

Mark B. Lively
19012 High Point Dr.
Gaithersburg, Md. 20879
301-428-3618
MbeLively@aol.com

2003 June 19

Congestion Management Working Group
Midwest ISO
Via Exploder

I participated in today's conference via the telephone call-in. I mainly commented and asked questions about inadvertent and uninstructed deviations. I consider them to be parts of the same issue, how to price unscheduled flows of electricity, at least that is the terminology I have used for the issue since 1989.

GOOD VERSUS BAD

At least one person used the phrases "good inadvertent" and "bad inadvertent" without explaining what those phrases mean. As I have heard those phrases, "good inadvertent" is the delivery of inadvertent when the network frequency is low or the receipt of inadvertent when network frequency is high. Conversely, "bad inadvertent" is the delivery of inadvertent when the network frequency is high or the receipt of inadvertent when network frequency is low. This is summarized in Table 1.

Inadvertent Interchange Defining Good Versus Bad Table 1		
Frequency	Low	High
Inadvertent Delivery	Good	Bad
Inadvertent Receipt	Bad	Good

The concept of good versus bad is best explained when the frequency is low. The delivery of inadvertent when frequency is low helps the system by keeping the frequency from going even lower. Those who receive inadvertent when the frequency is low are short of power and are a drag on the rest of the network. This is considered to be bad inadvertent. Conversely, when frequency is high, any delivery of inadvertent just contributes to the frequency deviation and is thus considered to be bad. Those who receive inadvertent when the frequency is high keep the frequency from going even higher. This is considered to be good inadvertent.

Similarly there should be "good uninstructed deviation" and "bad uninstructed deviation" with good and bad depending upon the health of the network. Good uninstructed deviation would include surpluses when the MISO is short and deficits when MISO is long. Bad uninstructed deviation would include surpluses when MISO has a surplus and shortages when

MISO has a shortage. Instead, all uninstructed deviations are nominally treated as bad. Shortages are to be penalized at 140% of LMP¹ under the current plan and surpluses are to be penalized at 40% of LMP.

Uninstructed Deviation Defining Good Versus Bad Table 2		
MISO Balance \ Uninstructed	Shortage	Surplus
Delivery	Good	Bad
Receipt	Bad	Good

USING TWO SETS OF LOCATIONAL MARGINAL PRICES (LMP)

One way around this issue is to acknowledge that there can be two different sets of locational marginal costs. Considering the discussion today, let's call the traditional locational marginal cost LMP-SCD, for security-constrained dispatch. Let's call the new locational marginal cost LMP-UD, for uninstructed deviation. MISO would use LMP-SCD for amount of generation or load that was bid into the dispatch program. MISO would use LMP-UD for uninstructed deviation including inadvertent.

An advantage to having the two different LMPs is the elimination of the special exceptions discussed today for intermittent generators, non-conforming loads, generation in the process of starting up, and generation in the process of shutting down. These generators and loads could choose to participate in the security-constrained dispatch and settle at the LMP-SCD for the amount determined by the security-constrained dispatch. However, the LMP-UD would be applicable to any uninstructed deviations, whether above or below the dispatch level. The generators and loads could similarly choose not to participate in the security-constrained dispatch and settle at the LMP-UD for their output or load. The LMP-UD would also be used to settle inadvertent by the control areas.

SETTING LMP-UD

Since LMP-UD would be used for both uninstructed deviation and inadvertent, MISO would need a way to set LMP-UD to reward good uninstructed deviation and good inadvertent and to punish bad uninstructed deviation and bad inadvertent. High prices reward inadvertent

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	Billed at 100% of LMP		Billed at 60% of LMP		Total	
MW	MW	LMP-MW	MW	LMP-MW	LMP-MW	Change
90	90	90	0	0.0	90.0	N/A
89	88	88	1	0.6	88.6	1.4
88	86	86	2	1.2	87.2	1.4
87	84	84	3	1.8	85.8	1.4

surpluses and uninstructed deviation surpluses and punish inadvertent shortages and uninstructed deviation shortages. Low prices reward inadvertent shortages and uninstructed deviation shortages and punish inadvertent surpluses and uninstructed deviations surpluses.

