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September 29, 2004
VIA HAND DELIVERY

Elizabeth O'Donnell, Executive Director
Public Service Commission
211 Sower Boulevard
P.O. Box 615
Frankfort, KY 40602-0615

Re: Case No. 2003-00266, Investigation into the Membership of Louisville Gas and Electric Company and Kentucky Utilities Company in the Midwest Independent Transmission System Operator, Inc.

Dear Ms. O'Donnell:

Enclosed is the original copy of the Supplemental Prepared Direct Testimony of Ronald R. McNamara to be filed in the above-referenced proceeding on behalf of Midwest Independent Transmission System Operator, Inc. The verification page for Mr. McNamara is a facsimile; when the original-signature page is received, it will be submitted to the Commission. All additional copies of the Testimony, including those served on other parties, contain a conformed verification page.

Although we are placing this filing in the after-hours box, because it is not voluminous, we have included twelve (12) copies along with the original. One copy is to be file-stamped and returned to our office in the enclosed self-addressed stamped envelope. Thank you for your attention to this matter.

Sincerely,

Benjamin D. Allen

Enclosure

Drop Box

RECEIVED
SEP 29 2004
PUBLIC SERVICE COMMISSION

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

Investigation into the Membership of Louisville Gas and Electric Company and Kentucky Utilities Company in the Midwest Independent Transmission System Operator, Inc.	))))))	CASE NO. 2003-00266

Supplemental Prepared Direct Testimony of

Dr. Ronald R. McNamara

Vice President of Regulatory Affairs and Chief Economist

Midwest Independent Transmission System Operator, Inc.

ORIGINAL

Filed: September 29, 2004

w/ verification page transmitted electronically - original to be furnished

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Ronald R. McNamara. I work at 701 City Center Drive, Carmel, Indiana 46032.

Q. BY WHOM AND IN WHAT CAPACITY ARE YOU EMPLOYED?

A. I am employed as Vice President of Regulatory Affairs and Chief Economist for the Midwest Independent Transmission System Operator, Inc. (the "Midwest ISO").

Q. PLEASE SUMMARIZE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND.

A. I graduated from the University of California, Irvine with a B.A. degree in Economics and a B.A. degree in Social Ecology in 1979. I received an M.A. degree and Ph.D. in Economics from the University of California, Davis in 1991 and 1993, respectively. As an economist, I have worked in academia as well as in both the public and private sectors. From 1995 to 1998, as the Manager of Research and Development for the Electricity Market Company Ltd, and as a Senior Advisor for Putnam, Hayes and Bartlett Asia-Pacific, I was involved in designing and implementing the electricity market in New Zealand. I have also worked for the Queensland (Australia) state regulatory commission, Duke Energy as the General Manager of Regulatory Affairs (Australia), Enron, and, most recently prior to joining the Midwest ISO, I was employed at American Electric Power.

Q. PLEASE DESCRIBE YOUR RESPONSIBILITIES WITH THE MIDWEST ISO AS THEY RELATE TO THIS FILING.

A. I am the Midwest ISO Officer responsible for the Tariff and for Market Design. In this capacity, it is my responsibility to ensure that the Midwest ISO's markets facilitate enhanced reliability, are designed correctly, and operate efficiently.

Q. WHAT IS THE PURPOSE OF YOUR PREPARED DIRECT TESTIMONY?

A. The purpose of my testimony is to provide a better understanding of the Midwest ISO's security constrained economic dispatch platform and how this centralized dispatch protocol will affect and benefit the Midwest ISO's member companies in Kentucky. My testimony will discuss the basic elements of the security constrained economic dispatch platform and resultant energy markets that the Midwest ISO will be implementing on March 1, 2005. Specifically, after the introduction included in Part I of my testimony, Part II of my testimony will discuss the advantages that security constrained economic dispatch will bring to the Midwest ISO. Part III of my testimony will describe how the energy markets will change the manner in which energy transactions are handled in the Midwest ISO. Part IV of my testimony will describe in more detail certain elements of the Midwest ISO's energy markets. Part V of my testimony will describe the market monitoring and market power mitigation mechanism that will be a part of the Midwest ISO's energy markets. Part VI of my testimony will discuss the resource adequacy requirement applicable to the Midwest ISO's energy markets.

Q. HAVE THE ELEMENTS OF THE MIDWEST ISO'S ENERGY MARKETS BEEN ACCEPTED BY THE FEDERAL ENERGY REGULATORY COMMISSION?

A. Yes, for the most part. On August 6, 2004, the Federal Energy Regulatory Commission ("FERC") conditionally accepted, subject to the fulfillment of certain conditions, the Midwest ISO's filing of an Open Access Transmission and Energy Markets Tariff ("EMT") that contains all of the elements of the Midwest ISO's new energy markets. The FERC's order accepted all of the major elements of the Midwest ISO's proposed energy market design and set a market implementation date of March 1, 2005. The Midwest ISO is in the process of meeting all of the conditions of the FERC's August 6,

2004, order and will make a filing with the FERC, on or before October 5, 2004, demonstrating compliance with all of the FERC's conditions.

In addition, on September 16, 2004, the FERC issued an order addressing how grandfathered transmission service agreements will be handled under the Midwest ISO's energy markets. The implications of this order on eventual market operations is still being considered by the Midwest ISO; however, the order does not change the basic market design accepted by the FERC in its August 6, 2004, order. Pursuant to the FERC's orders, the Midwest ISO expects to implement the EMT and associated energy markets on March 1, 2005.

II. THE ADVANTAGES THAT SECURITY CONSTRAINED ECONOMIC DISPATCH WILL BRING TO THE MIDWEST ISO.

Q. WHAT PROMPTED THE MIDWEST ISO TO DEVELOP ENERGY MARKETS?

A. The development of energy markets is the logical outcome for efficient coordination of non-discriminatory Open Access Transmission Service. In fact, energy markets are a byproduct arising from centralized security constrained economic dispatch. The prime objective of centralized security constrained economic dispatch is to achieve reliable, efficient, transparent, and replicable system dispatch; and the proven way to achieve this is through the use of locational marginal pricing ("LMP"), which necessarily leads to the creation of a real-time or spot market for electricity.

