2003 State of the Market Report
Midwest ISO

Prepared by:

Independent Market Monitor
Midwest ISO

May 2004

POTOMAC ECONOMICS

Introduction

- The Midwest ISO currently provides transmission service and is the reliability coordinator for the region, but does not yet operate centralized spot markets for energy or ancillary services.
- Hence, the report evaluates the transmission service and operations, and the bilateral market outcomes in 2003.
- The report contains an assessment of the current market conditions and characteristics in anticipation of the markets to be implemented by Dec. 2004.
- The areas in the report include:
  - ✓ Characteristics of the Midwest Supply and Demand;
  - ✓ Wholesale Market Prices;
  - ✓ Transmission Service;
  - ✓ Transmission Operations;
  - ✓ Market Power Issues; and
  - ✓ Market Development.

Summary of Conclusions

Wholesale Market Prices

- Trends in bilateral market prices during 2003 primarily reflected movements in fuel prices (particularly natural gas) and load levels.
  - ✓ The daily prices were the highest in February and March of 2003 due to relatively high natural gas and fuel oil prices.
  - ✓ Daily prices were also relatively high in August due to high summer loads.
- The report also assesses how accurately prices reflected transmission congestion during 2003.
  - ✓ These results show that the current wholesale prices do not accurately reflect the transmission congestion on the system.
  - ✓ This conclusion indicates that the Midwest ISO's Day 2 markets, which include LMP spot pricing, promise substantial efficiency improvements in the commitment and dispatch of resources in the Midwest.
- Finally, while prices rose modestly during the blackout and restoration period in August 2003, we did not detect withholding of supply resources by participants or other attempts to influence wholesale prices.

Summary of Conclusions

Transmission Service

- The report finds that both the requests and approvals of transmission service have risen substantially from 2002 to 2003.
  - ✓ The number of approved firm requests increased by 73 percent in 2003 and approval rates remained at very high levels throughout the year.
  - ✓ These results indicate that transmission has generally been available to participants, which contributes to efficient trading.
- The report generally finds a low level of service redirected to an affiliate's control area, which causes the affiliate to receive the transmission revenue.
  - ✓ However, this opportunity does provide a competitive advantage to affiliated power marketers and we recommend that these rules be reviewed.
- The report also shows that unconfirmed accepted transmission requests remained at 2002 levels and does not indicate an attempt to hoard transmission capacity.
- The queue for yearly service has grown substantially and the majority of the requests are "self-competing" – multiple requests by an entity for the same service, which is causing delays in processing and substantially reducing the available capability.
- We recommend that the MISO evaluate tariff changes to address the effects of unconfirmed requests and reduce the incentive to submit self-competing requests.

Summary of Conclusions

Transmission Operations

- This section of the report evaluates the TLRs invoked in 2003 to reduce flows on the Midwest ISO flowgates, and the AFC values calculated by the MISO.
- The analysis of the MISO's TLRs supports the conclusion that the Midwest ISO has invoked TLRs in a consistent and justifiable manner based on the observed flows in the hours when the TLRs were called.
- However, our evaluation of the TLR results shows that the TLR process is substantially inferior to redispatching generation for managing congestion.
  - ✓ The report shows that, on average, more than three times as many transactions are curtailed as would be required to be redispatched to relieve the constraint.
  - ✓ This conclusion strongly supports the move to MISO's Day 2 markets.
- We also evaluate the AFC values posted by the MISO, showing that MISO frequently posts zero non-firm hourly AFC when substantial physical capability is unused on its flowgates.
  - ✓ It is important to address this issue by utilizing state estimator information and by other means to allow the transmission system to be more fully utilized.

Summary of Conclusions

Market Power Analysis

- The report summarizes the pivotal supplier analysis supporting the recently filed market power mitigation measures.
  - ✓ Market power concerns in electricity markets are typically the result of transmission constraints.
  - ✓ Locational market power arises when transmission constraints are binding, preventing adequate competition and giving rise to potential market power.
  - ✓ This market power is frequently related to a supplier that becomes "pivotal". A supplier is pivotal when a transmission constraint cannot be managed without its resources.
- The analysis in this section shows that a number of MISO's flowgates have at least one pivotal supplier.
  - ✓ Of the flowgates that exhibit one or more pivotal suppliers, generally only flowgates affecting flows into or within WUMS are frequently congested.
- The market power issues raised by these results will be addressed by the Midwest ISO's mitigation measures.

Summary of Conclusions

Key Market Developments

- GridAmerica began operations October 2003.
- Development of Day 2 market rules continued during 2003.
  - ✓ The tariff was filed on March 31, 2004.
  - ✓ Day 2 markets are now scheduled to begin December 2004.
  - ✓ The Day 2 markets will be initially composed of day-ahead and real-time energy markets, including a real-time pricing provision to set energy prices efficiently when the market is in a shortage.
- Continued development of the markets after this initial implementation will be important, including:
  - ✓ Operating reserve and regulation markets; and
  - ✓ Long-term resource adequacy provisions.

Summary of Conclusions

Key Market Developments (cont.)

- A Joint Operating Agreement with PJM was filed in December 2003.
  - ✓ This agreement provides the basis for the market-to-market coordination to resolve serious issues associated with the electrical interactions between the two markets.
  - ✓ Work is underway to develop the software to implement the market-to-market coordination provisions, which are essential to implement as part of the MISO's Day 2 markets.
  - ✓ The agreement is also expected to improve emergency protocols, system planning, and market monitoring between PJM and MISO.
- As the SPP develops its RTO markets, similar coordination provisions will be needed with SPP.

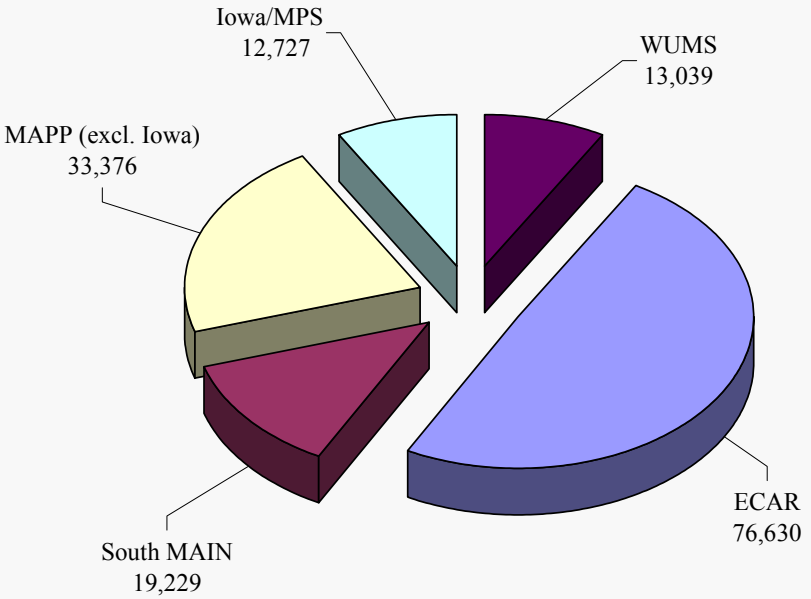
Supply and Demand in the Midwest Markets

Midwest Markets -- Supply

Midwest ISO Generating Capacity

- Generating resources in the Midwest ISO footprint totaled 155,000 MW in 2003;
  - ✓ The footprint includes Midwest ISO transmission-owning members, other transmission owners committed to joining, and resources and load that are directly connected to these transmission systems.
- The following figure shows the distribution of this capacity among the major sub-regions in the MISO;
  - ✓ The Table is presented according to one of five sub-regions
    - – ECAR, MAPP (excluding Iowa), South MAIN, Iowa/Missouri Public Service, and WUMS;
  - ✓ These sub-regions correspond to major study areas of the MAIN Summer Transmission Assessment;
  - ✓ The Iowa/MPS sub-region includes the control areas served by Mid-American Energy, Alliant West (including Muscatine), and Missouri Public Service;

Geographic Distribution of MISO Capacity



Note: South MAIN does not include Alliant West, which is included in Iowa/MPS.

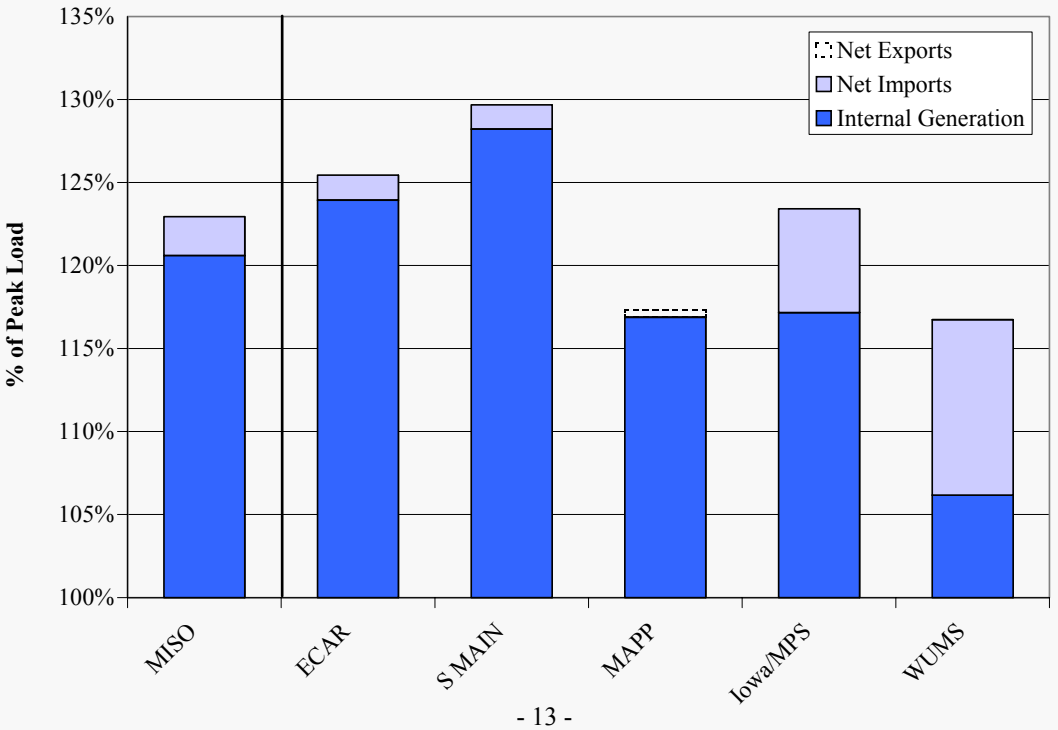
Transmission Interconnections and Resource Balance

- The table below and the following figure show resource margins in each of the sub-regions, which is the percentage by which firm resources exceed peak load.
- With the exception of WUMS, the Midwest ISO sub-regions have access to substantial generating resources in excess of their peak load.
  - ✓ MAPP (excl. Iowa) shows a low resource margin, but has strong ties to adjacent areas.
- WUMS has relatively weak interconnections and relies on firm imports to meet its resource requirements.

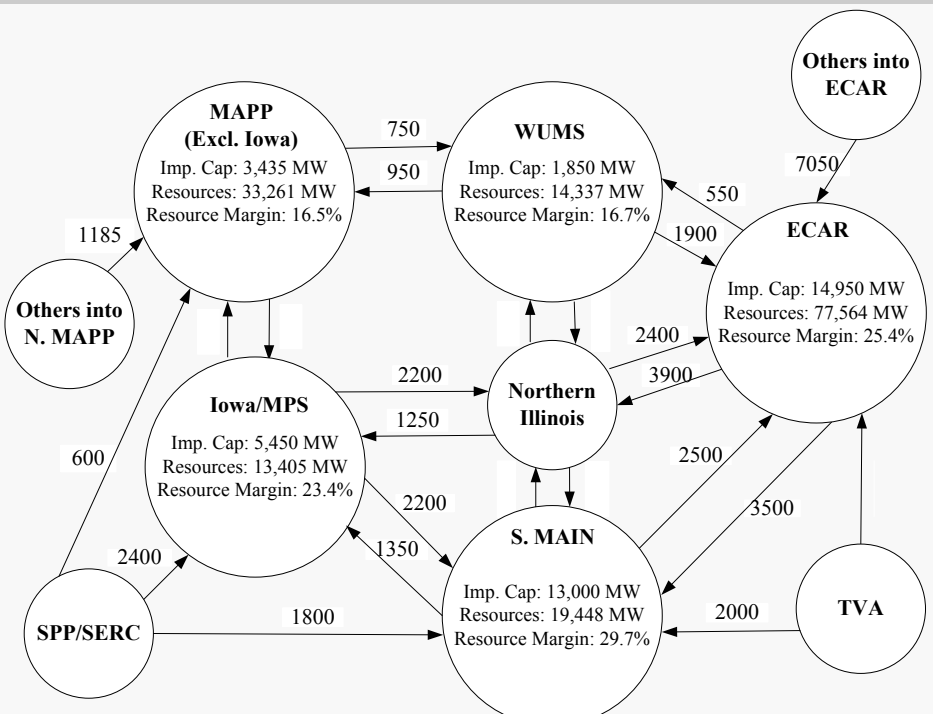
Load and Resource Balance -- 2003 Peak

	Generating Capacity	Net Firm Imports	Total Firm Resources	Resource Margin
ECAR	76,630	934	77,564	25.4%
South MAIN	19,229	219	19,448	29.7%
MAPP (Excl. Iowa)	33,376	(115)	33,261	16.5%
Iowa/MPS	12,727	678	13,405	23.4%
WUMS	13,039	1,298	14,337	16.7%
Total MISO	155,000	3,014	158,014	22.9%

Resource Margins in the MISO Sub-regions



MISO Transmission Interconnections and Resource Balance



Note: Values between areas represent non-simultaneous incremental transfer capability.

Change in Resources, Load, and Resource Margin

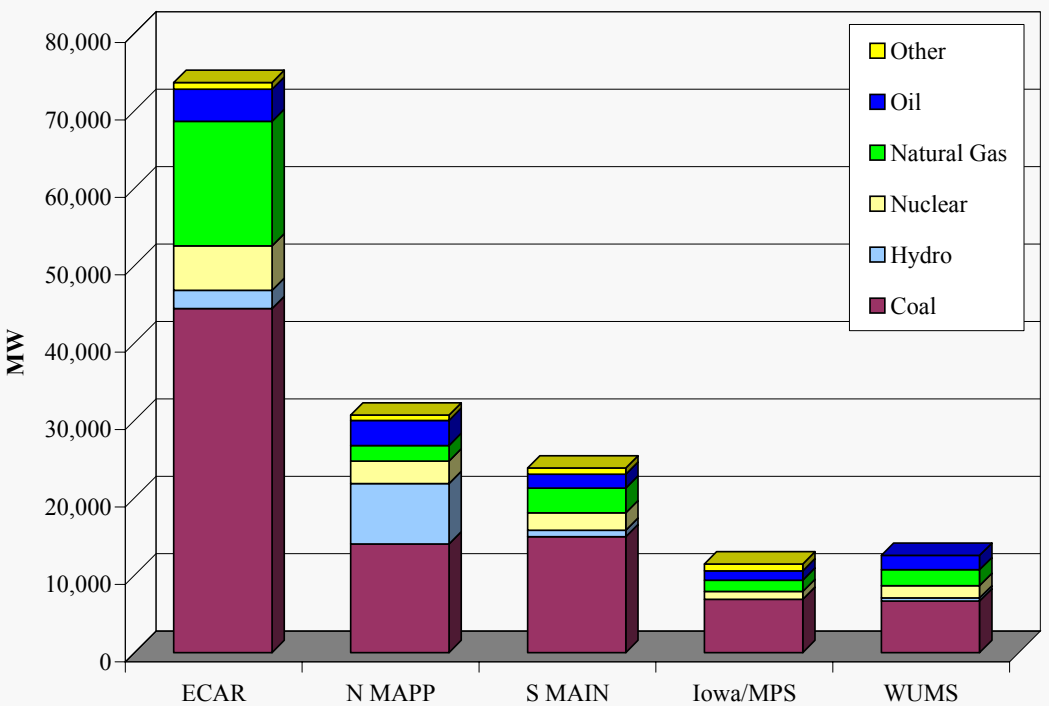
- Load grew slightly faster than capacity between 2002 and 2003, resulting in a slight decrease in the overall resource margin.

