load loss have been accomplished:

For Counterclockwise (CCW) Lake Erie Circulation (LEC)

- **Michigan's exposure** to interrupting load in Michigan due to a supply deficiency in Ontario is equal to one half the reduction in the base control strategy.

  Example:
  - Michigan requested a Phase Shifting Transformers setting of 100 MW Block. This is a reduction of 400 MW from the base control strategy of 500 MW Block for LEC in excess of 500 MW CCW. Michigan's **maximum** exposure to interrupting load in Michigan for this supply deficiency is equal to one half of 400 MW or 200 MW.

- **Ontario's exposure** to interrupting load in Ontario due to a supply deficiency in Michigan is equal to one half of the Block setting that exists at the time of the Michigan supply deficiency.

  Example:
  - The Phase Shifting Transformers are set at 400 MW Block. Ontario's **maximum** exposure to interrupting load in Ontario for this supply deficiency is equal to one half of 400 MW or 200 MW.

Note: Michigan or Ontario's exposure can not exceed one half of the capability of the Phase Shifting Transformers (one half of 500MW or 250 MW).

4) "Blocking Phase Shifter Adjustment" is reducing counter-clockwise LEC flow.

5) "Encourage Phase Shifter Adjustment" is reducing clockwise LEC flow.

Examples for Emergency Conditions

Example #1:

Initial Conditions:

- LEC (without Blocking) is 1000 MW counter-clockwise.
- Phase Shifting Transformers are set at maximum "Blocking" to retard Ontario to Michigan flow.
- Michigan – Ontario Schedule = 0.
- QFW is at its limit.
- Michigan Southern Interface is at its limit.
- Michigan Operating Reserves = 0 (on verge of firm load loss).
- Ontario Operating Reserves = 0 (on verge of firm load loss).
- Ontario is purchasing 500 MW from the East for Firm Load Customers.
- Michigan declares an emergency.
- Ontario declares an emergency.

1st Contingency: Michigan loses 500 MW Generator.

- Ontario operates QFW under emergency limit (a nominal increase of about 400 MW).
- Michigan requests Phase Shifting Transformers adjustment to enable import of 400 MW from either South and/or East (Phase Shifting Transformers are adjusted from 500MW Block to 100 MW Block).
- Michigan sheds 100 MW of firm load.

2nd Contingency: Michigan loses another 500MW Generator.

- Michigan sheds an additional 500 MW of firm load.

Example #1A:

Initial Conditions: Same as Example #1

1st Contingency: Ontario loses 500 MW Generator.
- Ontario operates QFW under emergency limit.
- Ontario requests Phase Shifting Transformers adjustment to relieve Michigan Southern limit (this avoids a Transmission Loading Relief (TLR) on the Southern Interface).
- Ontario imports 400 MW generation from New York.
- Ontario sheds 100 MW of firm load.

2nd Contingency: Ontario loses another 500 MW Generator
- Ontario sheds an additional 500 MW of firm load.

Example #1B:

Initial Conditions: Same as Example #1

1st Contingency: Michigan loses 500 MW Generator.
- Ontario operates QFW under emergency limit.
- Michigan requests Phase Shifting Transformers adjustment to enable import of 400MW from either South and/or East (Phase Shifting Transformers are adjusted from 500 MW Block to 100 MW Block).
- Michigan sheds 100 MW of firm load.

2nd Contingency: Ontario loses 500 MW Generator.
- Ontario sheds 300 MW of firm load.
- Michigan sheds an additional 200 MW of firm load (this is one half of the reduction from control strategy which is one half of 400 MW).

Example #1C:

Initial Conditions: Same as Example #1

1st Contingency: Ontario loses 500 MW Generator
- Ontario operates QFW under emergency limit.
- Ontario requests Phase Shifting Transformers adjustment to 350 MW Block to relieve Michigan Southern limit.
- Ontario imports 400 MW generation from New York.
- Ontario sheds 100 MW of firm load.

2^{nd} Contingency: Michigan loses 500 MW Generator

- Ontario sheds 175 MW of firm load (one half of the Block setting at the time of deficiency or one half of 350 MW).
- Michigan sheds 325 MW of firm load.

Example #2:

Initial Conditions:

- LEC (without Blocking) is 1000 MW counter-clockwise.
- Phase Shifting Transformers Shifter is set at maximum "Blocking" to retard Ontario to Michigan flow.
- Michigan – Ontario Schedule = 0
- QFW is at its limit
- Michigan Southern Interface is at its limit
- Michigan Operating Reserves = 0 (on verge of firm load loss)
- Ontario Generation Available = 500 MW
- Ontario is conducting an economy purchase of least 500 MW from the East.
- Michigan declares an emergency.

Contingency: Michigan loses 500 MW Generator

- Either :
  - (a) Ontario operates QFW under emergency limit, and Michigan purchases 500 MW from either Ontario or Southern Interface if available, or
  - (b) If the 400 MW of QFW relief has already been requested, then Michigan would request Ontario to re-dispatches generation to further relieve the QFW in order that the Phase Shifting Transformers could be moved to accommodate a Michigan 500 MW purchase from the South.
  - Michigan would compensate the appropriate party(ies) for the cost of re-dispatch.

