

**Summary of Key Midwest ISO Benefit – Cost Studies related to Regional Security-Constrained Economic Dispatch**

Study	Geographic Scope	Quantitative Analysis – Items Covered	Key Quantitative Findings	Key Qualitative Findings
Wisconsin – March 26, 2004	Wisconsin Investor Owned Utilities	<p>The study compared participation of Wisconsin Midwest ISO members participation in the Midwest Energy Market to a continuation of Day 1 operations, taking into consideration:</p> <ul style="list-style-type: none"> <li>• Production and purchased power costs;</li> <li>• Revenues from off-system sales;</li> <li>• FTR Revenues from projected Tier 1 &amp; 2 allocations;</li> <li>• Congestion Costs; and</li> <li>• Schedule 16 &amp; 17 Market Implementation Costs.</li> </ul>	<ul style="list-style-type: none"> <li>• During 198 Level 3 and higher TLR events in Wisconsin during 2003, constrained flowgates were under utilized by 11.4% on average without regional economic dispatch. This was significantly higher degree of under utilization than in other less constrained portion of the Midwest ISO.</li> <li>• Implementation of Midwest ISO energy markets would result in a net savings \$51.2 million / yr.</li> </ul>	<p>Development of transparent and efficient spot markets will change economic incentives and produce significant intermediate and long-term efficiency benefits.</p>
GFA – June 25, 2004	MISO Member Control Areas	<p>The study quantified:</p> <ul style="list-style-type: none"> <li>• The historical impacts of 2003 Level 3 and higher TLRs on transmission utilization;</li> <li>• Cost of service benefits from managing congestion through security-constrained unit commitment and economic dispatch taking into consideration production and purchased power costs, off-system sales revenues, and the cost of market implementation;</li> <li>• Costs to serve load at market prices; and</li> <li>• In an illustrative analysis, the potential impacts of a carve-out of GFAs.</li> </ul>	<ul style="list-style-type: none"> <li>• During 926 Level 3 and higher TLRs the constraining transmission facilities were under utilized by 12.9% on average due to the imprecision of the TLR process.</li> <li>• Regional unit commitment and dispatch could produce benefits in production costs, purchased power costs, and off-system sales of \$255 million / yr. After deducting the cost of market implementation, this represents a net benefit of \$128 million / yr.</li> <li>• Security-constrained unit commitment and economic dispatch would reduce the cost of power at market prices to Midwest ISO members by \$713 million / yr. Taking into the cost of market implementation, this equals a net benefit of \$586 million / yr.</li> <li>• A carve-out of GFA contracts could raise peak prices in the Wisconsin Public Service load zone by 52%, in the Wisconsin Power &amp; Light area by 20.9%, and by substantial amounts in other control areas.</li> </ul>	<ul style="list-style-type: none"> <li>• Use of TLRs to manage transmission congestion is economically inefficient – TLR curtailments do not reflect the then current value of transactions curtailed.</li> <li>• Reliance on TLRs to manage congestion makes it difficult to system reliability.</li> <li>• The economic benefits of regional dispatch quantified in this analysis were exclusive of potentially larger benefits of transparent markets related to improved investment decisions, lower forced outage rates, and enhanced demand management.</li> </ul>

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<p>LG&amp;E / KU III – March 3, 2005</p>	<p>LG&amp;E / KU control area</p>	<p>The study examined the total costs of continued membership in the Midwest ISO compared to a non-specific LG&amp;E / KU proposal for independent transmission operations with a contract for reliability coordination services. Costs and benefits considered in the study included:</p> <ul style="list-style-type: none"> <li>• Production and purchased power costs;</li> <li>• Transmission payments associated with off-system sales;</li> <li>• Congestion costs;</li> <li>• Uplift charges;</li> <li>• LG&amp;E / KU administrative costs;</li> <li>• RTO charges;</li> <li>• Off-system sales revenue;</li> <li>• Transmission revenues; and</li> <li>• Financial Transmission rights related costs and revenues.</li> </ul>	<p>Withdrawal from the Midwest ISO in favor of stand alone transmission operations and contracting for reliability coordination services would:</p> <ul style="list-style-type: none"> <li>• Impose a net recurring cost on LG&amp;E / KU customers of \$46.2 million / yr.;</li> <li>• LG&amp;E / KU would be responsible for paying an exit fee of \$40.2 million;</li> <li>• Under a broad range of assumed futures, there would be significant net recurring costs to LG&amp;E / KU, ranging from \$7.3 million per year to \$52.9 million per year; and</li> <li>• For the period 2005 – 2010, the net present value cost to LG&amp;E / KU of leaving the Midwest ISO (after taking into consideration all costs of Midwest ISO membership) would be \$276.1 million.</li> </ul>	<p>The study identified economic incentives for more efficient location of generation, including that locating a single combustion turbine downstream for frequently occurring transmission constraints instead of near LG&amp;E / KU's major load center where the Companies have sited generation could save consumers \$2.2 million / yr. This study updates earlier testimony that had identified additional benefits of transparent markets based on regional dispatch, including:</p> <ul style="list-style-type: none"> <li>• Meeting LG&amp;E / KU merger requirements related to the mitigation of market power;</li> <li>• Incentives to reduce LG&amp;E / KU forced outages to provide the equivalent of more than 170 MW of capacity;</li> <li>• Price signals that if made available to consumers might reduce peak demand by 100 MW or more and enhance choice;</li> <li>• Incentives for improved generator efficiency;</li> <li>• Enabling regulators to benchmark utility costs; and</li> <li>• Facilitating the allocation of capital investment risks through liquid wholesale markets.</li> </ul>