	2003	2002	*Net Change*
Total Resources (MW)	158,014	154,860	*3,154*
Load (MW)	128,526	124,726	*3,801*
Resource Margin	22.9%	24.2%	*-1.2%*

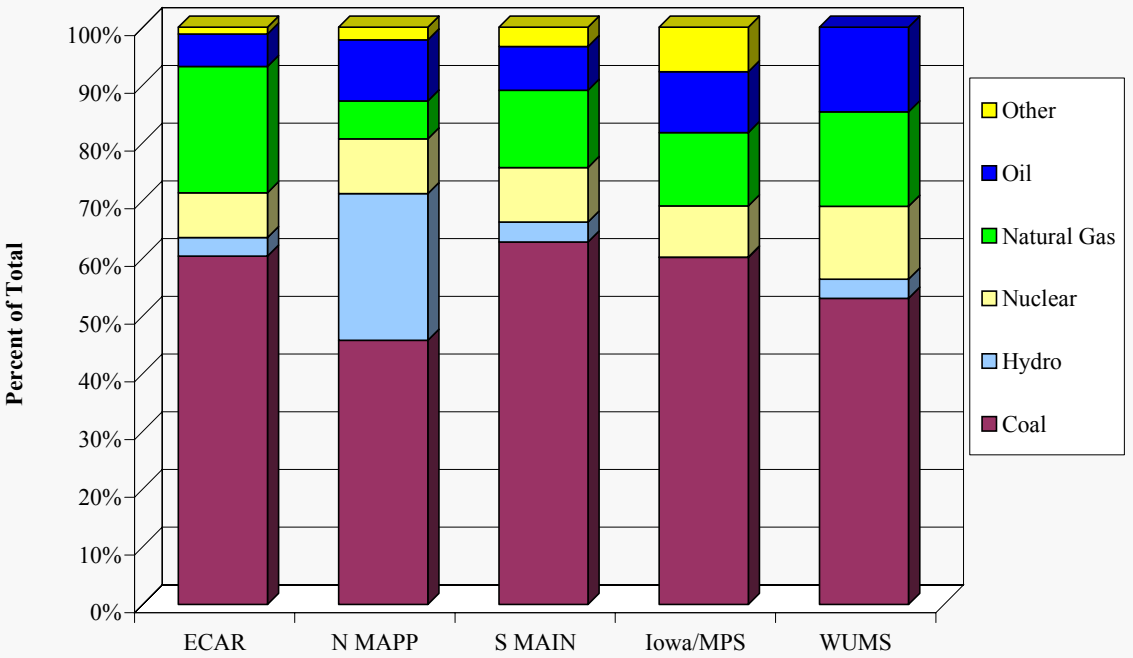
Note : Numbers may not add exactly due to rounding.

- The following figures show the quantities and shares of generating resources by fuel-type.
  - ✓ MISO and each of its sub-regions relies heavily on coal-fired generation.
  - ✓ Close to 60% of the generation in the Midwest ISO is coal-fired.
  - ✓ Nuclear, Oil, and Hydro resources account for almost 25% of the resources.
  - ✓ Natural gas-fired generating resources are 16% of the supply in the Midwest, although they account for the majority of the new capacity.

MISO Capacity by Fuel Type in the Midwest ISO Sub-Regions



MISO Capacity by Fuel Type in the Midwest ISO Sub-Regions



Market Concentration in MISO Sub-regions

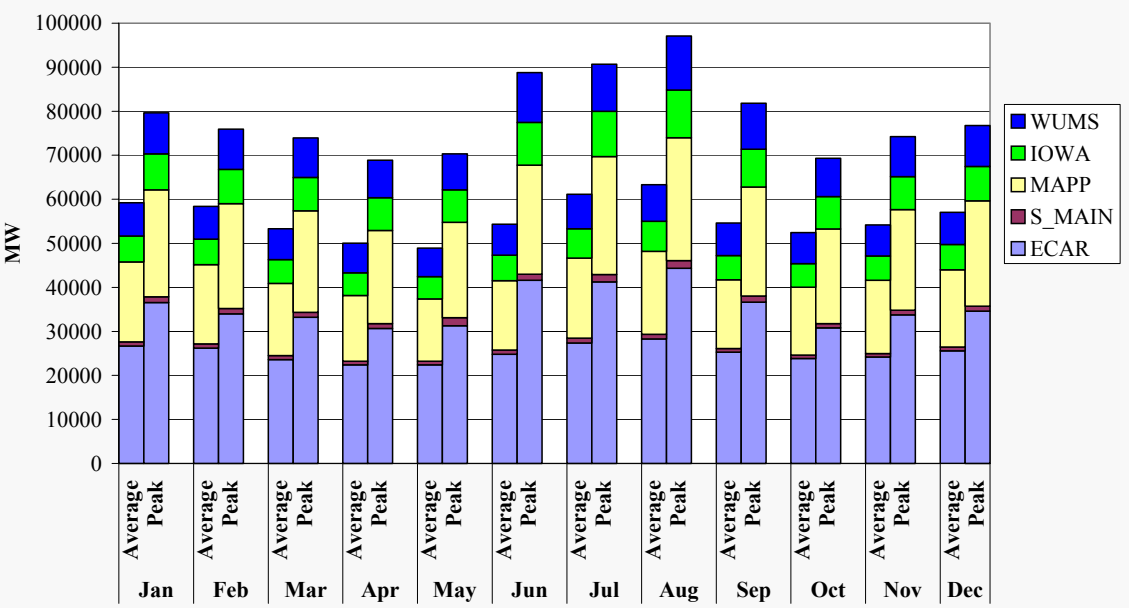
- The following table shows the Herfindahl-Hirschman Index (HHI) for each sub-region within MISO. The HHI is a measure of market concentration.
  - ✓ HHIs are calculated by summing the squares of each supplier's market share.
  - ✓ The antitrust agencies generally characterize markets with HHIs of greater than 1800 as highly concentrated.
  - ✓ The HHI provides only a general indication of market characteristics and is not a definitive measure of market power, which must consider demand and network constraint factors.
- The HHIs in the Midwest are higher than in other regions because the vertically integrated utilities have divested less capacity than in other regions.
- In addition to having the lowest capacity margin, WUMS is the most highly concentrated of the MISO regions.

MISO Subregion	HHI
ECAR	563
North MAPP	938
South MAIN	1,736
Iowa/MPS	1,343
WUMS	2,656
MISO	**261**

Load in MISO during 2003

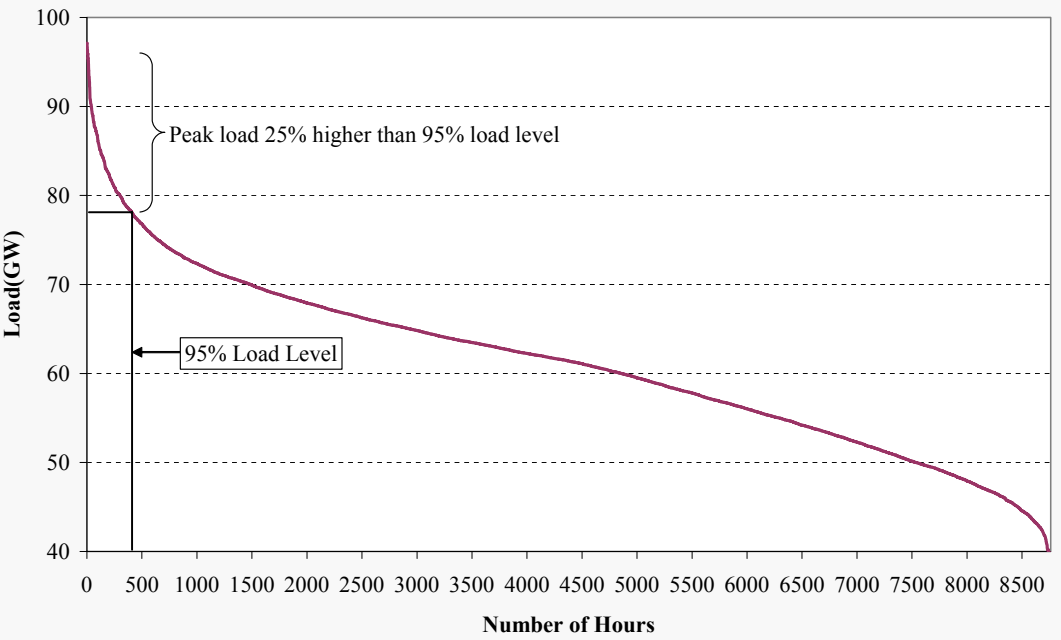
- The next two figures show the load conditions during 2003 in the Midwest.
- The first figure shows the average and peak loads in each sub-region by month.
  - ✓ Loads peaked for the year in August and for the winter in January.
  - ✓ The figure also shows that the largest share of the MISO's load is located in ECAR, although the absence of Ameren causes the MAIN load to be understated.
- The second figure shows the load duration curve for the Midwest ISO.
  - ✓ This curve shows the number of hours (on the x-axis) in which the load exceeds a given load level (on the y-axis).
- The load duration curve exhibits the typical high peak demand in electricity markets.
  - ✓ The peak load is 25 percent higher than the load level at highest 5 percent load level.
  - ✓ This illustrates the need in any electricity market for peaking resources – more than one-fourth of the generation can be expected to run in less than 5 percent of the hours.
  - ✓ This indicates how critical it is for the wholesale markets to price electricity efficiently in these hours.

Average Monthly Load by Sub-region



* Due to incomplete data for 2003, loads not included for Ameren, FE, NIPS, and MDU.

Midwest ISO Load Duration Curve

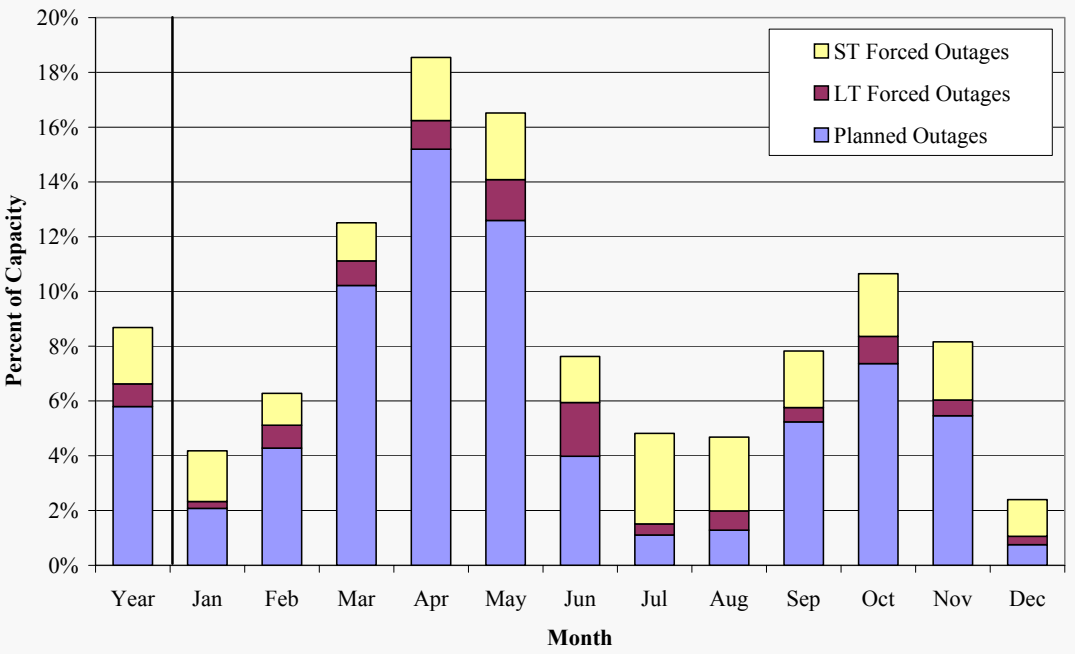


* Due to incomplete data for 2003, loads not included for Ameren, FE, NIPS, and MDU.

Generation Outages

- The following figure shows the generator outages that occurred in each month during 2003.
  - ✓ These values include only full outages, no partial outages or deratings are included.
- As expected, this figure shows that the largest outages occurred in the spring and fall, peaking in April at more than 18 percent, as planned outages increased substantially.
- The figure also divides the forced outages by short-term (less than 7 days) and long-term (longer than 7 days).
  - ✓ The figure shows that majority of the outages were short-term outages, particularly during the highest load months of July and August.

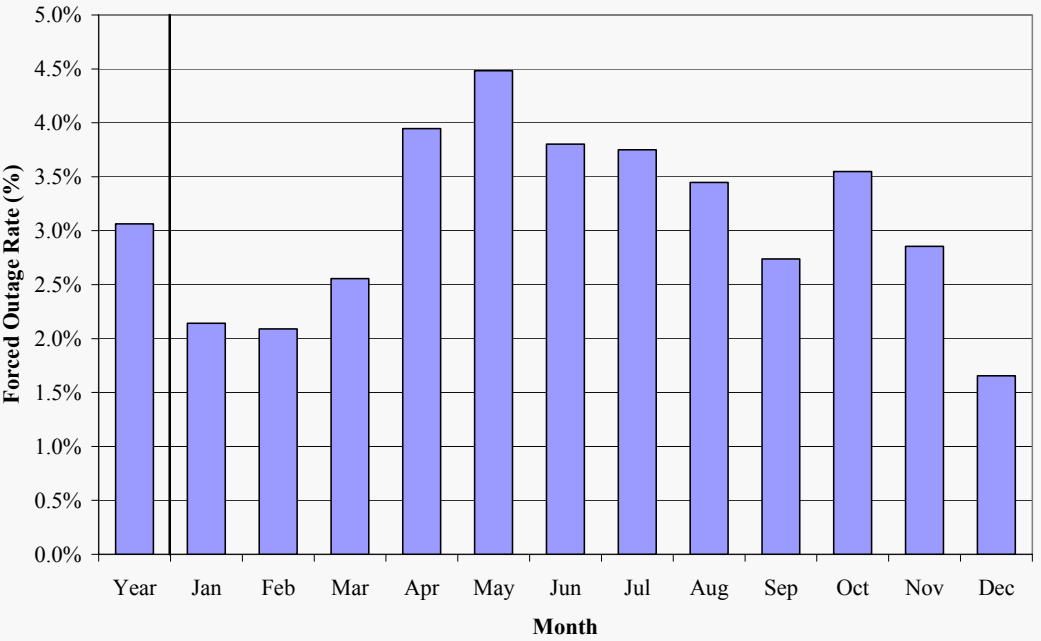
Generation Outages



Generation Outages

- The next figure shows the forced outage rates for the MISO generation in each month in 2003 and the year.
  - ✓ The forced outage rates are equal to the forced outage hours divided by the sum of the in-service hours and forced outage hours.
  - ✓ Due to data limitations, the analysis does not include forced partial outages.
- The annual forced outage rate of close to 3 percent is low relative to the forced outage rates in other regions.
- The forced outage rate remained low during the peak summer months.

Forced Outage Rates



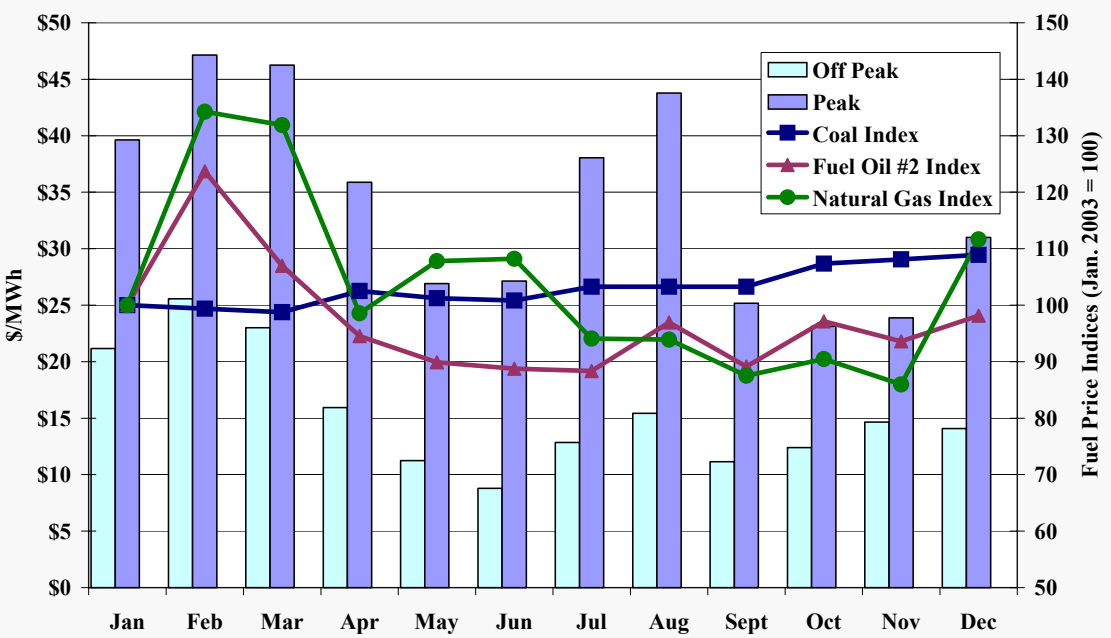
Wholesale Market Prices

Wholesale Electricity Prices

- The following figure shows price trends in the bilateral electricity markets during 2003.
- The prices shown are prices associated with day-ahead forward contracts for delivery at the Cinergy Hub.
- The figure shows monthly averages for both peak and off-peak and includes natural gas, fuel oil, and coal price indices to indicate general trends in underlying input prices.
- This figure shows that prices were substantially higher during peak hours as expected.
- Natural gas prices peaked early in the year, which contributed to the higher peak-hour prices in February and March.
  - ✓ Natural gas costs have a much greater effect on peak prices because natural gas resources are frequently on the margin during peak hours and typically not economic during off-peak hours.
- The higher summer loads also caused higher prices during peak hours in July and August.

