The paper recently circulated by Andy Ott, PJM entitled "Can Flowgates Really Work?" presents historical data on congestion costs associated with constraints in PJM to demonstrate that historical congestion is not a good predictor of future congestion. Specifically, they show that constraints that capture 80 percent of congestion from a six-month period in 1998 capture less than 5 percent of congestion in 1999, and constraints that capture 80 percent of congestion in 1999 capture less than 60 percent of congestion in the first four months of 2000. The author concludes that this analysis shows that the flowgate approach in defining "commercially significant flowgates" (CSFs) will more often than not "miss the mark" and likely require high, unpredictable socialization of non-flowgate congestion. Further, he says that the current LMP system offers substantial opportunity for hedging congestion risk.

The paper overstates the implications of the data, and erroneously characterizes the flowgate model on the basis of these implications. Further, the paper does not address the key failures of the current market structure in PJM. This memo is the first part of a response that discusses the following arguments:

1) The data presented in the PJM paper in fact paints an optimistic picture for the flowgate model.
2) The PJM paper misrepresents the flowgate approach to defining CSFs, and misses the point that CSFs should be defined based on an expectation of future conditions, and historical data are only one input into this definition process.
3) The paper distorts the socialization of costs in the flowgate model by using an inappropriate example, and avoids discussing the corresponding trade-offs in the LMP system.
4) The PJM paper states that liquidity at the Western hub is evidence of the vibrant forward market in PJM. This is a red herring, because the inactivity of the forward market in PJM is reflected in the absence of any forward contracts for delivery in the major load centers in eastern PJM.

1) **Historical congestion data in PJM in fact paint an optimistic picture for the flowgate model.**

The example of constraints in 1998 capturing only 5 percent of congestion in 1999 does not lend much insight into the value of historical data for several reasons. There was no true market in PJM in 1998, since participants did not have market-based rates until mid 1999. Thus, the data across the two years are not comparable. The data also represent just six months of experience with a new market, during which learning curve issues make the data unreliable for historical comparison.
However, the fact that commercially significant constraints from 1999 can capture 60 percent of congestion in part of 2000, and as much as 80 percent of congestion with the addition of just one additional constraint (Limerick 4A transformer), bodes well for the flowgate model. As discussed in (2), with additional analysis of future conditions on an on-going basis, the RTO can very likely select a set of flowgates that capture significantly higher than 80 percent of congestion. It has been suggested that the simplicity of defining 24-43 flowgates in an RTO is questionable, when several of these may be needed for a transaction, compared to an LMP system where just a single point-to-point FTR suffices for the same transaction. It is hard to miss the flaw in this comparison. The 24-43 transmission products under the flowgate model are comparable to the *hundreds or thousands* of FTR products in the LMP system. The fact that any one transaction may require multiple flowgate rights add no complexity to the transaction, because it is trivial to assemble automatically portfolios of these rights in transaction-based products based on fixed shift-factor matrices, as has been described in most previous flowgate model proposals. The complexity of the LMP system with thousands of products and prices lies in the fact that these transmission products, being so numerous, can hardly have much liquidity and therefore any price certainty, as empirical evidence in PJM and New York suggests. So that even though a point-to-point transaction requires just one FTR, the challenge participants, and particularly load serving entities, face is to evaluate hundreds of FTRs in order to compare the delivered costs of different supply options before finding the right point-to-point transaction for their needs. Similarly, traders cannot offer loads any certain delivered products, because of the myriads of uncertain transmission products they need to evaluate.

2) **CSFs in the flowgate model can and should be defined based both on historical data and a projection of future market and system conditions.**

The PJM paper gives the impression that CSFs in the flowgate method should or can be defined solely on the basis of recent historical congestion data. This is not the case. CSFs should be determined based on an *expectation of future market conditions*, in an iterative process between the RTO and stakeholders, into which historical congestion data are only one set of inputs. Most regions have not yet introduced competitive wholesale markets, and therefore historical data, mainly TLR logs in the east, would help capture a first cut at a selection of CSFs. Since the commercial significance of these cannot be determined from TLR data, this selection would have to be refined based on a projection of future conditions. The RTO will have significant additional data to develop such a projection. These fall into two categories: the physical system and the market. With regard to the expectation of the physical transmission system conditions, the system operators knows better than any other entity the likelihood of transmission upgrades/fixes in the next year. Another critical determinant of congestion patterns is new generation. The RTO could predict with very little uncertainty the likely new generation, since projects would have to be under construction or close to it in order to come online in the following year. Several physical attributes, such as flow limits, vary on interfaces, and these will have to be reasonably estimated and varied in scenarios based on past RTO experience.

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1 For example, the Bayway transformer at PJM caused significant congestion when down in the latter half of 1997 and early 1998, but alleviated congestion once the transformer came back into service. Such changes to the system can be anticipated and their impacts on flow patterns analyzed and accurately forecasted.
Clearly the challenge lies mainly in predicting market conditions. Scenario-based market simulations can be used, however, to evaluate the impact on flow patterns of market conditions, such as bidding behavior, fuel prices, weather sensitivities, etc. Several market simulation tools exist that under different assumptions of bidding behavior (e.g., perfect competition, strategic bidding) can reasonably project flow patterns and market prices. With knowledge of anticipated future conditions, stakeholder input, market simulations and historical constraints, the selected set of flowgates will very likely capture a high percentage of anticipated congestion on the system, and, the resulting uplift should be very low.