Q. HOW DOES THE MIDWEST ISO OPERATE TODAY, IN THE ABSENCE OF AN ENERGY MARKET, TO HELP ENSURE REGIONAL RELIABILITY?

A. The Midwest ISO currently operates as the regional transmission system operator pursuant to an Open Access Transmission Tariff ("OATT") on file with the FERC. When the Midwest ISO began its so-called "Day 1" operations under the OATT on

February 1, 2002, it took over important system reliability functions across the Midwest ISO's transmission footprint (*i.e.*, the "Midwest ISO Region"). The Midwest ISO assumed responsibility for many of the functions of a regional security or reliability coordinator, functions that had been performed by the North American Electricity Reliability Council ("NERC") Regional Reliability Councils – ECAR, MAIN and MAPP. The Midwest ISO also took over some of the functions that were previously handled by those Midwest ISO Transmission Owners ("TOs") that are the control area system operators. The control area functions that the Midwest ISO assumed included the traditional *pro forma* OATT provision of transmission service, such as the determination of transfer capability, the handling of requests for transmission service and OASIS administration, and transmission or transaction scheduling. The Midwest ISO thus assumed responsibility for evaluating regional security conditions to determine whether requests for transmission service could be accommodated on the transmission system and whether transactions actually scheduled on the grid resulted in flows that remained within or violated various security limits designed to ensure reliable operations. As part of its overall security responsibility, once schedules were submitted, the Midwest ISO became responsible for determining whether and which transmission schedules should be curtailed to maintain flows within the security limits.

Q. WHAT TOOLS DOES THE MIDWEST ISO USE TODAY TO ENSURE FLOWS REMAIN WITHIN SECURITY LIMITS, UNDER THESE "DAY 1" PROCEDURES?

A. Within the Day 1 framework, there are three principal means by which control area operators and regional security coordinators keep flows within safe and secure limits, while keeping the system in balance. They include: (1) control of transmission access

through screening and approval (or denial) of transmission requests; (2) real-time dispatch; and (3) curtailments.

Q. PLEASE DESCRIBE THESE DIFFERENT TOOLS.

A. The first principal means is try to screen and deny requests for transmission use that would cause flows to exceed the security limits. This is done through the determination of Available Flowgate Capacity ("AFC") and the process for approving, disapproving, or preempting requests for transmission service. When it became the independent transmission provider for the Midwest ISO Region, the Midwest ISO took over the screening and approval of transmission service requests from the TOs and/or their respective control area system operators.

The second principal means is for each local control area[1] that dispatches Generation Resources to use its dispatch to keep flows within limits and maintain system balance (including acceptable voltage and frequency levels) within its control area, as well as maintain agreed-upon flows between adjoining control areas. If flows across any transmission element exceed or would exceed the security limits in a pre- or post-contingency condition, the affected control area or areas can redispatch the generation under its control to relieve transmission constraints and bring flows back within secure operating limits. Under "Day 1" procedures, this important coordination function remains almost exclusively within the control of the existing TOs and/or their respective control area system operators; the Midwest ISO did not have this capability

[1] An important factor in designing a transition for the Midwest ISO Region is that there are different categories of "control areas" in the Midwest ISO Region; not all control area operators have the same functions. The focus here is on the control of the real-time dispatch used to maintain system balance, frequency and voltage levels.

when Day 1 operations began and does not yet have this responsibility. That will change when the Midwest ISO begins Day 2 operations with the implementation of the energy markets of the EMT.

The third principal means is for the regional security coordinator – in this case, the Midwest ISO – to determine and monitor the flows across the regional grid and then, if needed, to require that certain transmission uses or schedules be reduced, in accordance with the curtailment rules specified by the NERC under the Transmission Line Loading Relief ("TLR") procedures. Under Day 1 procedures, the Midwest ISO can thus monitor actual power flows, including so-called "loop flows," across the Midwest ISO Region, and if necessary, order affected Midwest ISO and non-Midwest ISO control areas to curtail transactions between the Midwest ISO control areas, as well as transactions that may originate and/or end in control areas outside the Midwest ISO Region.

Q. HOW EFFICIENT ARE THESE TOOLS AS A MEANS OF ENSURING SYSTEM REILABILTIY?

A. If economic redispatch is not available to support a given transmission service, then transmission use that leads to violations of operating security limits must be curtailed through some means, in most cases, by use of TLR curtailments. Physical rationing through the imposition of a TLR has many disadvantages. Most importantly, TLRs are inherently inefficient, because they take little account of economics, which leads to the curtailment of otherwise economic transactions and thus to an inefficient utilization of the grid. If economic redispatch is not available to support transmission service, then the only practical way to avoid excessive use of TLRs after the fact is for the transmission provider to be overly conservative in granting transmission service before the fact, a

solution that clearly leads to an under-utilization of the physical grid. Hence, the separation of the provision of transmission service from the dispatch function under the current OATT leads either to uneconomic use of the grid and/or under-utilization of the grid. These functions were once integrated within vertically integrated utilities, but they were artificially separated in early attempts to ensure open access transmission service. These adverse consequences can be avoided by recombining the transmission service and security-constrained economic dispatch functions in an independent transmission provider and making the total service available at a transparent price that grid users can compare with the economic value they place on continuing their transactions without curtailments. This will occur upon the Midwest ISO's assumption of Day 2 operations.

Q. HOW DOES RELIANCE ON TRANSMISSION LOADING RELIEF PROCEDURES LEAD TO UNDER-UTILIZATION OF THE TRANSMISSION GRID?

A. TLRs inherently rely on imprecise estimates and cannot accurately reflect system interactions. Under NERC TLR procedures, the impact of control area-to-control area transactions and local generation on constrained facilities is estimated using power flow distribution factors. Power flows estimated using these procedures do not consistently correspond to actual power flows. Moreover, TLRs are issued to curtail specific transmission transactions. When a transaction is curtailed, the affected control areas have choices about how to redispatch generation, curtail load, and/or reconfigure their systems to comply. Each of these actions takes time, occurs against a background of constantly changing power flows, and affects power flows on multiple flowgates. Because the parties' responses to the curtailment are not coordinated, the simultaneous impact of the responses to a TLR cannot be precisely predicted. As a result, it is not possible for

reliability coordinators to use TLRs to maintain power flows at operating security limits on a sustained basis. Inevitably, some amount of transfer capability goes unutilized during TLR events.