Monthly Average Electricity and Fuel Prices

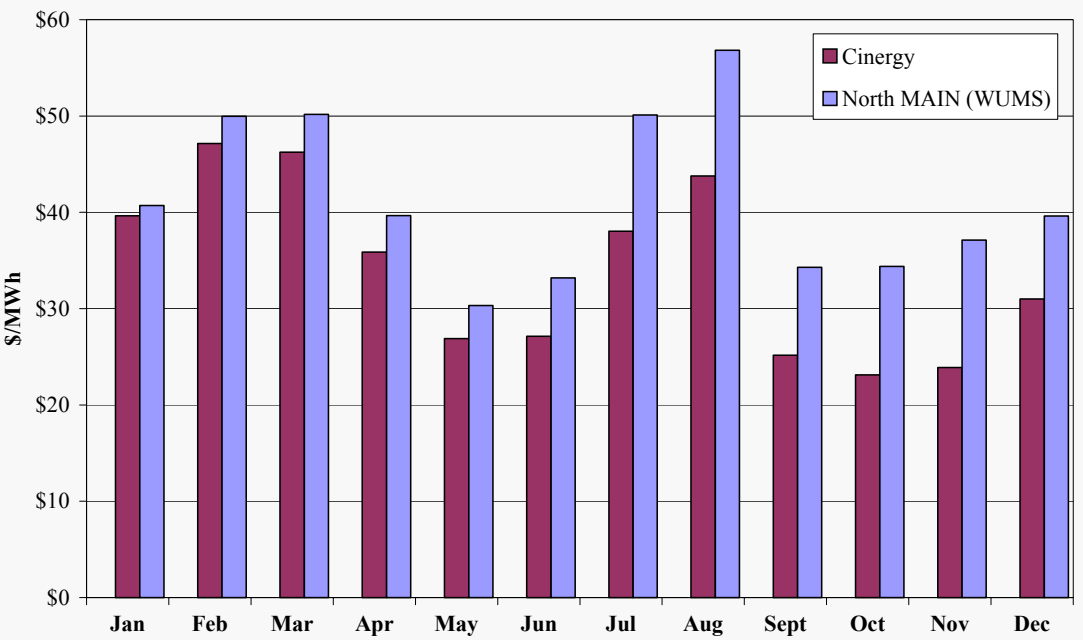
Cinergy Day-Ahead Electricity Prices -- 2003



Daily Prices in 2003

- The following figure shows the monthly average of prices during peak hours at the Cinergy hub and the North MAIN point, corresponding to the WUMS area.
- The Cinergy hub is shown because it is the most liquid trading point in the Midwest.
- This figure includes the North MAIN pricing point because the constraints into the WUMS area are among the most frequently binding in the Midwest.
  - ✓ When these constraints are not binding, the prices outside and within WUMS should be highly correlated.
  - ✓ When these constraints are binding, the prices within WUMS should be higher than outside of WUMS.
- This figure shows that the monthly average price in North MAIN was slightly higher than in WUMS in all months.
- The relationship of these bilateral energy prices and transmission constraints is analyzed in more detail below.

Day-Ahead Energy Price During Peak Hours Cinergy and North MAIN - 2003



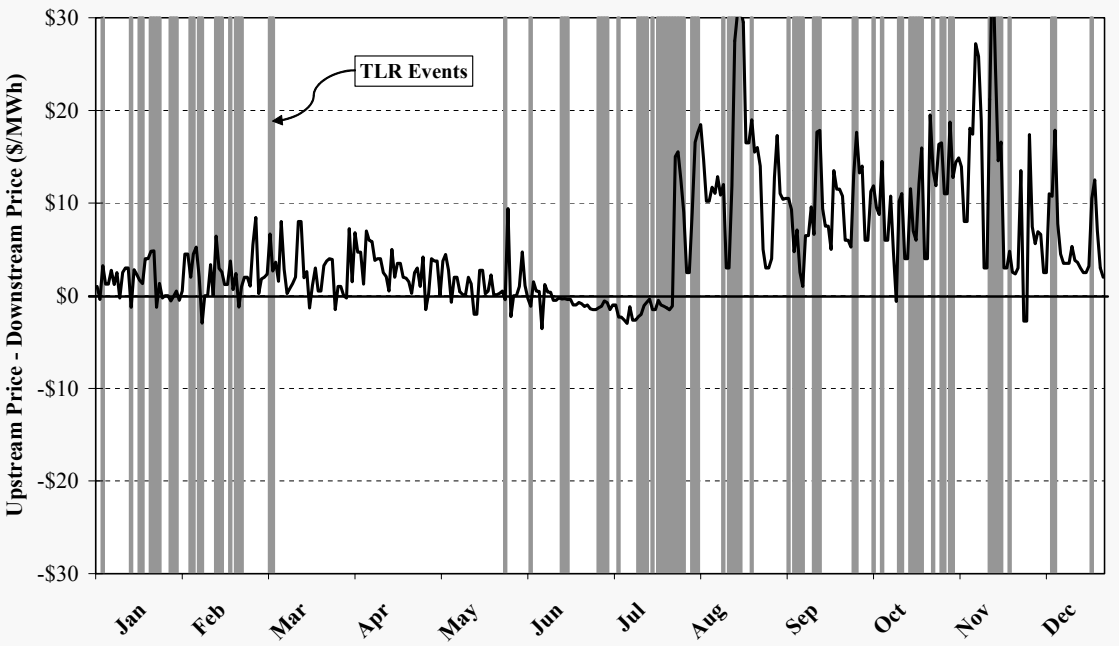
Prices and Transmission Constraints

- The Midwest ISO's Day 2 markets will utilize Locational Marginal Prices (LMPs) that will efficiently dispatch supply to manage network constraints.
- Prices will equal the marginal system cost of serving an additional increment of demand at each location, given the supply offers and demand bids.
- When constraints are binding, preventing additional power from flowing into a constrained area, the prices in the constrained area ("downstream price") should rise relative to prices outside of the constrained area ("upstream price").
- The following analysis investigates whether these pricing relationships exist under the current bilateral markets in the Midwest.
- We focus our analysis of these issues on the WUMS region because, historically, the WUMS region has experienced chronic congestion.

Prices and Transmission Constraints

- The following figure shows the daily price difference between the upstream and downstream market locations, indicating with shading when TLR events occurred on flowgates that limit imports into WUMS.
- Consistent with the discussion above, the downstream - upstream price difference should be positive when the flowgate constraint is binding.
- The figure shows that:
  - ✓ The price differences in the second half of the year increased noticeably as the frequency of TLRs on the WUMS flowgates increased; and
  - ✓ Some of the positive price differences coincide with the TLR events called on the flowgate.
- Although the figure may be useful in observing the relationship of the upstream-downstream price relationships during TLRs, statistical analysis of the data provides a more reliable means to evaluate how constraints have affected prices.

Relationship of Upstream-Downstream Prices During TLR Events – WUMS Flowgates



Prices and Transmission Constraints

- To further analyze prices and transmission constraints, we conducted two statistical tests designed to determine the relationship between the bilateral prices and transmission constraints (as measured by TLRs).
- The first analysis tests whether the average difference between the upstream-downstream price is statistically different in days with TLR events versus all other days.
  - ✓ The analysis is conducted on a flowgate by flowgate basis.
  - ✓ The analysis is conducted on peak prices for the day following the TLR event. These prices are associated with transactions initiated on the day with the TLR event.
  - ✓ We performed the same analysis on the prices for the day with the TLR and the results were comparable.

Prices and Transmission Constraints

- The results are presented in the following table, which shows:
  - ✓ The number of days in each category (i.e., with TLRs vs. without TLRs);
  - ✓ The mean upstream-downstream price difference for each category, and the difference in these means;
  - ✓ The "p-value", which indicates the probability that the difference in means is statistically equal to zero.
  - ✓ Economists generally employ a 95% confidence interval to determine whether a result is statistically significant, corresponding to a p-value less than 0.05. A p-value greater than .05 indicates a lack of statistical significance.
- This table shows that the differences in the means in TLR hours vs. non-TLR hours are not statistically different from zero for most of the flowgates.
  - ✓ Hence, no apparent relationship exists between the market prices and transmission congestion (contrary to what one would expect in a well-functioning market).
  - ✓ This supports the move to the Day-2 LMP markets, which will provide more accurate and transparent price signals.

Effects of TLRs on Bilateral Energy Prices

	Without TLR		With TLR		Difference	
Flowgate Name	**N**	**Mean**	**N**	**Mean**	**of Means**	**P-Value**
Paddock Xfmr 1 + Paddock-Rockdale	324	0.054	35	-0.503	0.558	0.594
Russel-Rockdale 138/Paddock-Rockdale 345	355	-0.020	4	1.79	-1.810	0.391
Albers-Paris138 for Wemp-Padock 345	307	-0.014	52	0.0854	-0.100	0.911
Poweshiek-Reasnor 161 for Montezuma-Bondurant 345	306	0.062	53	-0.365	0.427	0.713
Lore-Turkey River 161 (flo) Wempletown-Paddock 345	331	0.384	28	2.3332	-1.949	0.184
Salem 345/161 Quad Cities-Sub 91	343	0.017	16	-0.344	0.361	0.839
Arnold-Vinton 161 for D.Arnold-Hazleton 345	313	0.070	46	-0.482	0.552	0.572
Salem 345/161 flo Wempletown-Paddock 345	341	-0.044	18	0.8167	-0.861	0.691
MHEX_N	310	-0.023	49	0.1416	-0.165	0.847

Effects of TLRs on Bilateral Energy Prices

- The second analysis of prices and TLRs examines whether the difference in the means increases or decreases significantly when a TLR is invoked.
  - ✓ This is done by determining whether the mean of the upstream-downstream price difference for the day following the TLR event (associated with transactions initiated on the day with the TLR event) is significantly different than the mean of the difference for the previous day.
  - ✓ The hypothesis in the case is that the upstream-downstream price difference should become more negative when the TLR occurs.
- The following table presents the results by flowgate, showing:
  - ✓ The counts of days with and without TLRs;
  - ✓ The change in the upstream-downstream price difference from the current day to the following day; and
  - ✓ The p-value for the test, which will be less than 0.05 when the result is statistically significant at the 95-percent confidence level.

Effects of TLRs on Bilateral Energy Prices

Flowgate	Flowgate ID	Count - No TLR	Count - TLR	Est. Change ($/MWh)	P-value
Paddock Xfmr 1 + Paddock-Rockdale	3012	324	35	1.99	0.2241
Paddock Xfmr 1 + Paddock-Rockdale	3012	355	4	5.64	0.4701
Albers-Paris138 For Wemp-Padock 345	3522	307	52	3.47	0.0065
Kewaunee Xfmr+Kewaunee-N Appleton	3613	306	53	-4.75	0.0005
Lor5-Trk Riv5 161kv/Wempl-Paddock 345kv	3707	331	28	-1.95	0.1839
Poweshiek-Reasnor 161 For Montezuma-Bondurant 345	3704	343	16	11.11	<.0001
MHEX_N	6003	313	46	-1.07	0.3831
MHEX_S	6002	341	18	2.16	0.3769
MWSI	6004	310	49	0.78	0.3883

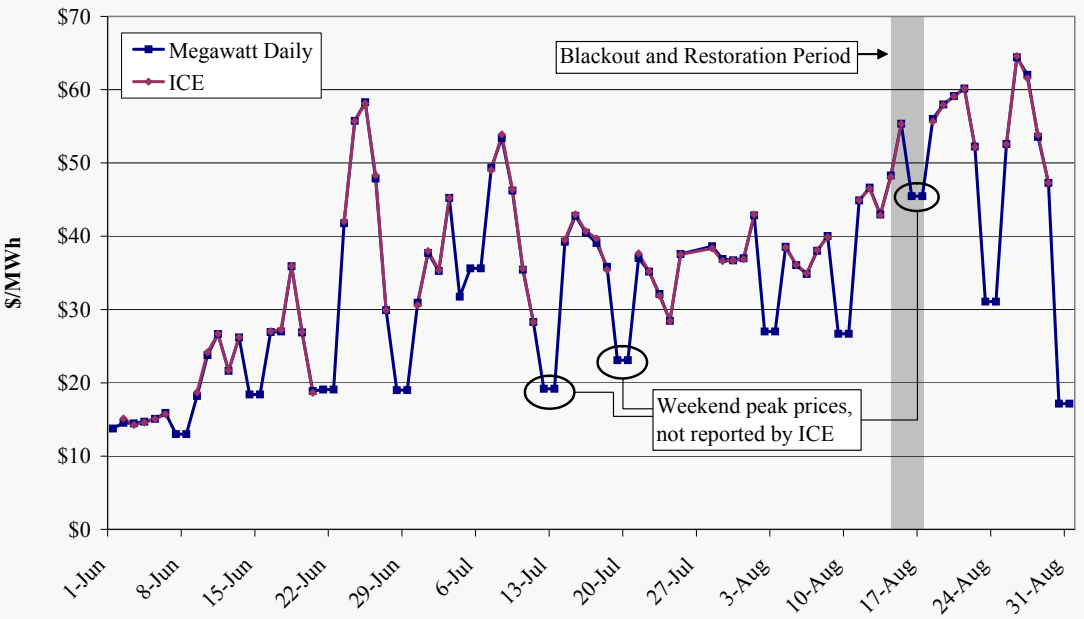
Effects of TLRs on Bilateral Energy Prices

- Except for a few exceptions (p-value less than .05), these results generally do not show a statistically significant relationship between the upstream-downstream price differences on the two days.
- Taken together, these results indicate that the daily bilateral prices in the Midwest do not generally reveal the presence of transmission congestion.
  - ✓ Hence, the bilateral market prices do not provide transparent and accurate price signals for participants in the Midwest market.
- These conclusions must be tempered by the fact that the prices are daily prices, rather than intraday hourly prices which may provide more accurate price signals.

Blackout of 2003

- A blackout occurred in the eastern interconnect on August 14, 2003 with the vast majority of the load and generation restored over the following three days.
- According to the report by NERC, the blackout was caused by inadequate recognition and monitoring of the voltage problems on the FirstEnergy system.
  - ✓ This became critical following the failure of key transmission facilities on the FirstEnergy system.
- The following figure shows the prices posted by Megawatt Daily and the Intercontinental Exchange ("ICE") at the Cinergy Hub during the summer 2003.
  - ✓ Prices increased by close to $7 per MWh on August 15 following the blackout.
  - ✓ Larger increases of approximately $25 per MWh were reported for the weekend days of August 16 and 17 during the restoration process.
  - ✓ These increases are consistent with the uncertainty that prevailed regarding unit availability and load levels during this period.
- We monitored the restoration process, including generation outages that occurred prior to and following the blackout, and did not detect any withholding of resources or other forms of price manipulation during this period.

Prices During the Blackout in 2003
Daily Peak Price at the Cinergy Hub



Assessment of Midwest ISO Transmission Service in 2003

Transmission Utilization

- This section of the report summarizes and evaluates the operation of the transmission system from the perspective of the wholesale market.
- This section addresses the:
  - ✓ Disposition of transmission reservation requests;
  - ✓ Redirecting of firm transmission service;
  - ✓ Evaluation of unconfirmed transmission requests;
  - ✓ Frequency of and justification for TLRs invoked to reduce the flow on the Midwest ISO's flowgates;
  - ✓ Efficiency of the TLR process for managing congestion relative to the economic dispatch process that underlies the Midwest ISO's Day 2 markets; and
  - ✓ Estimated available flowgate capability.