Example #3:

Initial Conditions:

- LEC (without Blocking) is 1000 MW counter-clockwise.
- Phase Shifting Transformers are set at maximum "Blocking" to retard Ontario to Michigan flow.
- Michigan – Ontario Schedule = 0.
- QFW is at its limit.
- Michigan Southern Interface is at its limit.
- Michigan Operating Reserves = 0 (on verge of firm load loss).
- Ontario Operating Reserves = 0 (on verge of firm load loss).
- Generation available for purchase from the South = 0.
- Ontario is purchasing 500 MW from the East for firm load Customers.
- Michigan declares an emergency.
- Ontario declares an emergency.
- No generation is available from Ontario.

Contingency: Michigan loses 500 MW Generator.

- Michigan sheds 500 MW of firm load (Phase Shifting Transformers change can only provide access to generation, but no generation is available from any source, therefore, Michigan sheds 500 MW of firm load)

Appendix F

Effects of New Ontario-Michigan PARs on Ramapo and Other PARs

Table F-1
Effects of New Ontario-Michigan PARs on Ramapo and Other Existing PARs

	From	Ramapo	Fairlawn Waldwick	Hawthawn Waldwick	Hillsdale Waldwick	Farragut	Goethal	St. Lawr	Keith	L4D Lambton	L51D Lambton	Scott	Net Ontario
(Max, Min)	Ang	(40,-40)	(35,-35)	(30,-30)	(32,-32)	(30,-30)	(30,-30)	(40,-40)	(40,-40)	(47,-47)	(47,-47)	(47,-47)	
Degrees/Tap		2.50	1.156	0.94	1.15	1.88	1.88	2.50	2.35	2.94	2.9	2.9	
	To	Branburg	S. Mahwa	S. Mahwa	S. Mahwa	Hudson	Linden	Moses E	Watermn	St Clair	St. Clair	Bunce	Mich
1 1999 Summer MEN/VEM	Ang	0.1	-11.4	-11.4	-10.9	5.1	-1.5	27	0				
Base Case	Flow	-818	-301	-312	-333	-809	-203	0	70	241	240	316	867
1a Ramapo @ Max Ang	Ang	40	-32.5	-30.0	-32.0	24.6	-24	36.5	0				
	Flow	0	-300	-73	-322	-800	-200	3	33	185	184	289	691
1b Ramapo @ Max Ang	Ang	40	-38.7	-38.8	-38.4	29.2	-27.6	37.6	0				
/w Wldwck Ang open	Flow	-130	-300	-312	-332	-801	-200	3	28	178	177	286	669
1c Ramapo @ Min Ang	Ang	-40	10.4	10.2	10.7	-17.9	20.4	19	0				
	Flow	-1338	-300	-310	-330	-800	-199	3	101	290	289	338	1018
1d MW/Tap		44	16	15	17	31	28	31	31				
2 With New Pars	Ang	-6.7	-5.3	-5.4	-4.9	-1.9	4.7	31.9	15.2	19.6	19.4	-27.2	
(@ Scheduled 600 MW)	Flow	-819	-300	-310	-330	-800	-200	-3	100	200	200	100	600
2a Ramapo @ Max Angle	Ang	40	-32.3	-30	-32	24.5	-23.8	38.5	1.7	6.4	6.2	-14	
	Flow	16	-299	-83	-328	-797	-197	0	100	200	200	100	600
2b Ramapo @ Max Angle	Ang	40	-38.2	-38.2	-37.8	28.8	-27.1	39.3	0.4	5.1	4.9	-12.7	
/w Waldwick Ang Open	Flow	-110	-300	-309	-329	-799	-200	3	100	200	200	100	600
2c Ramapo @ Min Angle	Ang	-40	14	13.9	14.3	-22.1	24.8	27.9	23.4	27.6	27.3	-35.2	
	Flow	-1215	-300	-310	-330	-800	-200	3	100	200	200	100	600
2d MW/Tap		38	11	13	15	31	20	32	22	34	37	18	