Q. TO WHAT EXTENT HAS THE MIDWEST ISO GRID BEEN UNDER-UTILIZED AS A RESULT OF RELIANCE ON TRANSMISSION LOADING RELIEF PROCEDURES?

A. The Midwest ISO has recently analyzed actual flowgate utilization from two samples of TLR events in separate areas of its footprint. For a comparatively less constrained portion of the footprint (Kentucky), we examined a sample of 28 TLR events and found that on average 7.78% of available flowgate capacity was actually unused during these TLR events. We also studied 198 TLR level 3 – 5 events in a frequently constrained portion of our footprint (Wisconsin and Upper Peninsula control areas). We found the amount of unused capacity during TLRs on affected flowgates in this region equaled, on average, 11.407% of available flowgate capacity. In both portions of the footprint, the inability to fully utilize the capabilities of the transmission system during periods of high demand for transmission services has produced significant economic costs.

Q. HOW DOES THE NEW MARKET DESIGN REDUCE THE NEED FOR THE MIDWEST ISO TO RELY ON TLRS TO SUSTAIN RELIABILITY OF THE TRANSMISSION GRID?

A. By integrating dispatch and transmission functions at the Midwest ISO level, the EMT will greatly enhance the Midwest ISO's ability to ensure reliable operations and greatly reduce the use of TLRs.

Q. HOW WILL COMBINING THESE FUNCTIONS AT THE REGIONAL LEVEL ALLOW THE MIDWEST ISO TO ACHIEVE THE GOALS OF MORE EFFICIENT GRID UTILITIZATION AND ENHANCED RELIABILITY?

A. The central coordination of transmission service and dispatch by the Midwest ISO provides a regional dispatch to support additional transmission service that might otherwise not be scheduled or allowed, or if allowed, curtailed under a TLR. When transmission service and dispatch are centrally coordinated by the Midwest ISO, then the Midwest ISO will be able to offer transmission service throughout the Midwest ISO Region and back that service with a regionally coordinated redispatch of generation when that is needed to keep flows within operating security limits and thereby greatly reduce the usage of TLRs.

Q. WILL THE CENTRALIZED DISPATCH APPROACH PROVIDED IN THE EMT ELIMINATE THE NEED FOR TLRs?

A. No, not completely. While centralized dispatch by the Midwest ISO, as described above, will greatly reduce the need for TLRs, it will not eliminate their use completely. Transmission service between the Midwest ISO and neighboring regions, and transmission service that has sources and sinks outside the Midwest ISO Region but causes loop flows through the Midwest ISO Region, may still be subject to TLRs. This is because the Midwest ISO may not be able to arrange a security-constrained economic dispatch to support that transmission service or, even if it could provide redispatch to accommodate loop flows within the Midwest ISO Region, there may be no mechanism to hold the external transmission customers responsible for the Midwest ISO's marginal costs of redispatch. The Midwest ISO members should not be required to subsidize these redispatch costs to support transactions outside the Midwest ISO Region. Solving this

problem will require inter-regional coordination of the dispatch, common redispatch pricing and settlements between the regions.

Q. HOW ELSE WILL A REGIONALLY COORDINATED DISPATCH ENHANCE RELIABILITY IN THE MIDWEST?

A. In conjunction with the development of a regional dispatch system, and as part of its responsibilities as regional security coordinator, the Midwest ISO has developed additional tools, such as a "state estimator," that will allow the Midwest ISO to monitor flows and conditions across the entire Midwest ISO Region, as well as flows and conditions in neighboring systems. These tools allow Midwest ISO to "see" the entire system and become aware almost immediately when problems occur anywhere on the system. The virtual real-time data provided by such tools will enable Midwest ISO's region-wide coordinated dispatch to deal quickly and effectively with imbalances, security violations or other problems anywhere in the region. The Midwest ISO's enhanced regional capabilities, and use of more precise and responsive reliability tools, such as a regional state estimator and a regionally-coordinated dispatch, will replace the current system that relies on multiple control areas, multiple dispatch, and extensive coordination between those control areas.

III. <u>HOW THE HANDLING OF TRANSACTIONS WILL CHANGE IN THE ENERGY MARKETS</u>

Q. DOES THE EMT SIGNIFICANTLY CHANGE THE WAY IN WHICH TRANSACTIONS WILL BE HANDLED BY THE MIDWEST ISO?

A. Yes. There are important changes in both the formal treatment of transactions and the financial implications when those transactions use the Midwest ISO grid. While the traditional features of transmission service will continue as they currently do under the

Midwest ISO Tariff, the addition of the EMT and its energy markets will significantly improve how transmission service is supported in the Midwest ISO.

Q. PLEASE SUMMARIZE THE PHYSICAL CHANGES IN HOW MIDWEST ISO WILL HANDLE TRANSACTIONS COMPARED TO HOW SERVICE IS PROVIDED TODAY.

A. These changes center on the transfer of additional operational responsibility from the existing TOs and local Control Area operators to the Midwest ISO as regional transmission provider and regional system operator. Perhaps the most significant change involves the introduction of a regionally coordinated, bid-based, security-constrained economic dispatch to manage congestion and support transactions across the Midwest ISO-controlled grid.

The introduction of a bid-based regional dispatch to support transactions will change how transmission schedules are accommodated in the Midwest ISO Region. While advance requests for transmission service will continue to be handled as requests for network integration transmission service or point-to-point transmission service and differentiated between "firm" or "non-firm" physical reservations, in the day-ahead and real-time energy markets, however, actual transmission schedules submitted will be analyzed with a Network Model and accommodated by the Midwest ISO's regional security-constrained economic dispatch, provided the transmission user is willing to pay a transmission usage charge defined by LMPs.