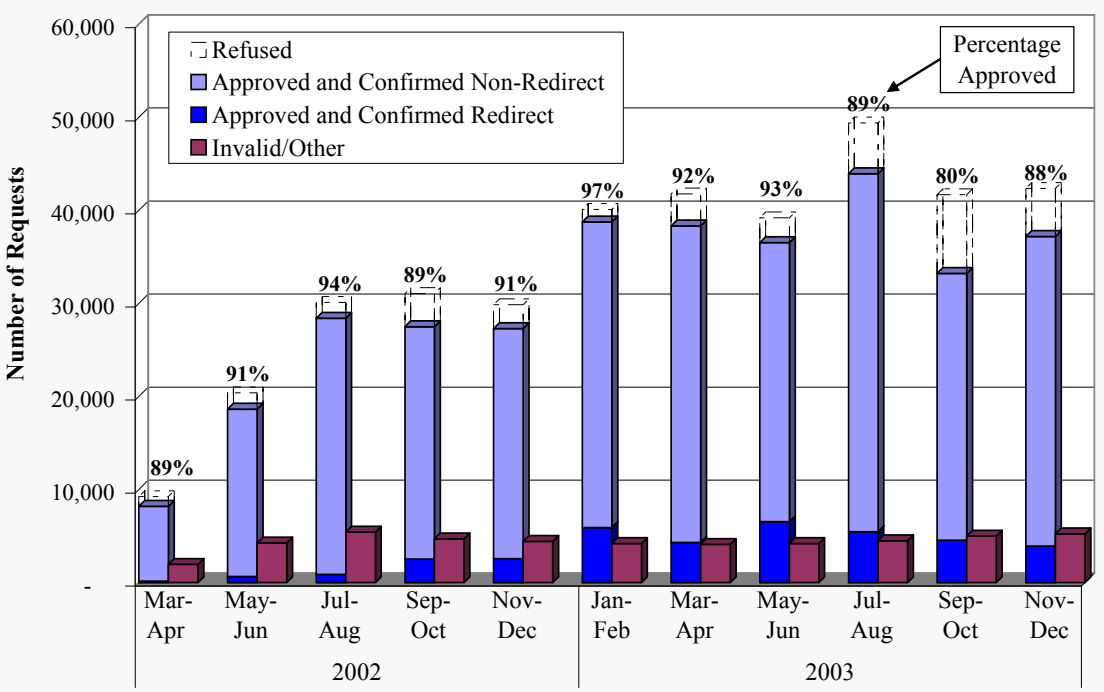
Disposition of Transmission Reservation Requests

- We evaluated disposition of transmission requests from February 2002 to December 2003.
- The vast majority of transmission requests Approved and Confirmed are comprised of;
  - ✓ Non-redirected – New service confirmed on a MISO path; or
  - ✓ Re-directed – a modification to an existing reservation to change the receipt or delivery points on a non-firm or firm basis.
- Other categories include:.
  - ✓ Refused – generally due to a lack of available transmission capability.
  - ✓ Invalid/Other (denied, annulled, and withdrawn) -- these requests ultimately do not result in a transmission reservation due to the participant's action or the validity of the request.
- Some requests must be studied before a request can be approved or refused. Because this is an interim designation, the figure does not include this category.

Disposition of Transmission Reservation Requests

- The chart shows that:
  - ✓ The volume of approved requests increased during 2002 and throughout 2003;
  - ✓ The approval levels on a monthly basis ranged from 80 percent to 97 percent; and
  - ✓ The "Invalid/Other" category remained at levels comparable to the relatively modest levels of 2002.
- The high rate and increasing numbers of approvals in 2003 indicate that transmission has generally been available for participants, which contributes to efficient wholesale trading.
- The increase in approved reservation requests during 2002 and into 2003 was likely due in part to reductions in transmission rates for through and out service, and by improved modeling of AFC.
- The figure also shows that redirected transmission service increased in 2003, but remains a relatively small share of the total reservation requests. This is examined in more detail below.

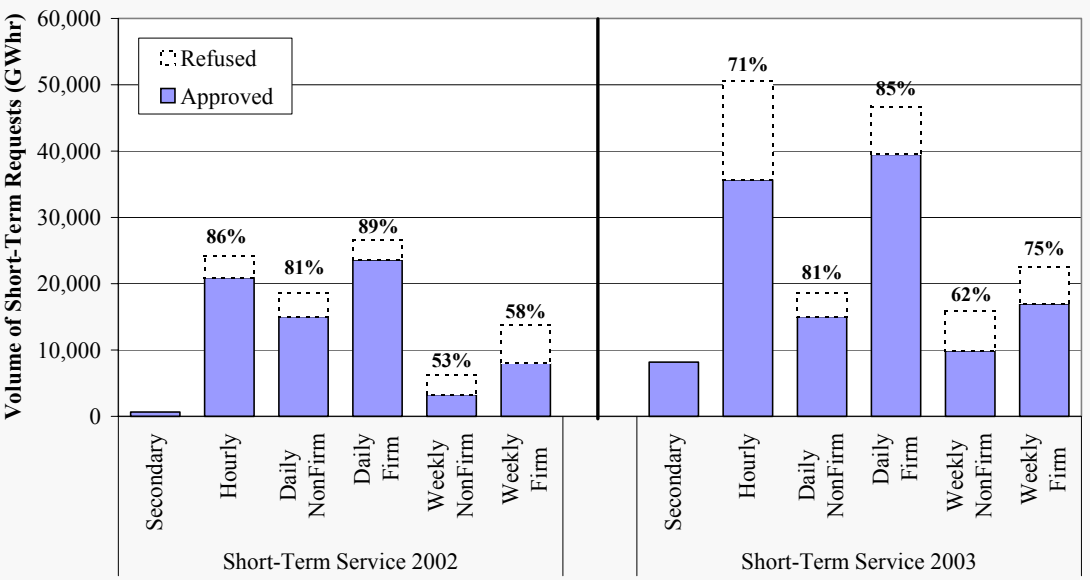
Disposition of Reservation Requests 2002-2003



Short and Long-Term Reservation Requests

- To better understand the transmission service provided by MISO in 2003, we examine the volume of requests by term of service. The next two figures show the volumes approved and refused for:
  - ✓ Short-term service requests (secondary non-firm, hourly, daily, weekly); and
  - ✓ Long-term service requests (monthly, yearly).
- The first figure shows that the volumes of approved requests for each type of short-term transmission service increased in 2003.
- The approval rates in 2003 were slightly higher for weekly service and slightly lower for hourly service.
  - ✓ Secondary service, which are schedules to secondary points under a firm reservation, are non-firm and always approved (then curtailed if necessary).
- The volumes of daily firm service in both years is higher than all other classes of short-term service.

Short-Term Reservation Requests

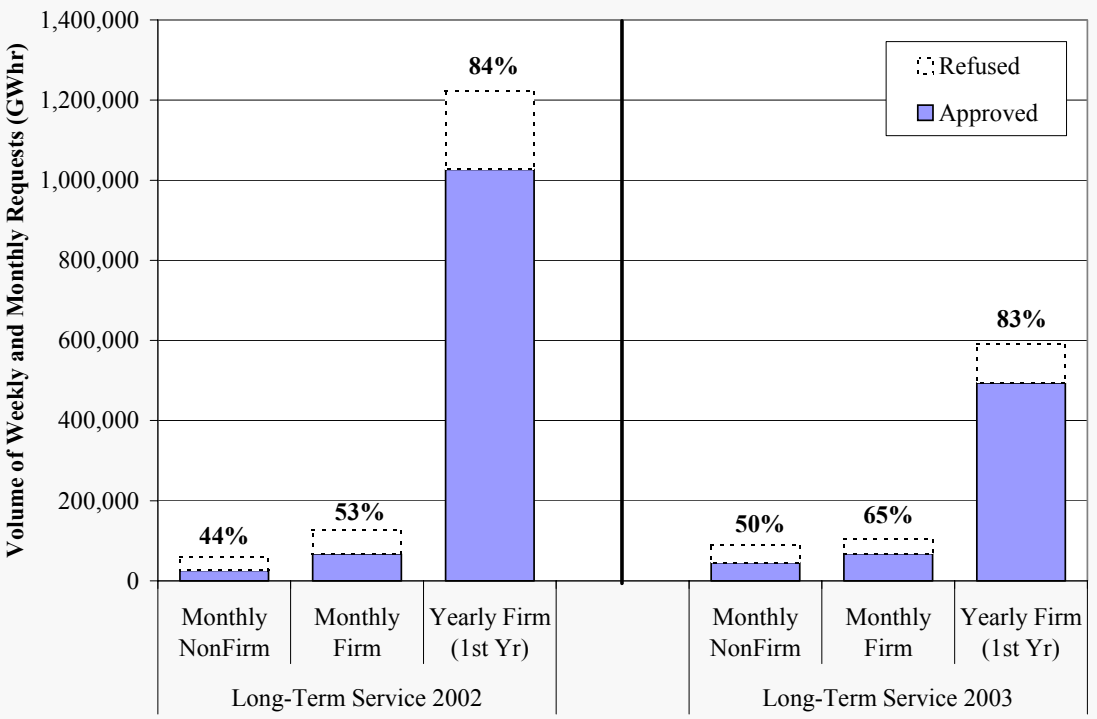


* Secondary non-firm service are schedules between secondary receipt or delivery points that are made under a firm reservation. These schedules are non-firm in priority and refusals of these schedules are not contained in the OASIS data (since they are not a request for new service). Therefore, no approval share is computed.

Short and Long-Term Reservation Requests

- The short-term and non-firm requests should generally exhibit a higher approval rate because (i) there is less uncertainty regarding available capability in the short-term, and (ii) the service imposes a lower obligation on the system.
  - ✓ For example, the Midwest ISO must have the ability to deliver power under all conditions over a year to approve yearly firm service.
  - ✓ Alternatively, hourly non-firm service must only be deliverable in the next hour and, if necessary, it can be curtailed.
- The results shown in the following figure show that the approval rates are generally lower than for short-term service.
- The volumes of service (in GWhs) are relatively large because the duration of the service is much longer (e.g., one request for yearly service of a given quantity would be equivalent in GWhs to 365 daily requests).
- This figure shows that the yearly requests account for a larger volume than any other class of service. The volumes of yearly requests decreased in 2003 due to:
  - ✓ Multi-year requests from 2002 that reduce available capability in 2003.
  - ✓ An increasing share of yearly requests that have accumulated in the Queue due to processing issues associated with long-term service renewals.

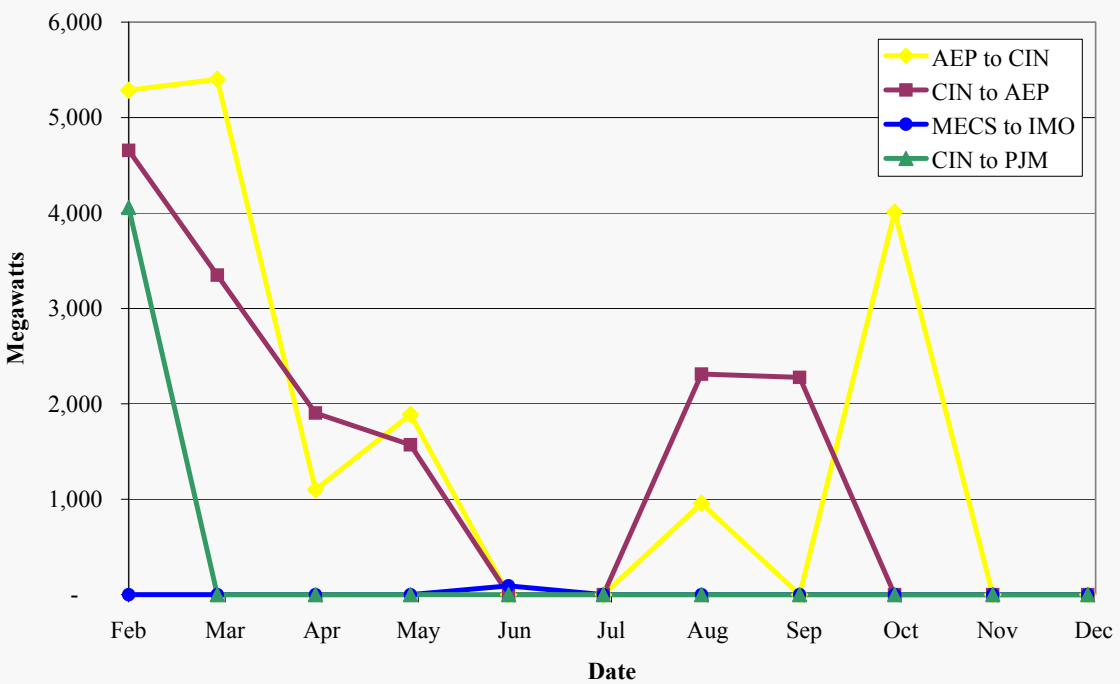
Long-Term Reservation Requests



Long-Term ATC Between Selected External Areas

- The next figure shows the estimated available transfer capability ("ATC") between the MISO and adjacent areas.
  - ✓ Cinergy is used as the MISO point for three of the paths because it is the most liquid trading point in the MISO area.
  - ✓ The ATC is shown to and from AEP, to PJM, and to Ontario from Michigan.
- The ATC estimates are derived from the posted AFC values based on how much of the transaction on a given path would actually flow over each flowgate.
- The figure indicates that long-term ATC has decreased over the year and is generally very low.
  - ✓ ATC from Cinergy to PJM and MECS to IMO are close to zero throughout 2003.

Long-Term ATC Between Selected External Areas



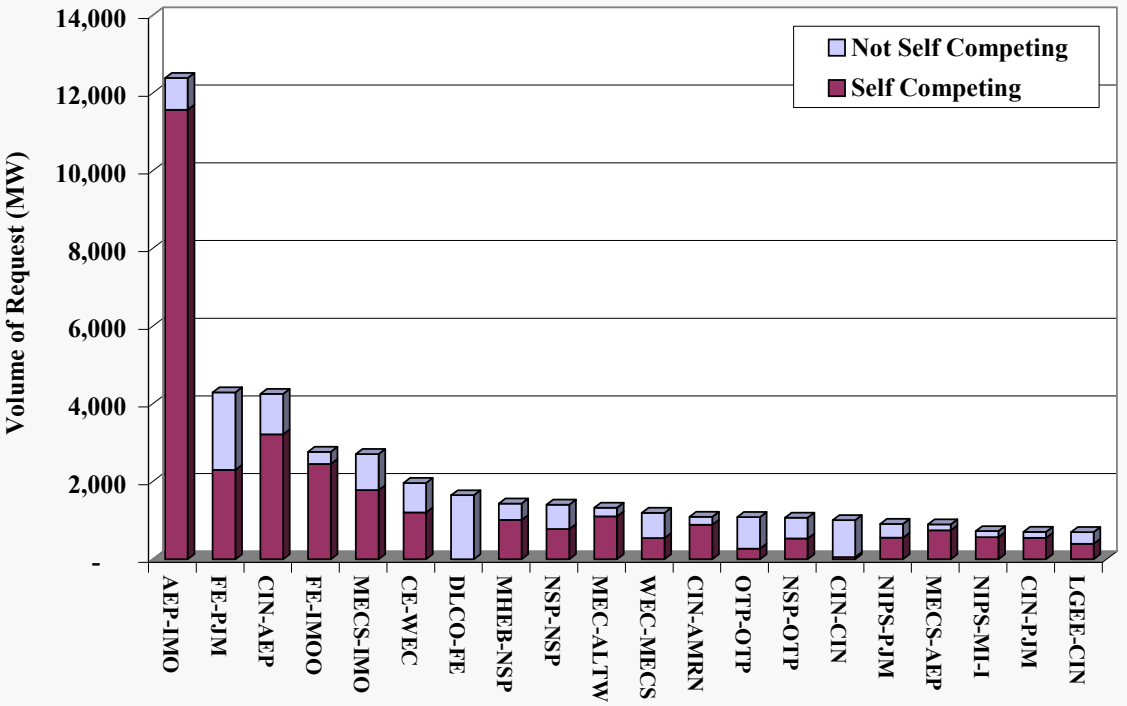
Long-Term ATC Between Selected External Areas

- These ATC values are affected by the requirement to reduce AFCs while a request it is pending. This can be a long time, including time for:
  - ✓ The ISO to determine whether a study is needed and conduct the study; and
  - ✓ The participant to determine whether it will pay for a study and to confirm the reservation if it is approved.
- This makes transmission capability unavailable for yearly service and shortage duration service over all paths that would affect the same flowgates.
- Other factors contributing to the increase in volumes of long-term requests and the low ATCs include:
  - ✓ The fact that no transmission charges are levied for reservations between MISO and PJM.
  - ✓ Long-term transmission rights, even those acquired recently, provide the holder an entitlement to an allocation of the FTRs.
  - ✓ The rules and procedures governing the queue process provide incentives for participants desiring to acquire or retain long-term capacity on congested interfaces to submit numerous requests.