Table F-1
Effects of New Ontario-Michigan PARs on Ramapo and Other Existing PARs

			Fairlawn	Hawthawn	Hillsdale					L4D	L51D		Net
	From	Ramapo	Waldwick	Waldwick	Waldwick	Farragut	Goethal	St. Lawr	Keith	Lambton	Lambton	Scott	Ontario
(Max, Min)	Ang	(40,-40)	(35,-35)	(30,-30)	(32,-32)	(30,-30)	(30,-30)	(40,-40)	(40,-40)	(47,-47)	(47,-47)	(47,-47)	
Degrees/Tap		2.50	1.156	0.94	1.15	1.88	1.88	2.50	2.35	2.94	2.9	2.9	
	To	Branburg	S. Mahwa	S. Mahwa	S. Mahwa	Hudson	Linden	Moses E	Watermn	St Clair	St. Clair	Bunce	Mich
3 With New Pars @	Ang	-15.9	2.9	2.8	3.2	-10.8	13.4	38.4	40	47	47	-47	
Max (blocking) Angle	Flow	-817	-300	-309	-329	-799	-201	3	57	4	4	171	236
3a Ramapo @ Max Ang	Ang	40	-30.9	-30	-30.6	22.2	-20.4	40	40	47	47	-47	
	Flow	155	-300	-218	-330	-801	-199	21	-15	-88	-82	127	-58
3b Ramapo @ Max Ang /w	Ang	40	-34.3	-34.4	-34	25	-22.5	52.9	40	47	47	-47	
Wldwk & St Lawr ang open	Flow	59	-300	-310	-330	-800	-200	3	-6	-76	-71	132	-21
3c Ramapo @ Min Angle	Ang	-40	15.8	15.7	16.1	24	27.3	33.9	40	47	47	-47	
	Flow	-1151	-299	-309	-328	-791	-201	3	77	32	30	184	323
3d MW/Tap		45	14	14	17	32	26	30					
4 With New Pars @	Ang	11.9	-24.2	-24.2	-23.8	17	-13.9	16.5	-40	-47	-47	47	
Min (aiding) Angle	Flow	-822	-300	-310	-331	-806	-201	3	128	483	455	397	1463
4a Ramapo @ Max Ang	Ang	40	-33.2	-30	-32	26.2	-26.9	21.8	-40	-47	-47	47	
	Flow	-116	-300	-4	-260	-798	-200	3	105	453	423	382	1363
4b Ramapo @ Max Ang /w	Ang	40	-44.1	-44.1	-43.7	35	-32.8	24	-40	-47	-47	47	
Wldwk,Huds,Goet ang open	Flow	-363	-300	-310	-330	-800	-200	3	95	440	411	375	1321
4c Ramapo @ Min Angle	Ang	-40	4.8	4.6	5.1	-11.3	14.6	6.2	-40	-47	-47	47	
	Flow	-1511	-300	-309	-329	-794	-201	3	177	545	514	424	1660
4d MW/Tap		38	8	6	7	27	17	30					

Table F-1
Effects of New Ontario-Michigan PARs on Ramapo and Other Existing PARs

	Ramapo	Fairlawn Waldwick	Hawthawn Waldwick	Hillsdale Waldwick	Farragut	Goethal	St. Lawr	Keith	L4D Lambton	L51D Lambton	Scott	Net Ontario
From												
(Max, Min) Ang	(40,-40)	(35,-35)	(30,-30)	(32,-32)	(30,-30)	(30,-30)	(40,-40)	(40,-40)	(47,-47)	(47,-47)	(47,-47)	
Degrees/Tap	2.50	1.156	0.94	1.15	1.88	1.88	2.50	2.35	2.94	2.9	2.9	
To	Branburg	S. Mahwa	S. Mahwa	S. Mahwa	Hudson	Linden	Moses E	Watermn	St Clair	St. Clair	Bunce	Mich
A. Comparison of Existing Condition to Base Case With New Pars Reg Ontario to Michigan @ 600 MW												
MW/Tap Change	-6	-5	-2	-2	0	-8	1					
Angle Change	-6.8	6.1	6	6	-7	6.2	4.9	15.2	19.6	19.4	-27.2	
Tap Change	-3	5	6	5	-4	3	2					
B. Comparison of Existing Condition to Base Case With New Pars @Max (blocking) Angle												
MW/Tap Change	1	-2	-1	0	1	-2	-1					
Angle Change	-16	14.3	14.2	14.1	-15.9	14.9	11.4	40	47	47	-47	
Tap Change	-6	12	15	12	-8	8	5					
C. Comparison of Existing Condition to Base Case With New Pars @Min (Aiding) Angle												
MW/Tap Change	-6	-8	-9	-10	-4	-11	-1					
Angle Change	11.8	-12.8	-12.8	-12.9	11.9	-12.4	-10.5	-40	-47	-47	47	
Tap Change	5	-11	-14	-11	6	-7	-4					

Ramapo Angle	Branburg to Ramapo Flow, MW: New Pars @ max ang	New Pars @ 600 MW	New Pars @ min ang	Existing	MW/Tap: existing	MW/Tap: new pars max ang	new pars 600 MW	new pars min ang
40	-59	110	363	130				
20	247	422	684	475	43*	38*	39*	40*
0	582	733	1034	817	43*	43*	39*	44*
-5	660			888	36	39	32*	32*
-10	735			958	35	38	32*	32*
-15	806			1025	34	36	32*	32*
-20	875	986	1290	1090	33	35	32*	32*
-25	941			1154	32	33	29*	28*
-30	1007			1215	31	33	29*	28*
-35	1070			1274	30	32	29*	28*
-40	1151	1215	1511	1338	32	41	29*	28*

* Average over 8 tap steps.

DOCKET NO. ER11-1844
EXHIBIT NO. NYI-45

<u>NYISO/MISO 4-2.</u> Has the NYISO ever participated in MISO's MTEP process?

Response: No.

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