Q. WILL ALL TRANSACTIONS NEED TO BE SCHEDULED WITH THE MIDWEST ISO?

A. Yes. All transactions will be scheduled with the Midwest ISO and must conform to the common "physical" requirements for scheduling transactions on the Midwest ISO grid.

Q. WHAT DO YOU MEAN BY "PHYSICAL" REQUIREMENTS FOR SCHEDULING TRANSACTIONS?

A. Every system operator must have certain kinds of information to operate the grid reliably. In addition to extensive information about the status of the grid and each of its component facilities, this information includes data concerning (1) injections, including the amounts and locations where energy and reactive power are being (or could be) generated, and (2) similar data regarding expected and actual withdrawals. The system operator needs to know the schedules for all net injections and withdrawals at each location to be able to determine the expected flows during each dispatch interval.[2] The operator must also have additional information concerning generator start-up times, ramping rates, minimum and maximum generation levels, minimum run times, and other data that may affect flows and/or the ability to dispatch or redispatch generation if the need arises. Comparable data from dispatchable loads, if any, is also necessary. Today, much of this scheduling information is exchanged (or through established practice, is understood) between the parties to a specific transaction, or may be known internally by the TO as both transmission provider and generation supplier. As these functions become coordinated by the Midwest ISO on a regional basis, however, this information will have to be provided in a more consistent and transparent manner to the Midwest ISO, using common forms, data requirements and deadlines established by the Midwest ISO. This will necessarily require that one or the other party to every transaction make explicit and provide to the Midwest ISO what may only have been implicit and/or known only between the parties under the old scheduling system.

[2] Under the EMT, the dispatch interval will be hourly for the day-ahead energy market and every five minutes for the real-time energy market.

Providing this information to the transmission provider that is responsible for dispatch and system reliability is not an option; it is a necessity.

Q. DOES THE MIDWEST ISO EMT PROVIDE THAT PARTIES SUBMIT THIS NECESSARY PHYSICAL SCHEDULING INFORMATION?

A. Yes it does. In general, the EMT will require that all grid users submit the same essential scheduling information to the Midwest ISO for its use in scheduling transmission use and arranging the bid-based, security-constrained economic dispatch that will accommodate those uses within the security limits of the transmission system.

IV. THE BASIC PRINCIPLES OF THE MIDWEST ISO ENERGY MARKET DESIGN.

Q. PLEASE DESCRIBE THE KEY MARKET MECHANISMS THAT THE MIDWEST ISO WILL COORDINATE UNDER THE EMT.

A. Under the EMT, the Midwest ISO will coordinate both real-time and day-ahead spot markets for energy using voluntary offers and bids to arrange a security-constrained economic dispatch for each market interval. The market interval for the day-ahead energy markets will be hourly and, for the real-time energy market, the dispatch interval will be every five minutes.

Once the Midwest ISO defines a security-constrained economic dispatch for a given market/dispatch interval, the Midwest ISO will determine market-clearing prices in each market for each product using the principles of locational marginal pricing ("LMP"), which is the same pricing tool currently used by PJM, the New York ISO and ISO New England. LMP defines the marginal cost of serving the next increment (1 MW) of load at each location, given the dispatch, the constraints binding in that dispatch, and the offers and bids. Under LMP, the market-clearing prices used for settlements in the Midwest

ISO-coordinated markets will differ between some locations when there is congestion on the Midwest ISO-controlled grid. While prices will also differ between locations because the LMPs will include the effects of marginal (as compared to average) losses, these "loss rentals" will be returned to Market Participants. The Midwest ISO will administer a settlement system for all spot sales and purchases in the Midwest ISO markets and for transmission usage charges.

Q. IS PARTICIPATION IN THE MIDWEST ISO ENERGY MARKETS MANDATORY, OR ARE THERE OPPORTUNITIES FOR A UTILITY SUCH AS LG&E TO MAINTAIN THE CURRENT BENEFITS THAT IT HAS WHEN IT SELF-SCHEDULES ITS GENERATION RESOURCES TO MEET ITS LOAD?

A. Participation in the Midwest ISO Energy Markets is voluntary. If a party wishes, it can self-schedule its generation resources with the Midwest ISO to entirely meet its native load obligations. If LG&E were to take full advantage of this opportunity and self-schedule all of its own generation to meet 100% of its load obligations, LG&E would only be required to offer its generation into the market to the extent that it had excess capacity associated with its identified designated network resources that was not needed to meet this load obligation.

Q. DO PARTICIPANTS IN COMPETITIVE MARKETS NORMALLY SELF-SCHEDULE THEIR ENTIRE LOADS AT ALL TIMES?

A. No. It is rare for a party that has the option of participating in a competitive energy market to find that it is always preferable to self-schedule its resources. There will invariably be some instances in which it will be financially preferable for a participant to buy some percentage of the power needed to supply its load from the market and/or sell excess generation into the market. In the case of LG&E, it is hard to imagine that there

will never be an instance where the cost of supplying power from its own generation resources will be higher than the cost of meeting its load obligations with power from outside suppliers. When a supplier other than LG&E offers its power at a lower cost than LG&E is able to produce power from its own generation resources, it may well be less costly for LG&E to use the market to meet its load obligations. In a competitive market, LG&E will have the option to serve its load with lower cost power from other generation resources and thereby forego the need to run its higher cost generating units.

Similarly, LG&E, with its ability to produce relatively low cost power, will have the opportunity to capitalize on this by offering its excess generation into the market. Any online generation that LG&E does not use to serve its load may be offered into the market for sale to other Market Participants. This generation, which would otherwise be idle, can be used to provide LG&E with additional revenues. If LG&E is a relatively low cost power producer during a given time period, LG&E power will be in demand, and other market suppliers will be willing to pay a premium (up to the cost they would otherwise incur for serving their load requirements from their own resources) to use LG&E's generation capacity to serve their native load requirements.

While both of these scenarios describe reasons why it would be unlikely for a utility such as LG&E to self-schedule its entire load at all times, there is no requirement that any utility take advantage of these opportunities. Nothing would prevent LG&E or any other utility from self-scheduling to meet its entire load at all times and thereby effectively never participate in the Midwest ISO markets. In any event, LG&E will have the opportunity to serve its load with its own generation just as it does today.