Self-Competing Long-Term Requests

- The rules and procedures governing long-term renewals and requests can allow a participant to benefit by having numerous requests in the queue, even if the participant only intends to confirm one of the requests.
  - ✓ We refer to these type of requests as “self-competing” requests;
- To evaluate whether the current rules may be causing participants to submit self-competing requests, the following figure shows the volumes of requests on the twenty most heavily requested paths.
  - ✓ Self-competing requests are those requested by the same participant over the same path, and which straddle a fixed point in time (June 1, 2004).
  - ✓ Self-competing requests do not include the first request made by the participant or any requests that are ultimately confirmed by the participant.
- The figure shows that a high percentage of the requests on the paths between two MISO control areas or to external areas are self-competing.
- MISO is examining options for improving the long-term request and queue process. Among the options that we believe would be beneficial is charging a processing fee for requests that would increase with the duration of service.

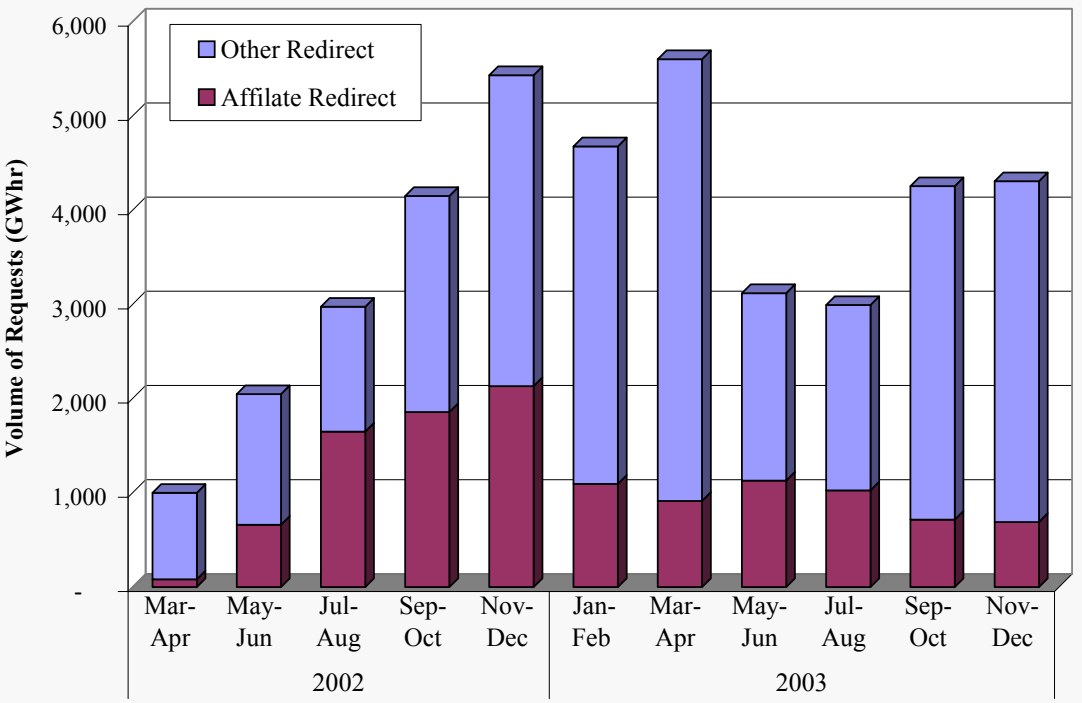
Self-Competing Long-Term Requests



Redirected Transmission Requests

- Market participants with firm transmission reservations are able to "redirect" a firm reservation to alternative MISO source-sink pairs.
  - ✓ Firm service that is redirected to secondary points on an hourly basis is non-firm.
  - ✓ Firm service can also be redirected on a firm basis for a term that is less than or equal to the original reservation term (e.g., a monthly reservation could be redirected on a daily basis).
  - ✓ In both cases, the revenue associated with the redirected service is allocated to the redirected sink location, providing an incentive for participants to redirect service back to their own control areas to retain the transmission revenues.
- The following chart shows the total monthly volume of transmission service redirected to an affiliate's control area and to other locations.
  - ✓ This analysis shows that the total volume of redirected service increased in 2002 before decreasing in 2003, while redirected service to affiliates also decreased.
- Despite these results that show the quantities of redirected service have not been increasing, this rule does provide affiliates of transmission owners an advantage over their unaffiliated competitors.

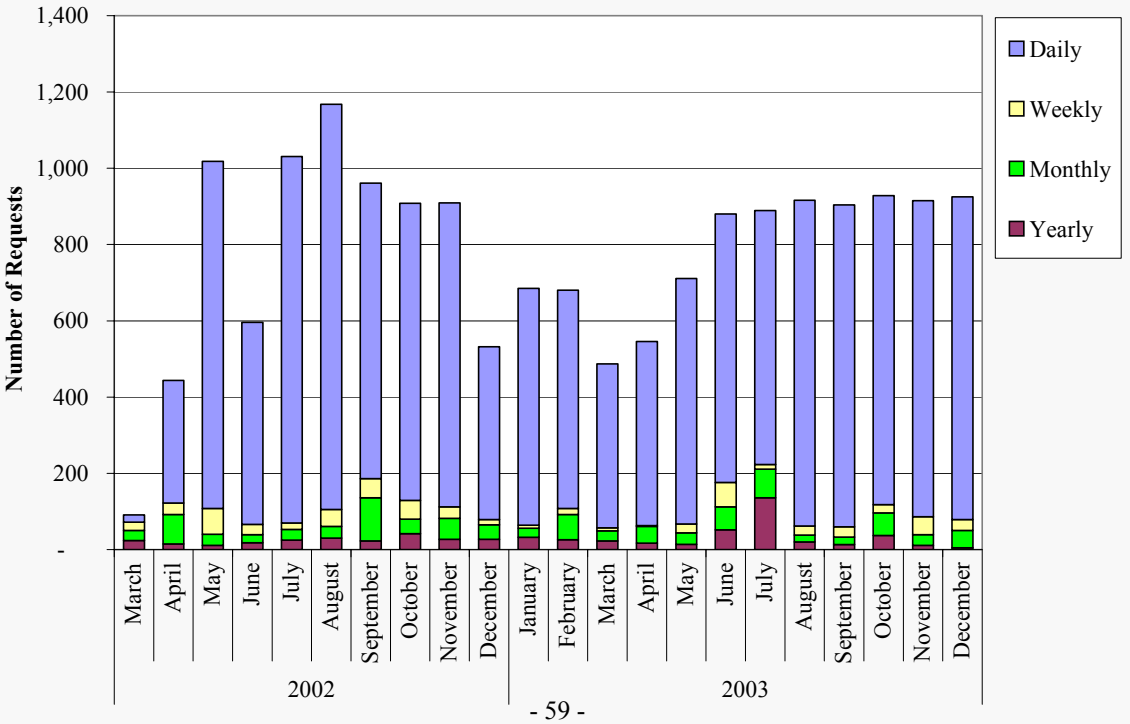
Redirected Transmission Requests



Evaluation of Unconfirmed Transmission Requests

- The next area of analysis evaluates the patterns and effects of unconfirmed transmission requests.
- Transmission capability available to market participants is reduced when a request is made, even if the reservation is not confirmed.
  - ✓ For daily firm service, requests can be made up to 14 days in advance. If MISO accepts the request, the participant has 24 hours to confirm (if the request is made at least 24 hours in advance), else it has 2 hours to confirm;
  - ✓ Participants have a longer time to confirm longer-term service as specified in Attachment J of the MISO's OATT (e.g., 15 days for yearly firm service).
  - ✓ During this time, the transmission capability will be unavailable to other participants requesting the service.
- Hence, large quantities of unconfirmed requests can cause transmission capability to be under-utilized.
- The number of unconfirmed requests in each month for various types of service is shown in the following figure, which indicates that the quantity of unconfirmed requests have not increased substantially from 2002 to 2003.

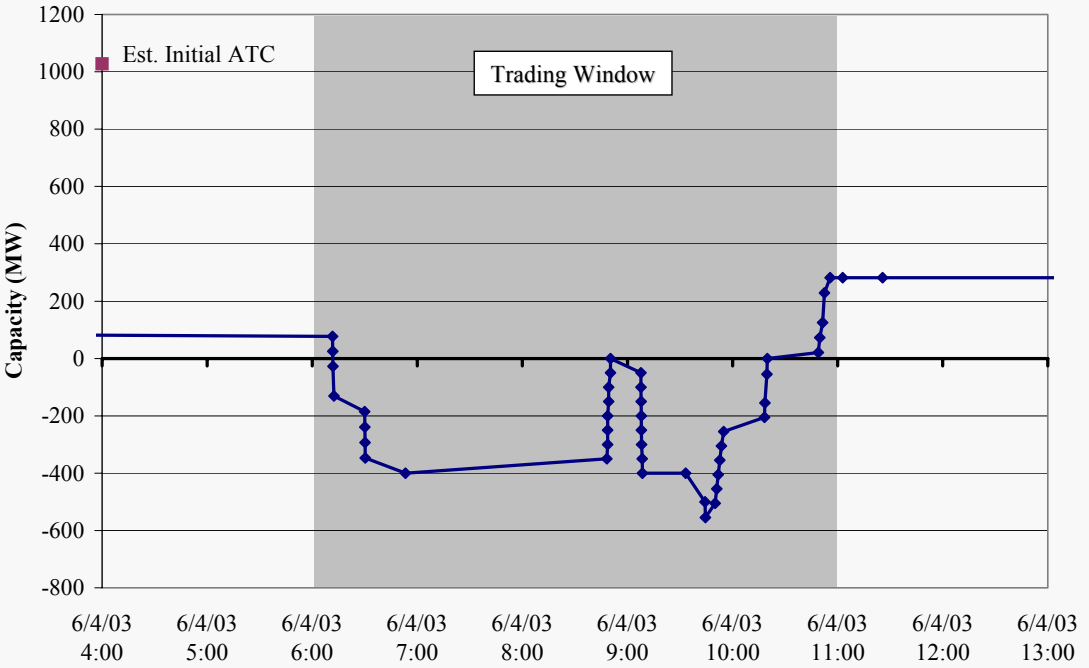
Trend in Unconfirmed Transmission Requests



Evaluation of Unconfirmed Transmission Requests

- The prior figure shows that the largest quantity of unconfirmed requests is for daily firm service – the largest share of which are over the Cinergy to TVA path.
- Hence, we evaluated these patterns of unconfirmed requests to determine whether they indicate potential hoarding of transmission, focusing on daily firm service.
- We considered a reservation to be potential hoarding if three conditions were met:
  - ✓ The daily firm ATC was zero during the trading window in which marketers and other participants make trades for the next day (6 a.m. to 11 a.m. central time);
  - ✓ MISO refused requests for daily firm service on the path; and
  - ✓ The ATC was greater than zero at the end of the reservation period for the service (i.e., daily firm capability went unsold).
- The following figure shows a day when these three conditions were met on the Cinergy to TVA path.
  - ✓ Although the initial ATC on the path was close to 1000 MW, there was no ATC during the most of the intervals in the trading window.
  - ✓ However, 300 MW of ATC became available after the trading window because the approved requests were not confirmed by the participant.

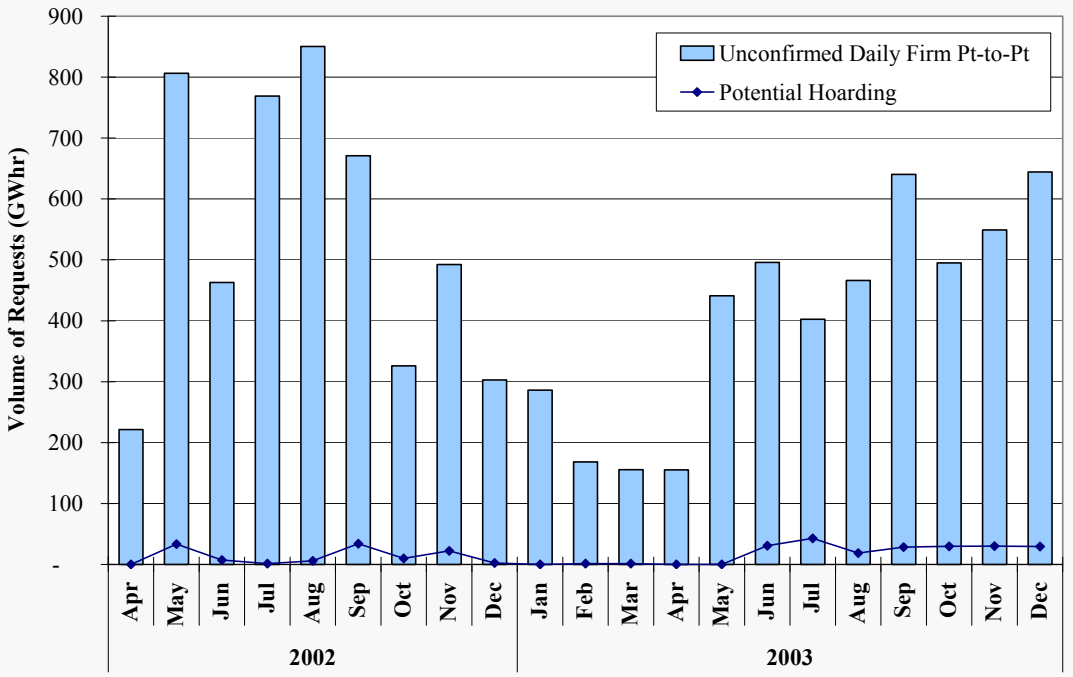
Estimated Firm Daily ATC – Cinergy to TVA
June 5, 2003



Evaluation of Unconfirmed Transmission Requests

- The following chart shows the total volume of unconfirmed daily firm requests by month.
- To evaluate whether these unconfirmed requests may indicate transmission hoarding, we applied the three criteria described above.
  - ✓ The volume of requests that satisfy these three criteria is shown in the figure as potential withholding.
  - ✓ These results show that there has not been a substantial quantity of unconfirmed requests that meet these criteria.
- The tariff allows participants a free call option on firm transmission service for the time period between the approval and the deadline to confirm the service.
  - ✓ This call option can be valuable on days when a significant basis differential emerges in the bilateral forward markets.
- Because this conduct can block participants' access to firm service at times, we recommend the MISO consider tariff revisions to eliminate this "free call" aspect of the tariff.