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Aquila – October 2005	Aquila Missouri Operating Companies	<p>The study compares the benefits and costs of the Aquila operating companies participating in the Midwest ISO, participating in an efficient SPP Energy Imbalance Service (EIS) market, or operating on a Stand Alone basis outside of the two RTOs. The comparison was made based on the following four perspectives:</p> <ul style="list-style-type: none"> <li>• Production &amp; Purchased Power Costs to serve Aquila Missouri native load;</li> <li>• Benefit to Aquila Missouri taking into consideration Production Costs, Purchased Power Costs, and Off-system Sales Revenue Net of Transmission Charges;</li> <li>• Congestion Costs associated with use of transmission to serve Aquila Missouri native load customers; and</li> <li>• Costs to serve Aquila Missouri native load at Wholesale Power Prices.</li> </ul>	<p>Aquila-MO participation in the Midwest ISO results in:</p> <ul style="list-style-type: none"> <li>• The lowest production and purchased power costs for serving Aquila native load – at least \$5.7 million / yr. below the cost of the SPP EIS market and \$6 million / yr. less than the cost of Stand Alone Operations</li> <li>• The greatest benefit to Aquila-MO taking into consideration net off-system sales revenues – \$3.3 million / yr. greater than for SPP EIS participation and \$6.4 million / yr. more than under Stand Alone Operation.</li> <li>• The lowest congestion costs \$5.7 million / yr. less than in SPP and \$6 million / yr. less than operation on a Stand Alone basis; and</li> <li>• The lowest cost to serve native load at wholesale prices – \$38.5 million / yr. less than in SPP and \$26.8 less than with Stand Alone Operations.</li> </ul>	<ul style="list-style-type: none"> <li>• SPP’s EIS combines elements of traditional transmission rights with locational pricing when an “imbalance” is created. Differences between this approach and the LMP markets used in the Midwest ISO and other RTOs could facilitate strategic behavior to degrade the efficiency of economic dispatch and under some circumstances expand high price load pockets.</li> <li>• SPP’s EIS proposal would not implement a regional security constrained economic dispatch that takes into consideration potentially impacted constraints such as that implemented for reliability purposes in other RTOs.</li> <li>• Transparent energy markets provide incentives for improved generator efficiency and availability, identify efficient locations for generation and transmission investments, permit regulators to benchmark utility costs, facilitate allocating capital investment risks through liquid wholesale markets, and enhance consumer choice.</li> </ul>

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<p>Value Review – Analysis of pre-Midwest ISO to post Midwest IOS Market</p> <p>Presented October 19, 2005</p>	<p>Midwest ISO Region</p>	<p>This analysis involves a simulation based on a relative review of publicly available data in which the same dispatch optimization algorithm was used in all cases. The models used in this analysis were statistical and cost based. The analysis provides results that are representative of the total benefits available to the market. The analysis was performed by:</p> <ul style="list-style-type: none"> <li>• Developing costs of control areas as islands</li> <li>• Developing a best case bilateral market</li> <li>• Blend first to scenarios to develop a representative bilateral market view</li> <li>• Comparing these three scenarios to the Midwest ISO market to see relative cost differences</li> </ul>	<p>The results of this analysis varied depending on assumptions, but were bounded by the examples analyzed:</p> <ul style="list-style-type: none"> <li>• Production cost savings range between \$59 million and \$154 million per month producing a benefit / cost ratio of between 5/1 and 14/1</li> <li>• Taking into account both market and reliability administration costs, the net benefit / cost ratios are between 2.5/1 and 7/1</li> <li>• Optimization of the market reduced the effects of net fuel inflation from an approximate 30% to an approximate 25% increase</li> </ul>	

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<p>Analysis of the Benefits of the Midwest ISO’s Day-2 Markets</p> <p>Preliminary results of study conducted by ICF Consulting, LLC October 31, 2005</p>	<p>Midwest ISO Region</p>	<p>This analysis compares an actual Midwest ISO Day-2 operation to a simulated Midwest ISO Day-1 operation for a single peak hour and for the entire 24-hour period of July 7, 2005. This analysis also estimates the maximum benefits achievable from an optimal Day-2 operation to reflect the potential to increase savings to Midwest ISO consumers from incremental operational improvements to current Midwest ISO Day-2 operations.</p>	<p>This study estimates that roughly, between \$0.6 million to \$1.0 million in maximum benefits from production costs savings over the 24-hour period of July 7, 2005. Annualized over a year, this amounts to approximately \$220 million to \$365 million in potential gross savings to consumers.</p>	<p>Additional savings are possible from potential improvements in Midwest ISO operations. For example, improvements in load forecasting could have a direct impact on improving unit commitment.</p>