Q. HOW DOES PRICING THE DISPATCH USING LMP AFFECT THE MIDWEST ISO'S ABILITY TO ENSURE RELIABLE OPERATIONS?

A. The use of LMP will enhance Midwest ISO's ability to ensure reliable operations. I have already explained how the Midwest ISO's ability to offer redispatch will improve reliable operations compared to a system that must rely primarily on TLRs. The LMP methodology is the necessary mechanism for pricing the marginal cost of redispatch, so that grid users can be properly charged for the costs they impose on the system; this allows the Midwest ISO to offer redispatch in support of reliability without fear of cross subsidies. LMP also sends the correct price signals to those generators whose output must be raised or lowered in the redispatch to bring flows back within security limits. For these two reasons, LMP is essential to implementing this more effective reliability tool.

There are also other reliability benefits from LMP. LMP encourages generators to follow the Midwest ISO system operators' dispatch instructions. LMP-based charges for transmission usage send efficient price signals about congestion, losses and usage that tend to discourage transactions that worsen congestion and losses and encourage transactions that reduce congestion and losses. Finally, LMP eliminates the gaming of market offers and bids that tend to plague markets that use alternative pricing approaches, such as zonal or uniform pricing.

Q. HOW DOES LMP ENCOURAGE GENERATORS TO FOLLOW DISPATCH INSTRUCTIONS?

A. The use of LMP supports reliable dispatch because the prices used for settlements are consistent with the actual dispatch, the grid conditions faced by that dispatch (including the actual constraints that are binding in that dispatch, given grid conditions), and the

offers and bids of the participants. If the LMP at a location is at or above the generator's offer, the LMP would provide an incentive to operate up to the level that corresponds with its offer price. LMP payments thus encourage generators to operate at the levels needed by the ISO to maintain reliable operations. Unlike other pricing systems, in which the "clearing" prices can be inconsistent with the dispatch for any given generator, generators paid at LMP prices always have the correct incentives to follow dispatch instructions.

Q. WHAT IS CONGESTION MANAGEMENT?

A. Congestion management is the process of managing competing uses of the transmission system so as to optimize economic outcomes while keeping power flows within operating security limits.

Q. HOW WILL THE MIDWEST ISO MANAGE CONGESTION IN THE ENERGY MARKETS?

A. The Midwest ISO will manage congestion through the market mechanism of LMP.

Q. HOW DOES LMP DISCOURAGE PARTIES FROM SCHEDULING TRANSACTIONS THAT WORSEN CONGESTION WHILE ENCOURAGING PARTIES TO SCHEDULE TRANSACTIONS THAT REDUCE CONGESTION?

Since transmission usage will be priced at the LMP-based cost of dispatch, usage that causes or worsens congestion will pay corresponding transmission usage charges that reflect the marginal cost of redispatching to accommodate those transactions. The more that transmission usage creates congestion and increases the LMP price differences, the more parties that use the congested lines will pay, thus discouraging parties from scheduling transactions that cause security limits to be violated and require redispatch. Conversely, some transmission usages will create counter-flows that reduce or relieve

congestion and reduce or eliminate the need for redispatch. This will be reflected in reduced differences in the LMPs.

Q. OTHER LMP-BASED MARKETS HAVE SOME FORM OF FINANCIAL TRANSMISSION RIGHTS ("FTRs") THAT ALLOW PARTIES TO HEDGE THE COSTS OF CONGESTION. WILL THE MIDWEST ISO ALSO HAVE SOME FORM OF FTRs?

A. Yes. The Midwest ISO will administer a system of financial transmission rights ("FTRs") to support the use of LMP for pricing congestion and transmission usage and to allow parties to lock in transmission prices in advance of real-time operations. Each FTR is defined as running from one pricing location to another pricing location (*e.g.*, from location A to location B). These pricing "locations" may be individual nodes or buses on the Midwest ISO grid or aggregations of nodes/buses that comprise pricing zones (such as service areas or sub-regions defined by states for retail rate purposes) or trading hubs established by the Midwest ISO. The FTRs are identical in concept to the FTRs used in PJM and ISO New England and the Transmission Congestion Contracts ("TCCs") used in New York.

Q. WILL THE MIDWEST ISO ALSO COORDINATE SHORT-RUN MARKETS FOR BUYING AND SELLING TRANSMISSION USAGE AND/OR TRANSMISSION RIGHTS?

A. Yes. The LMP system for pricing congestion defines locationally different prices for energy at each commercial node on the grid. Parties could therefore sell energy at one location at its respective LMP and purchase energy from another location at its respective LMP, using separate spot market transactions. However, simultaneously selling energy at one location (point A) and buying the same amount of energy at another location (point

B) is equivalent to buying transmission from point A to point B. The spot price of transmission usage is defined by the difference in the locational price at B minus the locational price at A. This price difference equals the marginal cost of redispatching the system – that is, the change in the bid-based cost of the security-constrained economic dispatch needed to accommodate the transmission usage from point A to point B.

In the context of the redispatch option discussed above for maintaining reliability, the LMP mechanism means that when a party schedules transmission from point A to point B, the Midwest ISO can easily define the marginal cost, which is based on the voluntary offers received from resources, of accommodating that transmission schedule through the Midwest ISO's security-constrained economic dispatch and charge that price to the party scheduling the transmission. As such, LMP provides a convenient, transparent and efficient way to charge all parties the marginal costs that their transactions impose on the grid. When parties schedule transactions from one location to another and agree to pay this LMP-defined marginal cost of usage, they are, in effect, "buying" transmission usage in the Midwest ISO-coordinated spot market.

Q. WHY DID THE MIDWEST ISO DECIDE TO ADD A DAY-AHEAD ENERGY MARKET?

A. There are a number of advantages in having the Midwest ISO coordinate a day-ahead energy market. This market provides another opportunity for parties to lock in prices for energy and transmission in advance of real time, allowing them to better align their long-term forward positions with the positions they expect to carry into real time. The day-ahead energy market allows loads to purchase any uncontracted requirements in advance, without waiting until real time, and it allows generators to sell uncontracted output in

advance, without waiting until real time. Having locked in day-ahead prices for energy and congestion, parties then have several hours to prepare for the next day's operations and/or to consider further changes in response to their expectations of real-time conditions.