Approved and Confirmed Requests and Potential Hoarding



Duration of Transmission Reservation Process

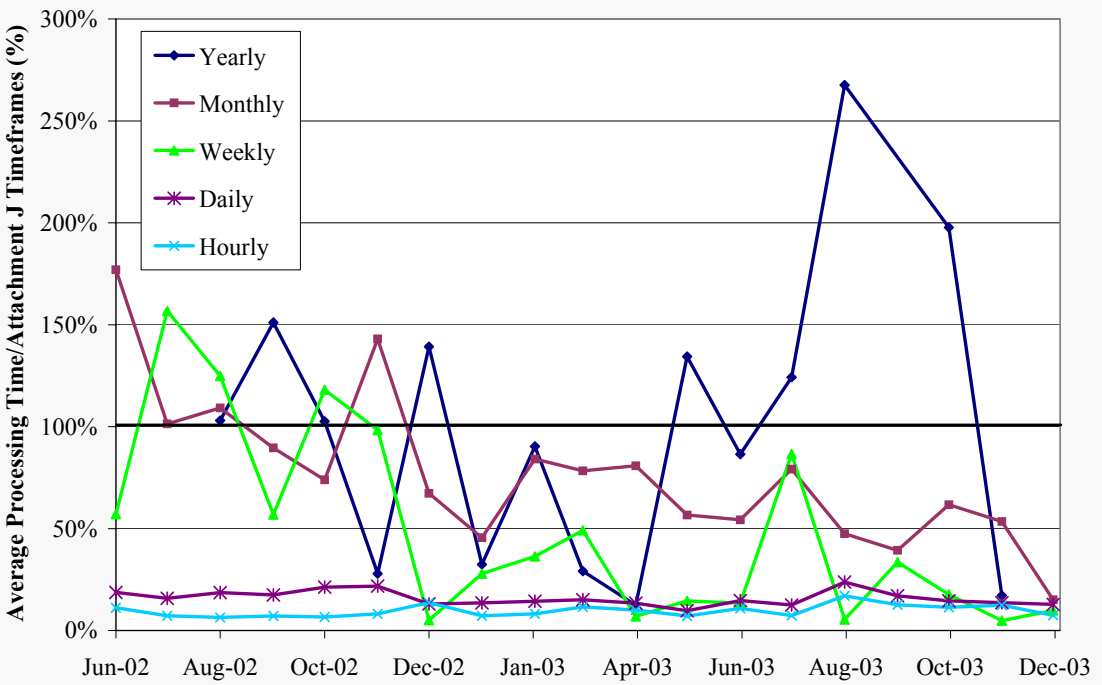
- The final analysis in this section evaluates the duration of the reservation process for various types of transmission service.
- The following figure shows the average time to achieve a final disposition for each type of service relative to the maximum timeframes for processing requests that are provided for in Attachment J of the MISO Open Access Tariff.
  - ✓ For reservations for service increments of a month or longer, the time used to achieve a final disposition could include actions by both the MISO and the participant.
  - ✓ In particular, if a study is required to determine ATC sufficiency, the MISO has a longer response time than when a study is not needed. Additionally, the participant will take time to decide whether or not to have the study conducted. Our data was not sufficient to determine when a study was required or not.
  - ✓ We assume no study is needed, which shortens the assumed time MISO is required to process the request from 60 days to 30 days for reservations of one month or longer. This will tend to make the values appearing in the following figure slightly higher.

Duration of Transmission Reservation Process

These results in the following figure show:

- ✓ Processing of daily and hourly service has remained relatively fast.
  - – Much of this process is automated.
- ✓ The duration of the longer-term weekly and monthly service has decreased from 2002 to 2003.
  - – Indicating improvements in the MISO's analysis and processing.
- ✓ The duration of yearly service has been highly variable.
  - – The processing of yearly requests has become problematic due to excessive volumes of requests.

Duration of Transmission Reservation Process



Midwest ISO Transmission Operations in 2003

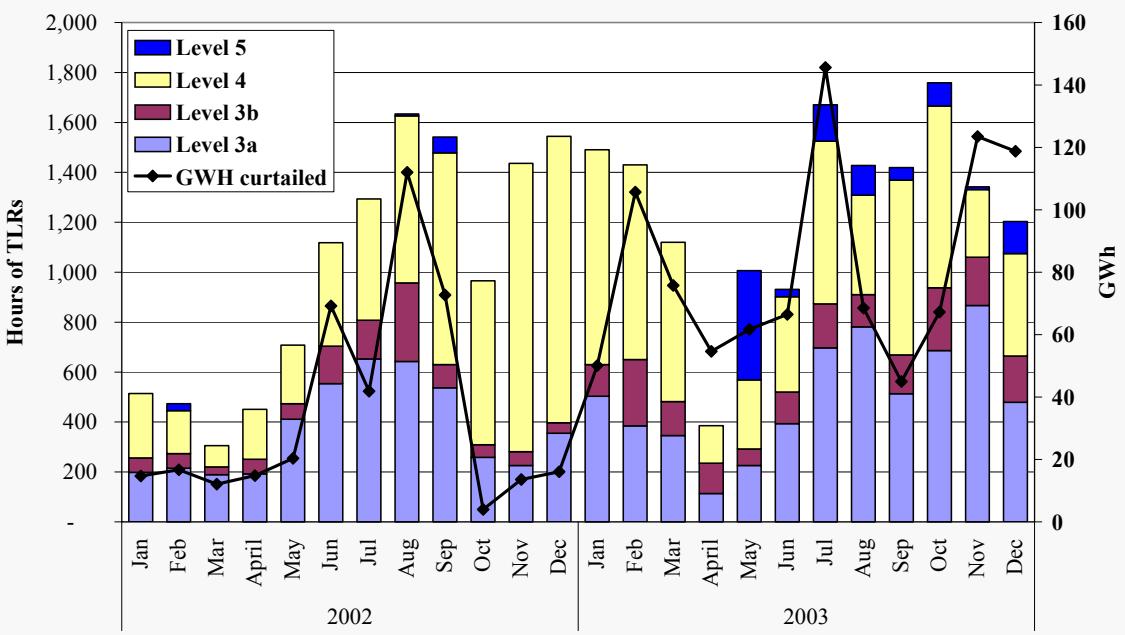
Assessment of Transmission Operations in 2003

- This section evaluates the Midwest ISO's transmission system operations in 2003, particularly as it relates to the MISO's facilitation of the wholesale markets in the Midwest.
- In this regard, this section evaluates:
  - ✓ TLR patterns over the past two years;
  - ✓ The level of curtailments associated with TLRs called by the MISO;
  - ✓ The effectiveness of the TLR process for managing congestion; and
  - ✓ The accuracy of short-term AFC postings;

TLR Events and Curtailments in 2003

- The following figure shows the number of TLRs by level that occurred in each month in 2002 and 2003 and the quantity of transactions curtailed.
- The TLR levels shown include:
  - ✓ Level 3 – non-firm curtailments.
  - ✓ Level 4 – commitment or redispatch of specific resources or other operating procedures to manage specific constraints.
  - ✓ Level 5 – curtailment of firm transactions.
- The TLRs called on Midwest ISO flowgates (level 3 and above) account for 62 percent of all TLRs called in the eastern interconnect.
  - ✓ Much of the eastern interconnect is operated under LMP or other central markets that redispatch generation rather than utilizing TLRs to manage congestion.
  - ✓ To maximize the utilization of the system, the Midwest ISO will approve non-firm reservations that are later curtailed in favor of a firm reservation and schedule.
- The figure shows that the curtailment quantities have increased significantly from 2002 as the number of TLR events has increased.

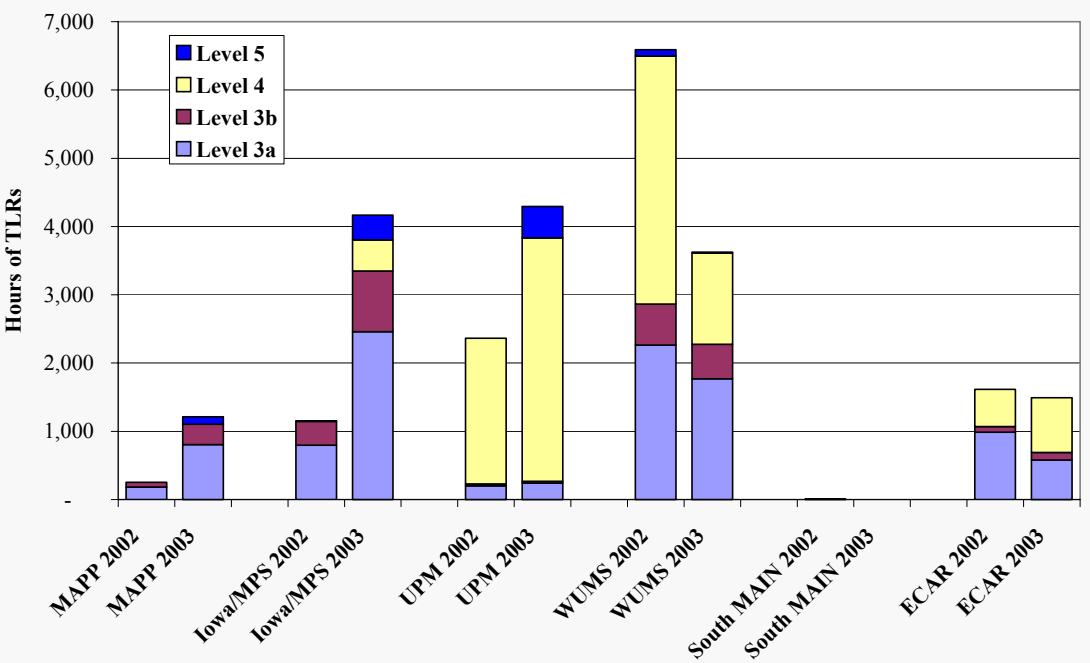
TLR Events and Transactions Curtailed 2002 to 2003



TLR Events and Curtailments in 2003

- The next figure shows the monthly number of TLRs and transactions curtailed that occurred in 2002 and 2003 by region.
  - ✓ The figure indicates that three areas with the most TLRS are WUMS, the Upper Peninsula of Michigan ("UPM"), and Iowa/MPS.
- TLRs in WUMS and UPM
  - ✓ The figure shows that a large share of the TLRs in these areas are TLR level 4, which result in redispatch of generation.
    - – This is the case because congestion is frequently managed in WUMS by the cost-based redispatch process of American Transmission Company.
  - ✓ The primary cause of the increase in TLRs in the UPM, particularly the level 5 TLRs, was an extended outage at the Presque Isle plant in the UPM that required many hours of redispatch and load curtailments to manage the flows into the area.
  - ✓ The TLR activity into the broader WUMS region was lower in 2003 due to transmission outages on the western interface into WUMS in 2002
- TLRs in Iowa/MPS
  - ✓ One of the primary causes of the increased TLRs in Iowa was the relatively light hydro conditions for Manitoba Hydro, which significantly affected the schedules and flows through the region.

TLR Events by Region -- 2003



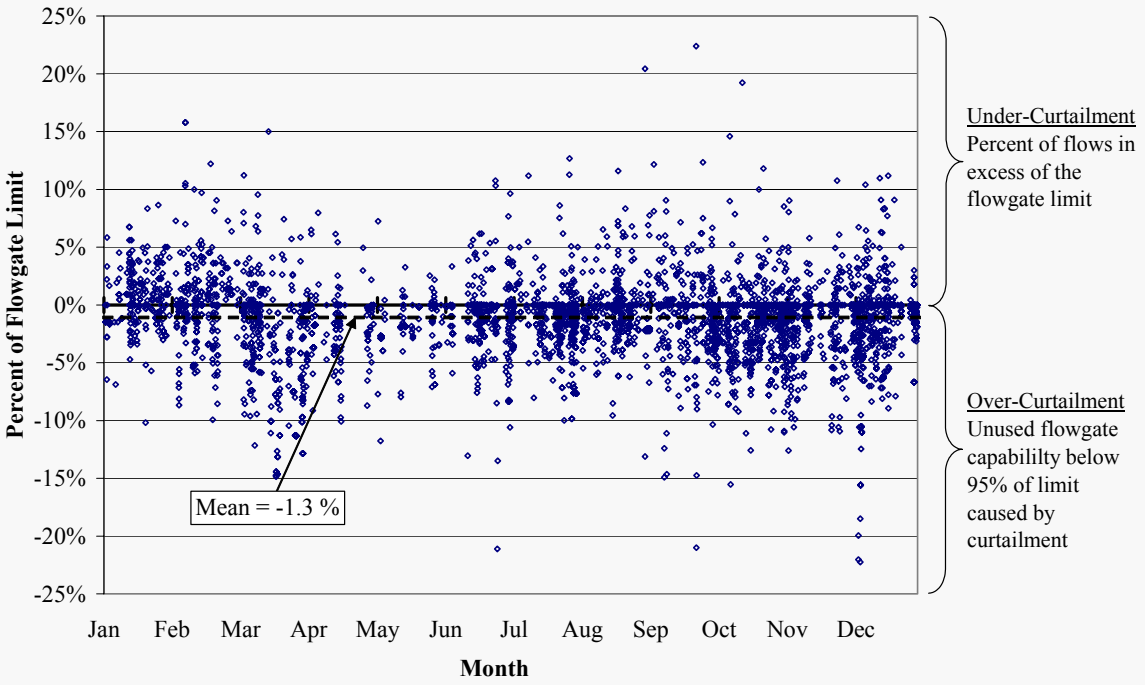
TLR Events and Curtailments in 2003

- The next analysis evaluates Midwest ISO's TLR calls in 2003.
- To evaluate the TLR calls by the Midwest ISO in 2003, we examined the flows on each of the flowgates in hours when TLRs were called.
  - ✓ TLRs should be called when the flow on a flowgate is approaching its limit.
  - ✓ When a TLR is called, curtailments are requested to reduce the flow to 95 percent of the flowgate limit.
  - ✓ This range exists in part because there is uncertainty regarding:
    - The amount of relief that will be needed since the operators are forecasting the operating conditions 20 minutes before the hour, which can be more than an hour before the relief is forecasted to be needed; and
    - The relief that any particular curtailment will provide since transactions are modeled from control area to control area.

TLR Events and Curtailments in 2003

- The following figures evaluate each TLR curtailment by showing whether the relief from the curtailments was greater than or less than the actual need.
  - ✓ Over-curtailment = curtailments that cause the flow to be less than 95% of the limit.
  - ✓ Under-curtailment = additional relief necessary to reduce the flow to the limit.
  - ✓ The flow in the middle of the hour with the TLR is used to exclude the effects of ramping that can exist at the beginning or end of the hour.
- The first figure is a scatter chart showing each TLR curtailment throughout 2003.
  - ✓ TLR level 4 events are not included since they result in redispatch rather than curtailments.
- This figure shows that:
  - ✓ The bulk of the curtailments are in the range of 5 percent over-curtailment to 5 percent under-curtailment with limited outliers.
  - ✓ The mean value is a 1.3 percent over-curtailment.

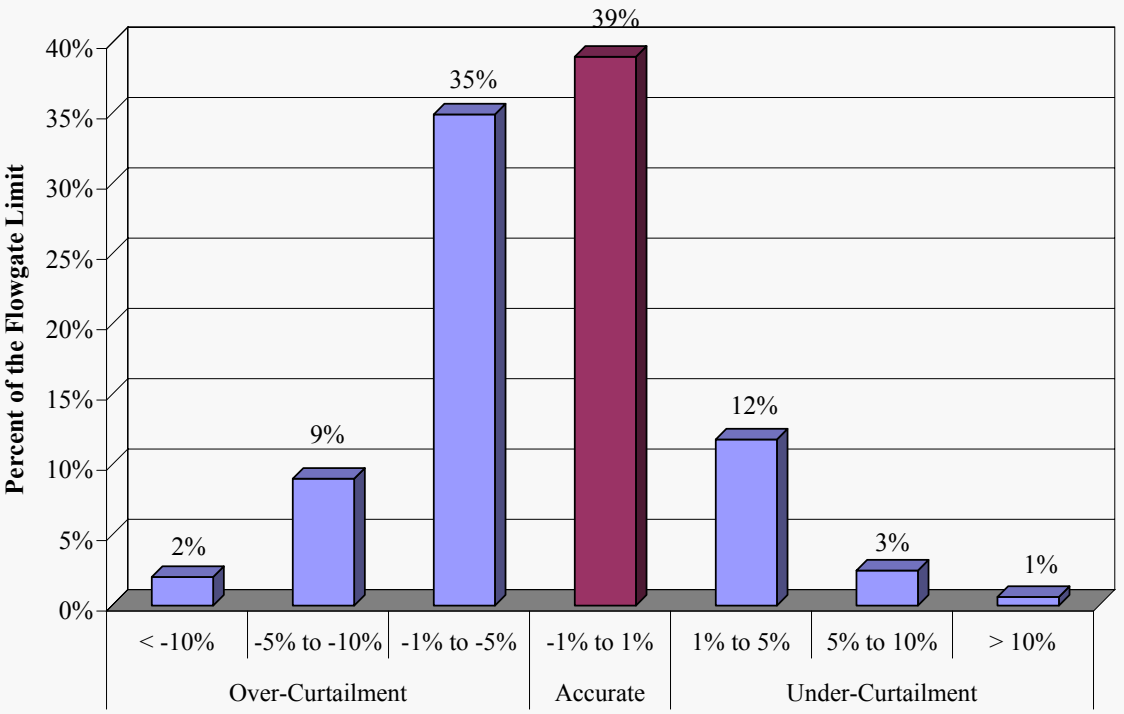
Over and Under-Curtailment During TLRs Events 2003



TLR Events and Curtailments in 2003

- The following figure shows the distribution of the over and under-curtailments during 2003.
- This figure shows:
  - ✓ Almost 40 percent of the curtailments are accurate, with over or under-curtailments of less than 1 percent of the flowgate limit; and
  - ✓ More than 86 percent of the curtailments exhibit over or under-curtailment amounts of less than 5 percent of the flowgate limit.
- These results are encouraging considering the uncertainties inherent in the TLR process.