From Table 1 for defining good versus bad inadvertent, a high price on the left column of the table when frequency is low will reward good inadvertent and punish bad inadvertent. Similarly, a low price on the right column of Table 1 when the frequency is high will again reward good inadvertent and punish bad inadvertent. The same analysis is true for the two columns of Table 2 for defining good versus bad uninstructed deviation.

System operators already combine the two tables for defining good versus bad in their development of area control error (ACE). Under the above analysis, we should have high LMP-UD prices when ACE is negative and low LMP-UD prices when ACE is positive. I have in various papers proposed that the LMP-UD prices can be a continuous function of ACE, a concept I have called WOLF for Wide Open Load Following.

IMPORTANCE OF MAINTAINING SMALL INTERVAL PRICING

During the conference, I argued against using hourly average LMP-UD to cash out inadvertent and uninstructed deviation, saying that we should use the five-minute data. I gave the example of a system emergency during the first half of an hour and a surplus during the second half. I present a numeric example in Table 3.

Inadvertent Interchange Importance of Retaining Small Time Intervals Table 3			
	Inadvertent	Price	Payment
1 st 1/2 Hour	-50 MWH	\$100/MWH	-\$5,000
2 nd 1/2 Hour	60 MWH	\$20/MWH	\$1,200
Total	10 MWH	N/A	-\$3,800
Average Basis	10 MWH	\$60/MWH	\$600

CASHING OUT INADVERTENT INTERCHANGE BY PARTS

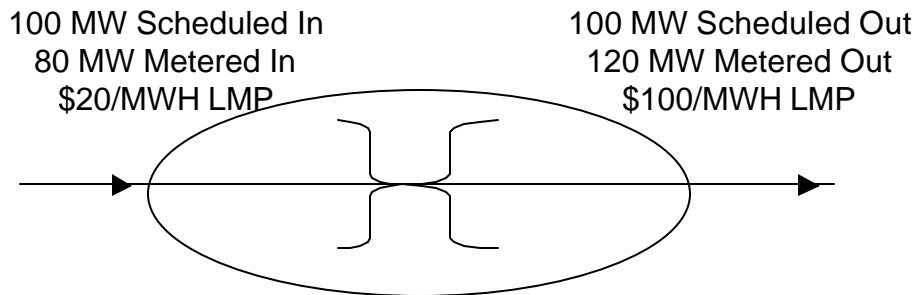
During the conference, the current proposal to cash out inadvertent was based on the average LMP for all of the generator nodes. Someone suggested that the average LMP also include all of the load nodes. I argued that the LMP should be applied against the unscheduled flows across each of the interconnections that the control area has with other control areas.

In Figure 1, I present a control area that has 100 MW scheduled through it from left to right. However, the flow out on the right is 120 MW while the flow in on the right is only 80 MW. Thus, there is inadvertent out of 40 MW. Because of the constrained flow gate in the control area, the LMP at the right interface is \$100/MWH and is much higher than the LMP at

the left interface of \$20/MWH. If the generation is all to the left of the constrained flow gate, the inadvertent would be priced at \$20/MWH or \$800/Hour. If the generation is all to the right of the constrained flow gate, the inadvertent would be priced at \$100/MWH or \$4,000/Hour. The alternative that I suggested would price 20 MW unscheduled out on the right at \$100/MWH or \$2,000/Hour and 20 MW unscheduled out on the left at \$20/MWH or \$400/Hour, for a total of \$2,400/Hour.

An advantage of this geographically differentiated cash out of inadvertent is that it produces a zero sum for MISO as a whole. Note that the payment of \$2,000/Hour to this control area on its right would be matched by a payment from the neighboring control area of the same \$2,000/Hour. In the same way, the payment of \$400/Hour to this control area on its left would be matched by a payment from the neighboring control area of the same \$200/Hour. This would be true for any number of control areas.

Inadvertent Interchange Example
With Constrained Flow Gate
Figure 1



CLOSING

I appreciated being able to participate in the conference today by telephone. Listening to the discussion provided me with new insights into how to explain the issues presented in this letter. I look forward to talking with you again, either individually or collectively.

Yours truly,

Mark B. Lively
Utility Economic Engineer