Q. HOW DOES LMP ELIMINATE OFFER AND BID "GAMING" OR OTHER MARKET MANIPULATION?

The alternatives to LMP for pricing spot energy and transmission are either some form of "zonal" pricing or "uniform" pricing. Uniform pricing was used in the original PJM tariff (from April 1997 to April 1998, when it was replaced by LMP) and in the original tariff for ISO New England until 2003, when it was replaced by LMP; uniform pricing is still used in Ontario, Canada and is the source of several market design issues in that market. Zonal pricing has been tried in California and ERCOT, and both single-state regional entities are now in the process of replacing their zonal pricing systems with LMP. These experiences have shown in various forms that the non-LMP pricing mechanisms require a system of side payments to generators to encourage them to follow dispatch instructions. One set of side payments must be paid to generators that are constrained off (essentially paying them not to run when running would worsen congestion, even though their offers are below the uniform or zonal settlement price). Another set of payments must be paid to constrained-on generators to encourage them to run when running would otherwise be uneconomic, given their offers in relationship to the settlement prices. Without LMP market-clearing prices to encourage generators to follow dispatch, the uniform or zonal prices by themselves are inconsistent with the generator offers and/or inconsistent with a reliable dispatch, thus requiring side payments to counteract the improper incentives. Rather than experiment further with pricing

mechanisms that have proven to be highly problematic in other regions, the Midwest ISO simply chose to move directly to the LMP approach that has proved successful in the Northeast ISO markets.

Q. DOES LMP ALSO HELP ALLOCATE TRANSMISSION CAPACITY EFFICIENTLY?

A. Yes. By charging each transaction the marginal cost of any redispatch necessary to accommodate that transaction, LMP sends economically efficient price signals about the value of transmission usage anywhere on the grid. Parties whose transactions have sufficient value and are therefore willing to pay the marginal cost of usage are thus allocated access to the grid, whereas parties whose transactions have insufficient value will decline to pay the usage charge and not use the grid. The LMP-based usage charges will thus allocate grid usage efficiently to those with the highest value transactions. Alternatively, if the Midwest ISO used some other (non-LMP) pricing mechanism to charge for grid usage, it would not be possible to allocate grid usage efficiently, and the potential excess demand for transmission would tend to produce reliability concerns that would have to be addressed through some other non-market, administrative restrictions. For example, during the period in which it used uniform pricing in 1997-98, PJM experienced many occasions when parties were encouraged to use congested transmission because they were not required to pay the marginal cost of redispatch. In effect, redispatch costs were socialized across all grid users by the uniform pricing system, so that transactions that caused or exacerbated congestion were being subsidized for their redispatch costs by other parties whose transactions did not cause or exacerbate congestion. In addition, when parties were not required to pay the marginal costs of their usage, they were encouraged to self-schedule transactions and avoid the ISO's dispatch,

resulting in a loss of dispatch control. Without an LMP-based mechanism to charge each party for the costs its transactions imposed on the system, it is my understanding that PJM had difficulty maintaining a reliable dispatch and had no equitable way to allocate grid access other than through some arbitrary method. To limit the degree of cross subsidies and discourage transactions that created "internal" congestion, PJM chose to limit access for some parties (external transactions) in order to protect other parties ("internal" transactions). The result was a barrier to inter-regional trading with no means to determine whether the prohibited transactions were more or less valuable than the allowed transactions.

Q. HOW WILL THE MIDWEST ISO'S USE OF LMP INFLUENCE INVESTMENTS IN GENERATION?

A. Investments in new generation are influenced by many factors, including the overall expected level of prices under anticipated demand and supply conditions. Decisions to locate new or expanded generation, or to retire or maintain existing generation at a given location are also affected by many factors that reflect the difficulty or costs of siting. That said, all other factors being equal, paying each generator the LMP for its injections at each location will tend to encourage new resource additions more at those locations with higher LMPs than at those locations with lower LMPs. The higher LMPs will tend to be at locations where there is less supply relative to demand, so LMP-induced resource additions at those locations will tend to increase supply competition, lower prices, reduce congestion and mitigate market power. Conversely, lower LMPs will tend to be at locations where there is more supply relative to demand, so LMP-induced resource additions at those locations would tend not to occur or occur less. At locations that are already export limited because of congestion, the LMP incentives will potentially

discourage investments that make matters worse. The LMP incentives will thus both work to (i) make supply and prices more competitive at those locations that need it and (ii) reduce congestion where it is currently uneconomic.

Q. HOW WILL THE MIDWEST ISO'S USE OF LMP INFLUENCE INVESTMENTS IN DEMAND-SIDE OPTIONS?

A. As with investments in generation rsources, LMPs will also influence demand-side management ("DSM") investments. In areas with high LMPs, DSM potentially reduces costs to end users and this may serve as a competitor to other investment options.

Q. HOW WILL THE MIDWEST ISO'S USE OF LMP INFLUENCE INVESTMENTS IN TRANSMISSION?

A. The LMP-based usage charges will make the marginal cost of redispatching generation to relieve congestion fully transparent. Parties' willingness to pay this marginal cost signals their willingness to pay for congestion, given the value of their transactions. At the same time, parties' willingness to purchase FTRs (in secondary markets now and in forward FTR auctions in the future) to hedge congestion costs will reveal a Market Participant's willingness to pay to avoid congestion charges. Together, LMP-based usage charges and forward prices for FTRs whose value reflects expected LMP prices will reveal the value of congestion and hence the value of reducing congestion through various means. Transmission upgrades are one means to reduce congestion; locating generation in load pockets is another; expanding demand-response in load pockets is a third; and providing redispatch priced at marginal cost is a fourth mechanism. LMP does not dictate which of these four methods is the more efficient or desirable approach. What LMP does provide is a common, transparent yardstick against which to measure the value of each of these investment choices. LMP will help investors and regulators determine whether

transmission upgrades are both economically justified and more economically attractive (or otherwise preferred) relative to other options.