Distribution of Over and Under-Curtailments During TLR Events in 2003



TLR Events and Curtailments in 2003

- Complementing the prior analysis of TLR calls by the Midwest ISO, we also sought to identify any cases where the MISO was slow in invoking a TLR, allowing the flow to rise above the flowgate limit.
- To do this we identified every interval on every flowgate where the flow was greater than 100 percent of the limit and no TLR was invoked.
- This analysis showed that it was extremely rare for flow to be greater than 100 percent without the Midwest ISO invoking the TLR procedures:
  - ✓ The average frequency over all the flowgates was less than 0.02 percent of the intervals (approximately 2 hours) from January to December 2003.
  - ✓ The highest frequency on any flowgate was 0.9 percent.
- Taken together with the prior analysis, this analysis supports the conclusion that the Midwest ISO's operators invoked TLRs in a consistent and justified manner.

Analysis of TLR Efficiency

- Although the Midwest ISO has implemented TLRs justifiably, the TLR procedures are not an efficient means to manage congestion.
- The analysis in this section examines the effectiveness of the TLR procedures by comparing the results of the TLR process to a redispatch of generation to manage the same congestion.
- The analysis in the following table examines TLR events by flowgate to determine the quantity of redispatch that would have been necessary to achieve the same relief that the TLRs provided.
  - ✓ The redispatch quantity is determined by using the most effective generating units (based on their generation shift factors) to relieving flow on the flowgate.
- The table shows the results of our analysis for each flowgate that had at least 5 TLR events during 2003.
  - ✓ The table shows the average amount of flowgate relief required per event, the average amount curtailed to achieve the relief, and the redispatch amount that would have been necessary to achieve the same relief.

Analysis of TLR Efficiency

- The table also shows two comparison statistics for each flowgate to compare the amount of generation that must be redispatched to achieve the same relieve as the TLR curtailment.
  - ✓ Redispatch ratio: redispatch amount divided by the curtailment amount. A ratio of 50% would indicate that the redispatch amount was one-half of the curtailment amount; and
  - ✓ Excess TLR curtailments: This indicates the additional quantity of TLR curtailments beyond the redispatch amount as a percent of the redispatch amount. Hence, 100% means the curtailment amount was double the redispatch amount.
- This analysis shows that:
  - ✓ The TLR process, on average, curtails more than three times as many transactions as could be redispatched to achieve the same result.
  - ✓ For the individual flowgates, the TLR curtailments ranged from 73 percent more than the redispatch amount to 472 percent more (almost six times the redispatch amount).

Redispatch Ratio by Flowgate for TLR Events 2004

Flow Gate	TLR Events	Relief Provided (MW)	Curtailed Amount (MW)	Redispatch Amount (MW)	Comparison Statistics	
					Redispatch Ratio	Excess TLR Curtailments
11Blue L 161 20Blit C 161 flo 06Clifty	6	15	261	115	44%	128%
12w Lexi 345 12Brwn N 345	8	13	172	45	25%	306%
Paddock Xfmr 1 + Paddock-Rockdale	32	24	156	53	32%	214%
Rockdale 345-138 T2 Flo Rockdale 345-138	14	26	182	101	47%	114%
Albers-Paris138 For Wemp-Paddock 345	48	16	185	93	46%	118%
Poweshiek-Reasnor 161 For Montezuma-Bond	29	9	154	43	28%	254%
Arnold-Hazelton 345 For Wemp-Paddock 345	17	33	267	78	30%	234%
Arnold – Hazleton	5	52	395	135	33%	201%
Lore-Turkey River 161 (Flo) Wemp-Paddock	24	17	175	115	58%	73%
Arnold-Vinton 161 For D.Arnold-Hazleton	40	13	221	45	19%	422%
Lakefield-Fox Lk 161 For Lakefield-Lgs 3	18	18	224	58	19%	436%
Wisdom-Triboji 161 Flo Raun-Lakefield 34	5	25	230	104	39%	157%
Lakefield-Fox Lake 161 (Flo) Lakefield-W	11	18	259	52	16%	522%
Genoa-Coulee Flo Genoa-Lacrosse-Marshland	15	10	153	49	32%	216%
Montezuma-Bondurant 345kv	42	26	329	63	17%	482%
Sub K/Tiffin-Arnold 345kv	13	32	304	72	22%	347%
S1226-Tekamah 161kv Flo S3451-Raun 345kv	13	22	234	105	44%	126%
Weighted Average Redispatch Ratio					**31%**	**218%**

Conclusions: the TLR Process vs. Day 2 Markets

- The TLR process has been implemented competently by the ISO and has been improved through use of the state estimator.
- However, the results of the prior analysis indicate that the TLR process is substantially inferior to the Day 2 markets.
  - ✓ The Day 2 markets will dispatch the most effective resources to manage congestion.
- The Day 2 markets will also increase the utilization of the transmission network and promote reliability.
  - ✓ The real-time economic redispatch (every 5 minutes) will allows transmission interfaces to be operated closer to the rated limits (e.g., to have lower transmission reservation margins and other operating offsets).
  - ✓ The relief available from redispatch is much more predictable and timely than relief through TLR or emergency redispatch, which should contribute to improved reliability.

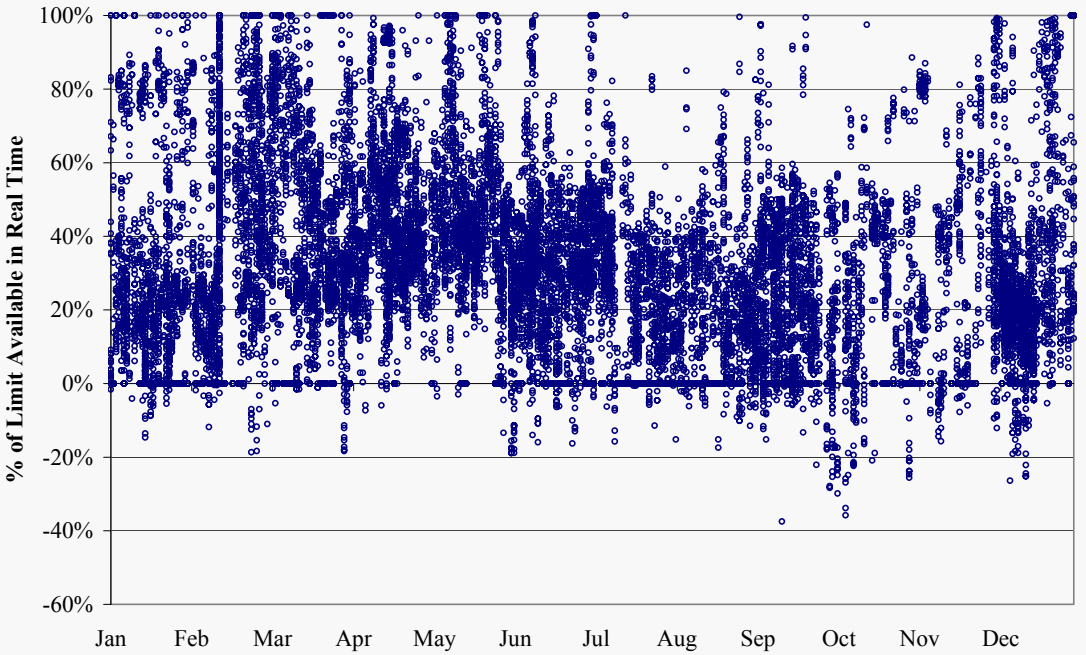
AFC Issues and Analysis

- MISO calculates AFC for firm and non-firm transmission service of various durations (hourly, daily, weekly, monthly, yearly).
- The AFC calculations involve a complicated process including:
  - ✓ Multiple models addressing different time horizons; and
  - ✓ Forecasted generation, load, transmission schedules, and loop flows from other systems.
- MISO has spent considerable resources improving the AFC calculations by improving the quality and completeness of the data and models.
- To assess the accuracy of the AFC values, we have conducted an analysis of the AFC relative to the un-utilized physical capability of the flowgates.
  - ✓ The analysis focuses on hours when MISO posted zero AFC for non-firm hourly PTP service on a flowgate.
  - ✓ Hours with zero AFC are studied because they affect power trading in the Midwest by (i) causing short-term reservation and scheduling requests to be refused, and (ii) signaling to participants that capability is unavailable.

AFC Issues and Analysis

- The AFC values will not match the unused physical flowgate capability because:
  - ✓ The AFC models forecast loads, generation, and other factors that can vary significantly from actual realized values.
  - ✓ AFC calculations are additionally affected by conservative assumptions regarding system conditions: For firm AFC calculations, reservations are assumed to be scheduled at a rate of 90% between their primary points and counter-flow reservations are assumed to be scheduled at only 10%. For non-firm AFC calculations, 100% of reservations between the primary points is assumed and 50% of the counter-flows. For firm reservations more than a month out, reservations are assumed to be scheduled at a rate of 85% between their primary points and counter-flow reservations are assumed to be scheduled at only 15%.
- The following figure shows the percentage of the flowgate capability available based on the real-time flows (accounting for TRM) in hours when a flowgate has a zero hourly non-firm AFC.
  - ✓ This figure shows a wide variance in the unused physical capability of the flowgates.
  - ✓ The average amount of capability available on the flowgates with zero hourly non-firm AFC is 33 percent.

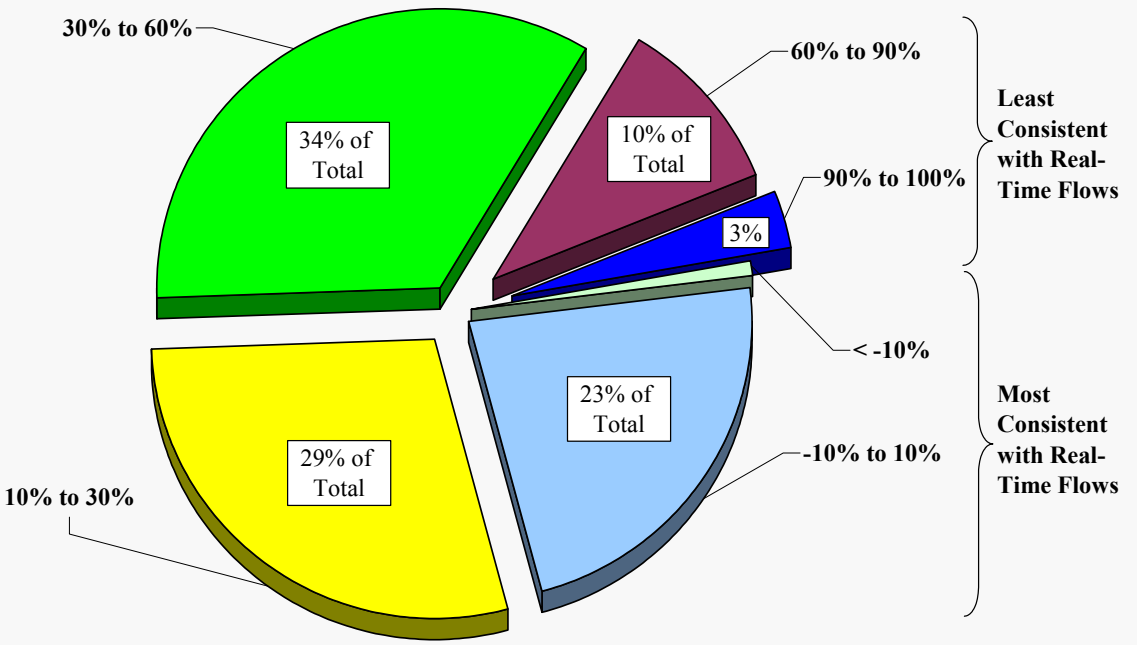
Percentage of Flowgate Limit Physically Available in Real Time During Hours with Zero AFC



AFC Issues and Analysis

- To further evaluate these results, the next figure shows the distribution of these values.
  - ✓ The largest single value in this distribution is 0 percent. This occurs, in part, because we assume that a flowgate in TLR has zero unused capability.
  - ✓ In almost one fourth of the cases, the portion of the flowgate that is unused is less than 10 percent.
  - ✓ However, more than 30 percent of the flowgate capability is physically unused in almost one-half of the cases.
- We note that:
  - ✓ Some of the AFC values are calculated by other entities; and
  - ✓ The effect of understated AFCs is mitigated by the fact that the MISO will often approve hourly non-firm service in these hours.

Available Flowgate Capability During Hours with Zero Hourly Non-Firm AFC -- 2003



AFC Issues and Analysis

- It is important to continue to improve the AFC values and make them as accurate an indicator of available capability as possible.
- MISO made some improvements in the calculation of the hourly non-firm AFC values in 2003:
  - ✓ In May, MISO restored hourly AFC quantities associated with daily and longer-term reservations that were not scheduled by the scheduling deadline.
  - ✓ In December, MISO began using the State Estimator information to improve its short-term AFC models.
  - ✓ Based on our review, these improvements have not resolved these issues.
- Hence, we recommend the MISO fully utilized the state estimator results and continue to investigate other improvements to improve the accuracy of the AFC values.

Market Power Issues

Market Power Issues -- Background

- The HHI statistics calculated above provide only a general indicator of market concentration.
  - ✓ HHIs are not a reliable indicator of potential market power concerns in the Midwest ISO market area because they do not recognize the critical role of transmission constraints in determining the extent of the geographic market nor do they recognize demand levels;
- Market power concerns in electricity markets are typically the result of transmission constraints.
- Locational market power arises when transmission constraints are binding, preventing adequate competition and giving rise to potential market power.
- We conducted a locational market power analysis in conjunction with developing the market power mitigation measures that were filed in March 2004.

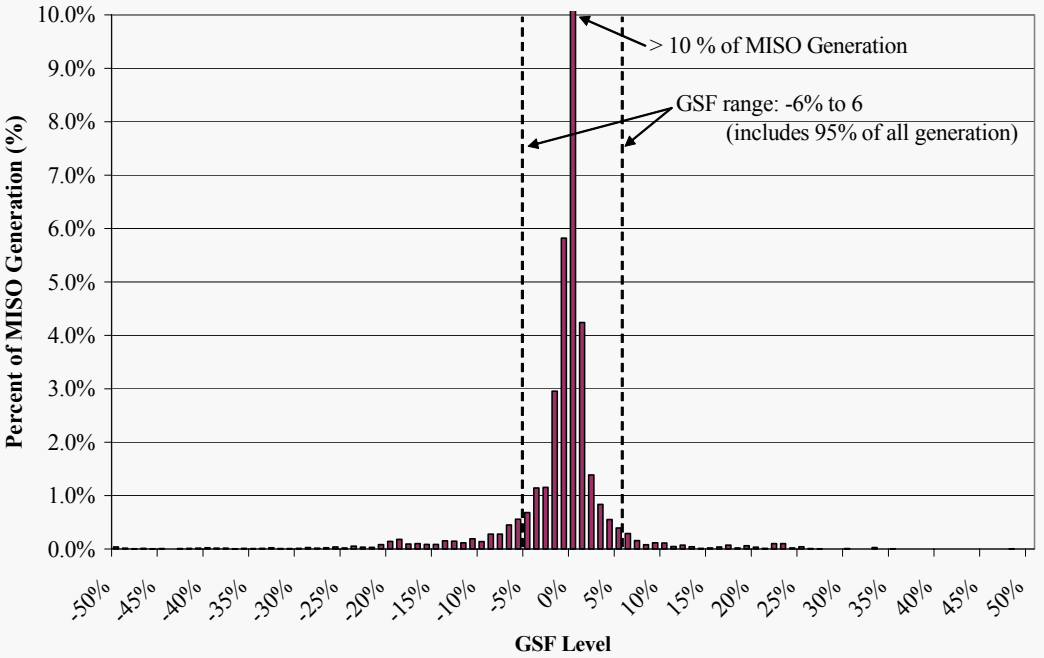
Market Power Analysis

- The analysis focused on areas that experienced frequent congestion and which had one or more pivotal suppliers.
- A supplier is pivotal if it can overload a flowgate even when rivals' generators are redispatched to reduce the flow over the flowgate.
  - ✓ The effect of the pivotal supplier and its rivals is determined by the generation shift factors (GSFs) of each unit on each flowgate.
- The analysis was conducted on all Midwest ISO flowgates that had measurable congestion during the two years. This was measured based on
  - ✓ The frequency of Transmission Line Relief (TLR) events of Level 3 and above – the level at which transaction curtailments are initiated; and
  - ✓ Flowgate Management Tool (FGMT) data – congestion was indicated when flows on the flowgate were close to the flowgate limit.