Q. IN WHAT WAYS WILL THE MIDWEST ISO-COORDINATED MARKETS ENHANCE REGIONAL TRADING?

A. The Midwest ISO-coordinated markets will enhance regional trading in several ways: (1) the Midwest ISO real-time balancing market will support bilateral contracting and trading; (2) the real-time and day-ahead energy markets will provide additional mechanisms for generators to sell uncontracted power and for loads to cover uncontracted demand; (3) the use of FTRs will provide price certainty to transactions in the face of congestion and curtailment uncertainty; and (4) the use of LMP will reveal economic opportunities for commercially beneficial trades. In addition, the elimination of pancaked transmission rates within the Midwest ISO Region will lower barriers to efficient inter-regional trading.

Q. PLEASE EXPLAIN HOW THE MIDWEST ISO REAL-TIME BALANCING MARKET WILL SUPPORT BILATERAL CONTRACTING AND TRADING.

A. Parties that engage in bilateral trading will be free to use the Midwest ISO spot markets to any degree they choose to supplement and/or backstop their transactions. Generation suppliers can use the Midwest ISO day-ahead and real-time energy markets to supplement their generation or replace it when the LMPs are either cheaper than their own operating costs or their own units experience an outage. Load Serving Entities ("LSEs") can supplement their contracts with purchases from the Midwest ISO day-ahead and real-time energy markets, and use the real-time balancing market to purchase or sell any imbalances between their contract amounts and the amounts actually supplied or consumed. Open access to the Midwest ISO spot markets will thus relieve

LSEs and their suppliers of any requirement to maintain balanced schedules or to engage in load following on their own (although parties will be free to match their supplies and obligations as close as they want). With imbalance energy priced at market-clearing LMPs, parties will no longer be faced with the imbalance penalty charges they sometimes face today.

In addition, the transparent spot prices from the Midwest ISO markets will provide a useful reference for forward contracting and futures markets that enhance liquid contract trading. In general, forward contract prices will tend to reflect the market's expectations of future spot prices.

Q. PLEASE EXPLAIN HOW THE MIDWEST ISO MARKETS PROVIDE ADDITIONAL OPTIONS FOR UNCONTRACTED GENERATION AND UNCONTRACTED DEMAND.

A. Generators whose capacity is not fully committed to contracts will be free to offer any uncommitted capacity to the Midwest ISO for dispatch and operating reserves, allowing them to receive additional revenues and contributions to fixed costs to enhance their profitability and encourage adequate investment levels. Dispatched energy from these generators will receive LMP energy prices and any capacity held for operating reserves will receive the market-clearing price for the type of reserves it provides. The sales can be made into the Midwest ISO day-ahead and/or real-time energy markets. When generators are scheduled or dispatched to provide energy in the day-ahead energy market, they receive day-ahead LMP prices for the scheduled amounts; any deviations in real time from the day-ahead schedules will be settled at the real-time LMPs.

Similarly, LSEs whose load obligations are not fully covered by contracts or the LSE's own resources will be free to purchase any remaining requirements from the Midwest ISO day-ahead and/or real-time energy markets. Any purchases in the day-ahead energy market will be settled at the day-ahead LMPs, and any deviations from the day-ahead schedules will be settled at the real-time LMPs.

Q. HOW WILL THE USE OF FTRs INCREASE THE CERTAINTY OF TRANSMISSION COSTS?

A. Generators and LSEs will be able to acquire FTRs through the Midwest ISO allocation process and through secondary trades with other parties. When the FTRs match the quantities and points of injection and withdrawal of a party's expected transactions, the FTRs will provide hedges against the congestion portion of the usage charges assessed to those transactions in the Midwest ISO markets. This effectively hedges the party against congestion charges and eliminates the risk of uncertain congestion costs.

Even if a party cannot acquire FTRs that exactly match its transactions, the party may still be able to acquire an acceptable hedge by acquiring a portfolio of FTRs that have a similar or greater settlement value as those matching the transaction. Because FTRs are financial instruments that entitle the holder to a set of dollars in the day-ahead energy market settlements, the actual FTRs owned do not have to match the party's actual schedules.

Q. HOW WILL THE USE OF LMP REVEAL OPPORTUNITIES FOR BENEFICIAL TRANSACTIONS?

A. Day-ahead LMPs will be calculated for each hour of the next day and posted on the Midwest ISO website. Similarly, real-time LMPs will be calculated for each five-minute dispatch interval and posted on the Midwest ISO website. Market Participants will thus

have a transparent set of day-ahead and real-time prices from which to determine the value of trades between any two locations on the grid (or between specific locations and aggregate LMP trading hubs).

Q. WILL THE MIDWEST ISO MARKET MECHANISMS ALSO SUPPORT LOAD SERVING ENTITIES WITH DEFAULT SUPPLY OR STANDARD OFFER SERVICE OBLIGATIONS?

A. Yes. All of the mechanisms described above will also be available to those entities with default supply and standard offer service obligations. In particular, access to the Midwest ISO markets will reduce the risks these LSEs face from uncertain load obligations. Again, these LSEs will be eligible for FTR allocations.

Q. WILL THE MIDWEST ISO'S MARKET MECHANISMS UNDERMINE THE ABILITY OF STATES AND/OR UTILITIES TO SERVE THEIR OWN CUSTOMERS AT LOWEST COST?

A. No. Just the opposite. The Midwest ISO's market mechanisms will actually enhance the ability of states and local utilities to serve their customers at the lowest costs, consistent with reliable operations. To begin with, by coordinating a regional economic dispatch the Midwest ISO will be able to arrange a more efficient (*i.e.*, lower cost) dispatch for the region as a whole than can be achieved by the individual dispatches of the separate control areas. This more efficient regional dispatch can then serve loads that are relying on the regional dispatch at the lowest cost, given the dispatch offers and bids.