Market Power Analysis - GSFs

- GSFs were estimated and used in the analysis. GSFs indicate the portion of each generator's output that will flow on each flowgate.
  - ✓ A positive GSF indicates that incremental production from the unit will increase the flow in the direction of the constraint.
  - ✓ A negative GSF indicates that incremental production from the unit will create flows in the opposite direction from the constraint (i.e., "counter-flow") that will relieve congestion on the flowgate by increasing production.
  - ✓ Likewise, a generator with a negative GSF may create congestion on the facility by reducing its output.
- As one moves away from a given transmission facility electrically, GSFs tend to decline rapidly.
- The following figure shows the distribution of GSFs for all flowgates studied.
  - ✓ This figure indicates that more than 95 percent of the MISO units have GSF factors between -6 percent and 6 percent.
  - ✓ For most flowgates, therefore, the vast majority of the MISO units are electrically distant and have little effect on the flowgate flows.

Distribution of Generation Shift Factors
All Flowgates Studied

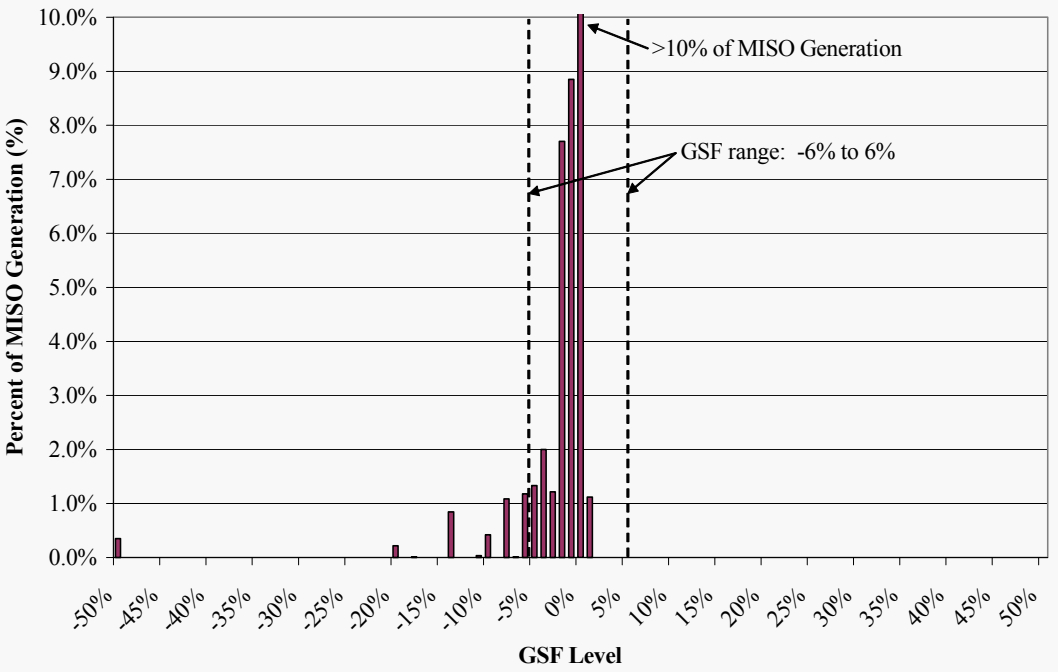


Pivotal Supplier Analysis – GSFs

- The prior figure shows that for most flowgates, the vast majority of units are electrically distant and have little effect on the flowgate.
- However, the distribution of GSFs can vary substantially as shown in the following two figures.
  - ✓ The first figure shows a more concentrated distribution of GSFs relative to the second figure.
  - ✓ This is due in part to the fact that the first figure shows a lower voltage flowgate (138 kV) than the second figure (345 kV).
  - ✓ The flow on higher voltage flowgates will tend to be affected by generating units over a broader area.
- For this study, GSFs are calculated based on four AFC cases for 2004: February, April, August, and November.

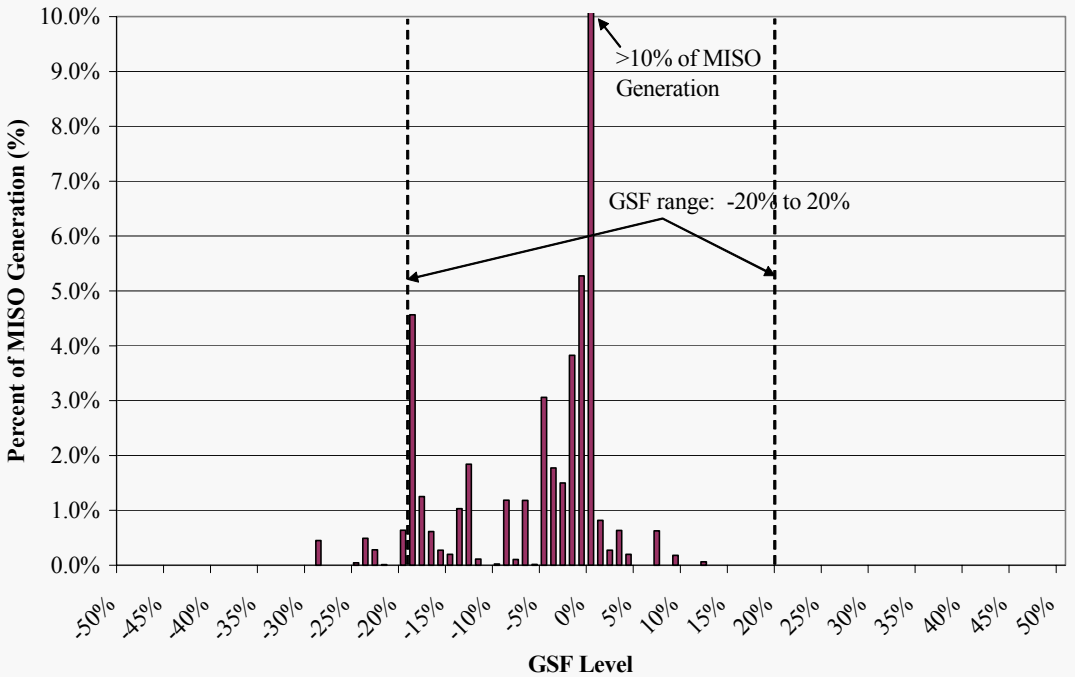
Distribution of Generation Shift Factors

Albers-Paris 138 for Wempletown-Paddock 345



Distribution of Generation Shift Factors

Arnold-Hazelton 345



Market Power Analysis

- The same four cases used to calculate GSFs are used to provide inputs for the pivotal supplier analysis. These inputs include:
  - ✓ Base generator loadings;
  - ✓ Base flows over each flowgate; and
  - ✓ Load levels and interchange with adjacent areas;
- The analysis was conducted on 121 flowgates that have been the source of congestion over the past two years.
- A separate analysis of each Midwest ISO supplier is conducted relative to each flowgate.
- The supplier tested is assumed to be able to start-up and shut-down units while rivals are assumed to only change the output of available resources.

Market Power Analysis

- To focus on the units that are electrically proximate to the flowgate studied, only units with GSFs between -2% and 2% are included.
  - ✓ This reduces the potential for excessive quantities of redispatch by electrically distant rival suppliers that would likely cause other constraints to bind.
- To ensure supply and demand are in balance in our analysis, generation is not decreased on net in the MISO.
  - ✓ All net reductions in output by the potential pivotal supplier being tested are balanced by increases in output from other suppliers.
  - ✓ Additionally, all net reductions in output by rival suppliers are matched with increases in output from other units (i.e., redispatch).
  - ✓ Interchange with adjacent areas is assumed to be held constant.

Market Power Analysis - Results

- A supplier is pivotal when the supplier can cause or sustain a binding constraint even when its rivals' generating resources are fully redispatched to relieve the congestion
- The following tables show each of the flowgates with at least one pivotal supplier in the four monthly cases.
  - ✓ The first table shows flowgates affecting imports into or transfers within WUMS.
  - ✓ The second table shows other flowgates within MISO or PJM which cause a supplier to be pivotal.
- For each of the flowgates, the tables indicate:
  - ✓ Average number of constrained hours over the past two years;
  - ✓ Number of pivotal suppliers;
  - ✓ Pivotal supplier ratio: average amount by which the pivotal suppliers can overload the flowgate as a percent of the flowgate limit; and
  - ✓ Net decrement ratio: the minimum percent that any pivotal supplier must reduce its base generation to cause the congestion.

Pivotal Supplier Analysis Results by Flowgate: Flowgates Affecting WUMS

		February 2004 Case			April 2004 Case			August 2004 Case			November 2004 Case		
Flowgate	Constr. Hours	# of Pivotal Suppl.	Pivotal Supplier Ratio	Reqd. Dec Ratio	# of Pivotal Suppl.	Pivotal Supplier Ratio	Reqd. Dec Ratio	# of Pivotal Suppl.	Pivotal Supplier Ratio	Reqd. Dec Ratio	# of Pivotal Suppl.	Pivotal Supplier Ratio	Reqd. Dec Ratio
Flow South	1459	3	98%	0%	1	20%	0%	1	86%	0%	1	50%	0%
Highway V - Preble 138 (flo) Lost Dauphin - Red Maple	181	2	52%	0%	1	11%	0%	2	26%	0%	1	15%	23%
HIGHWAYV-PREBLE+N APPLTN-WHITE CLAY	115	2	43%	0%	1	15%	0%	2	20%	0%			
N Appleton-Wh Clay 138 for Stiles-Pulliam 138	34	3	26%	0%	1	14%	0%	1	30%	0%	1	18%	0%
STILES4-PULLIAM 138+STILES5-PULLIAM 138	279	2	30%	0%	1	21%	0%	1	30%	0%	1	5%	0%
Stiles-Amberg 138 & Stiles-Crivitz 138 flo Morgan-Plains	1883	2	97%	0%				1	53%	0%	1	30%	0%
Stiles-Amberg 138 for Morgan-Plains 345	40	3	47%	0%	1	56%	0%	1	108%	0%	1	23%	0%
Stiles-Pioneer 138 for N.Appl-WhiteClay138	799	2	32%	0%	1	14%	0%	1	45%	0%	1	5%	0%
Green Lk-Roeder 138 for N Appleton-RoR 345	17							2	56%	61%			
N.Appleton-LostDauphin 138 for Kewaunee 345-138 TR	466				2	9%	0%	1	17%	20%			
KEWAUNEE 345/138 XFMR	8				1	1%	0%						
KEWAUNEE XFMR+KEWAUNEE-N APPLETON	702				1	11%	0%						
2221 Zion-PlsP for 17101 Wemp-Pad	12	1	4%	97%				1	96%	47%	1	5%	95%
Albers-Paris138 for Wemp-Padock 345	634	1	10%	12%	1	18%	0%	3	22%	22%	1	23%	20%
Blackhwk-Cor X54 for Paddock-ROR X39 138	233	2	29%	0%	2	12%	80%	2	45%	0%	2	28%	0%
Cassvl-NED 161 for Wemp-Paddock 345	22	1	28%	0%	1	27%	0%	2	35%	36%			
EAU CLAIRE-ARPIN 345 KV	224	1	1%	96%	1	4%	77%	2	13%	19%	2	10%	0%
LOR5-TRK RIV5 161KV/WEMPL-PADDOCK 345KV	600	1	13%	3%	1	19%	0%	4	29%	2%	1	17%	16%
NELSON DEWEY XFMR+WMPLETOWN-PADDOCK	6	1	38%	0%	1	39%	0%	2	44%	0%	1	65%	0%
Paris-Burlington 138 (flo) Wempletown-Paddock 345	26	1	1%	43%	1	5%	0%	2	7%	10%	1	16%	14%
PleasPr-Racine 345 for Wemp-Pad 345	15	1	20%	40%	1	19%	33%	1	62%	23%	1	27%	29%
Salem 345/161 flo Wempletown-Paddock 345	535	1	1%	99%				2	20%	66%			
WEMPLETOWN-PADDOCK 345 KV	9							1	10%	71%			
PADDOCK XFMR 1 + PADDOCK-ROCKDALE	377							2	26%	17%			
Russel-Rockdale 138/Paddock-Rockdale 345	318							2	1%	11%			
Kenosha-Albers 138 for Wempletown-Paddock 345	8							1	13%	56%			
Arnold-Hazelton 345 for Wemp-Paddock 345	107							1	54%	71%			

Pivotal Supplier Analysis Results by Flowgate: Other Flowgates

Flowgate	Constr. Hours	February 2004 Case # of Pivotal Suppl.	February 2004 Case Pivotal Supplier Ratio	February 2004 Case Reqd. Dec Ratio	April 2004 Case # of Pivotal Suppl.	April 2004 Case Pivotal Supplier Ratio	April 2004 Case Reqd. Dec Ratio	August 2004 Case # of Pivotal Suppl.	August 2004 Case Pivotal Supplier Ratio	August 2004 Case Reqd. Dec Ratio	November 2004 Case # of Pivotal Suppl.	November 2004 Case Pivotal Supplier Ratio	November 2004 Case Reqd. Dec Ratio
Blue Lick 345/161 XFMR-Baker-Broadford	243	2	13%	0%	1	13%	0%	2	23%	0%	1	4%	2%
Blue Lick-Bullit Co 161 (flo) Clifty Creek-Trimble Co	104	1	14%	0%	1	12%	0%	1	3%	18%	1	3%	0%
Blue Lick-Bullitt Co 161 flo Baker-Broadford 765	17	1	2%	18%									
Brown South-Fawkes 138 kV	31	1	36%	28%				1	55%	20%			
Gibson-Petersburg 345 flo Gibson-Bedford 345	16	1	12%	42%				1	0%	99%	1	1%	85%
Lakefield-Fox lake 161 (flo) Lakefield-Wilmarth 345	131	2	53%	35%	2	76%	23%	1	106%	47%	1	40%	59%
Lakefield-Fox Lk 161 for Lakefield-LGS 345	248	2	53%	35%	2	76%	23%	1	106%	46%	1	33%	64%
Paddys West-Paddys Run 138 (flo) Cane Run 138	14	1	34%	0%	1	19%	0%	1	84%	0%	1	53%	0%
ROCKY RUN -NORTHPT+WESTON-ROCKY RUN	593	1	79%	0%	1	57%	0%	1	103%	3%	1	86%	2%
Wisdom-Triboji 161 flo Raun-Lakefield 345	46	1	19%	86%	1	14%	90%	1	109%	55%			
05MARYSV 05E LIMA 345-MARYSV SWLIMA 345	11							1	5%	86%			
BentnHrbr-Palisades345/Cook-Palisades345	6							1	9%	89%			
X59 Christiana-Kegonsa 138 for F1 Christiana-Fitchburg	57							1	6%	38%			
Arnold - Hazleton	87							1	44%	75%			
Salem 345/138 Quad Cities-Sub 39	285							2	13%	73%			
Salem 345/161 for Quad-Sub 91 TR	228							2	14%	72%			
Arnold-Vinton 161 for D.Arnold-Hazelton 345	610							1	40%	73%			
Sub 56(Davnprt)-E.Calamus161 for Quad-RockCr345	225							2	15%	67%			
10ABBRWW 138 14HENDR4 138 1	43				1	26%	0%						
Dysart-Washburn 161 for D.Arnold-Hazelton 345	137				1	1%	100%	2	34%	65%			
Hills 345/161 Xfmr flo Tiffin-Duane Arnold 345	183							2	5%	0%			
MHEX_S	60							1	1%	0%			
Sub K/Tiffin-Arnold 345kV	100							1	16%	89%			
S1226-Tekamah 161kV flo S3451-Raun 345kV	253							1	10%	92%			

Pivotal Supplier Analysis

- The tables show that of the 121 flowgates studied:
  - ✓ 52 flowgates have at least one pivotal supplier in one month, more than half of which affect flows into or within WUMS;
  - ✓ 28 flowgates have more than one pivotal supplier in one of the monthly cases;
  - ✓ 19 of the flowgates have at least one pivotal supplier in all four cases;
- The pivotal suppliers often do not need to reduce their overall output, which increases the market power concern.
  - ✓ 23 of the 52 flowgates show that at least one of the pivotal suppliers would not have to reduce its output in one of the cases.
- Of the flowgates that exhibit one or more pivotal suppliers, generally only flowgates affecting flows into or within WUMS are frequently congested.
- To address the local market power issues raised by these results, we have designated WUMS and North WUMS as narrow constrained areas for purposes of the market power mitigation measures filed in March 2004.