Areas currently served by low-cost resources will be able to continue to serve local loads at low cost, but any surplus low-cost resources may be offered to the Midwest ISO regional dispatch, which will help to lower dispatch costs for other areas within Midwest ISO and return revenues for the entities owning the surplus low-cost resources. To the

extent that an area relies on imports to serve local loads, the Midwest ISO's regional markets will facilitate that area's ability to be serve customers at lowest cost, either through purchases from the Midwest ISO-coordinated day-ahead energy market and real-time spot markets or through efficient scheduling of bilateral transactions between suppliers and LSEs. The Midwest ISO's LMP-based markets will then support these transactions with effective and efficiently priced redispatch, and with open access to the Midwest ISO spot markets to cover uncontracted amounts and imbalances in real time.

Q. HOW CAN UTILITIES IN LOW-COST REGIONS CONTINUE TO SERVE THEIR CUSTOMERS AT LOW COSTS, WHEN THE MIDWEST ISO MARKETS ARE REGIONAL?

A. The EMT does not require any party to rely on the Midwest ISO spot markets to purchase any or all of their energy requirements or sell any or all of their output. Any party may arrange and schedule bilateral contracts between suppliers and LSEs, with the price for power defined by the contract, not by the Midwest ISO spot prices. Similarly, utilities and other regulated LSEs, such as default suppliers, are free to self schedule their own or contracted resources to meet their own load obligations, with the prices paid by default customers defined by contracts, by the LSEs/utilities and/or by state regulators using their authority over retail rates. Only the amounts actually purchased from the Midwest ISO spot markets would be priced at the Midwest ISO spot market-clearing prices. The Midwest ISO market mechanisms do not alter this fundamental allocation of retail rate-making authority.

V. MARKET MONITORING AND MARKET POWER MITIGATION.

Q. WHAT STEPS HAVE BEEN TAKEN TO PROTECT THE ENERGY MARKETS AGAINST MARKET "GAMING" AND OTHER ACTIVITES OF MARKET MANIPULATION?

A. First, as described above, the use of LMPs will eliminate much of the gaming of market offers and bids that tend to plague markets that use alternative pricing approaches. In addition, under the EMT the Midwest ISO will be implementing a new market monitoring plan and market power mitigation measures. These provisions, which are specifically designed to identify and address market "gaming" activities, are contained in Module D of the proposed EMT. Pursuant to Module D of the EMT, the Midwest ISO has retained the services of an Independent Market Monitor ("IMM") to oversee the implementation and day-to-day operation of the Midwest ISO's market monitoring plan and market power mitigation measures.

Q. WHAT IS THE OVERALL ROLE OF THE IMM?

A. The role of the IMM is to protect and foster competition in the Midwest ISO markets, while minimizing interference with open and competitive markets. This is accomplished by independently monitoring the markets to: (1) identify market design flaws that compromise the efficiency of the markets and recommend improvements; (2) detect and mitigate attempts to exercise market power or attempts to manipulate the market outcomes by Market Participants or Transmission Owners; and (3) identify operating actions or procedures of the Midwest ISO that distort market outcomes or otherwise undermine market efficiency. These responsibilities are set forth in Module D of the EMT.

Q. PLEASE DESCRIBE THE ELEMENTS OF THE MIDWEST ISO'S MARKET MONITORING PLAN.

A. The Monitoring Plan is designed to provide independent monitoring of the Midwest ISO markets by the IMM. This includes monitoring Market Participants' conduct; identifying opportunities for efficiency improvements (including changes to market rules); and evaluating the operation of the energy markets and transmission system by the Midwest ISO.

Q. WHAT IS THE ROLE OF THE IMM IN THE MITIGATION PROCESS?

A. The IMM is primarily responsible for conducting the tests set forth in Module D, which provide the framework for determining when market power may have been exercised by a particular Market Participant and whether the application of mitigation measures are warranted. Most of these tests employ objective criteria that require little or no discretion be exercised by the IMM. To the extent that discretion is required, the IMM is responsible for exercising such discretion only in a limited fashion and applying the specific Mitigation Measures set forth in Module D.

Q. WHAT IS THE OBJECTIVE OF THE MITIGATION MEASURES?

A. The Mitigation Measures will mitigate abuses of locational market power while minimizing interference with the market when the market is workably competitive. To that end, the Mitigation Measures authorize the mitigation of specific conduct only when the conduct exceeds well-defined conduct thresholds and when the effect on market outcomes of such conduct exceeds well-defined market impact thresholds. Using these thresholds, the Mitigation Measures are designed to allow prices to rise efficiently to reflect legitimate supply shortages while effectively mitigating inflated prices associated

with artificial supply shortages that result from physical or economic withholding in transmission-constrained areas.

VI. RESOURCE ADEQUACY REQUIREMENT.

Q. DOES THE EMT CONTAIN ANY PROVISIONS RELATING TO RESOURCE ADEQUACY REQUIREMENTS?

A. Yes it does. Module E of the EMT contains specific requirements and standards to be met by Transmission Providers and Market Participants to ensure that there is access to adequate generation resources to meet demand on the Midwest ISO transmission system. The resource adequacy requirements established by Module E of the EMT are based on the pre-existing reliability mechanisms of the states within the Midwest ISO Region. The provisions of Module E require all Transmission Providers and Market Participants to comply with: (1) all requirements of the Regional Reliability Organizations governing the location(s) where the load being served is located; and (2) all state regulations and laws regarding reliability, including any reserve margin requirements, of the states in which the Transmission Provider operates.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

VERIFICATION

The answers in the foregoing testimony are true and correct to the best of my knowledge and belief.

Ronald R. McNamara

STATE OF INDIANA)

COUNTY OF HAMILTON)

Subscribed and sworn to before me by Ronald R. McNamara, on this the 29th day of September 2004.

Notary Public

DOROTHY M. SHUTE
NOTARY PUBLIC, State of Indiana
My County of Residence: Hendricks
My Commission Expires: May 8, 2009

(SEAL)

CERTIFICATE OF FILING AND SERVICE

I hereby certify that on this the 29th day of September, 2004, the original and eleven (11) copies of the foregoing were hand-delivered for filing with the Commission, and a copy was sent by U.P.S. Overnight to:

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