To the extent that congestion cannot be predicted, even an LMP-based market would be unable to provide any useful hedging mechanisms to participants, and there would be no hope for a forward market under any market structure. Market participants can and always have had to project congestion in order to hedge themselves, even in LMP systems, for instance in order to purchase FTRs in auctions in New York. If FTR values cannot be reasonably projected in advance, then market participants cannot purchase a portfolio of FTRs to meet their needs, and they remain perfect hedging instruments only in theory. That FTRs are perfect hedging instruments is therefore a misnomer, because even though an owner of an FTR is hedged completely against any real-time congestion, a market participant has to have an idea of the value of the FTR in advance in order to purchase FTRs before they can have any use for them. Market participants can anticipate congestion to the extent that products are well defined and traded in liquid markets. Indeed, congestion is more likely to be unpredictable under an LMP system, due to the obfuscation of commercially significant congestion by numerous, volatile prices and numerous transmission products (FTRs), which is why PJM has an inactive secondary market and no forward contracts for delivery (see Section 3 below).

The RTO, having knowledge of the system in excess of any participant, would be in a much better position to project congestion and define a handful of CSFs on which most congestion would manifest. The fact that the CSF selection can be modified at a frequency that stakeholders can decide (for e.g., every six months, with the trade off that more frequent updates will reduce certainty for long forward contracts but better represent system conditions) allows the market design to be responsive to system conditions.

3) The paper distorts the magnitude of societal costs associated with the Flowgate model.

The paper presents hypothetical per-unit increases in electricity costs due to the uplift on the order of about $2.5/MWh in constrained hours, which could be as high as $30/MWh if these costs were applied only to certain loads in these hours. These values are grossly misleading for several reasons, and provide no indication of the magnitude of costs on an annual basis:

- The magnitude of the costs that they have illustratively used is based on a poor CSF selection methodology, as described in (1) above, which is not representative of the flowgate model. With a more involved and dynamic evaluation of CSFs (anywhere from every month, as proposed in MISO, to annual), a much smaller uplift can be expected - on the order of less than 10 percent of total congestion costs. Further, it must be pointed out that several regions

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2 LMP advocates wrongly point to the experience of California and NEPOOL as examples of implemented flowgate models. These markets do not have flowgate models, and their failures in allocating congestion costs have little to do with the flowgate model.
are considering hybrid approaches, where an LMP real-time balancing market will reduce the likelihood of market participants handing-off congestion costs arising from the inaccuracies of the commercial model to this 'uplift', since they will have to bear some of the costs of this simplification in the real-time balancing market. Thus, the hybrid approach being considered in most regions will reduce the socialization problem even further.

- The 'socialized' congestion costs in the flowgate model, besides being exaggerated, have always been considered in isolation without considering the trade off in an LMP system. To understand this, it is helpful to put in perspective the magnitude of congestion costs relative to the energy market. The total congestion costs in PJM in 1999 were $65 million. This represents about 1 percent of the total energy market in PJM, and only 0.3 percent of retail electricity sales in PJM (including T&D costs). Of this, the potential socialized costs would be on the order of 0.1 percent of energy demand value and 0.03 percent of retail electricity sales in PJM. On the other hand, the gains of an LMP system (the avoidance of this 0.03 percent of 'socialized costs') represent very small societal benefits but are accompanied by a very hefty sacrifice to bear in the form of a virtually inactive forward market. It is useful to consider the trade off between: a) defining under 30 transmission products for commercial trade, which will have a significant likelihood of improving liquidity in the forward market and improve the efficiency of a $6 billion wholesale energy market, but face the risk of causing uplift payments in the amount of 0.1 percent of this market value; against b) an LMP system with thousands of transmission products, with a low likelihood of any forward contracts for delivery in a $6 billion market, but the benefit of correctly allocating 0.1 percent of this market value. The price paid by society for an inefficient, inactive forward market in the long run will likely be significantly higher than the potential uplift costs, because it will stymie all the efforts of deregulation to lower electricity prices and increase innovation through market efficiency and competition. As discussed further below, the forward market in PJM is virtually inactive, because there are no contracts for delivery.

- The PJM paper disingenuously presents an artificially high number ($30/MWh) to illustrate the impact of the uplift by using a per-unit cost and assuming incorrectly that all uplift costs within an RTO could be allocated to a single load within the RTO. Clearly the relevant cost is the total annual cost to loads, and not the single cost in any hour. These total costs would be spread over all load, and not allocated to specific loads unless the congestion was directly attributable to these loads, in which case they should pay these costs, and then they wouldn't be 'socialized' costs anymore.

In any case, even though the magnitude of the inefficiencies of the flowgate model are likely to be small, it is still critical to understand that the flowgate model strives for a balance between the accuracy of the commercial model and the efficiency of the forward market, especially in the hybrid approach. As described above, the flowgate model expects the uplift costs to be negligible compared to the gains in the forward market of liquid secondary transmission market with well-defined products. LMP advocates have argued that the potential will always exist for high uplift costs, and the experience of California shows that such a gamble could be very costly. Further,

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3 Energy demand value from 'Case Study - Congestion Pricing Mechanisms in PJM', presented by Stu Bresler, PJM, at the Congestion Forecasting and Pricing Conference in Chicago, June 2000. Retail electricity sales from Table A13, Energy Information Administration, Form 826, 1998. The retail percentages would be even smaller if measured against 1999 retail electricity sales.

4 This is assuming that one can even consider the LMP prices to be reliable, which is highly debatable - this is an issue for a separate discussion.
the paper concludes with the comment that potentially large uplift payments can destroy liquidity in the market, because this uplift will inhibit efficient trading. The logic in this conclusion is unclear, because there is no direct correlation between high uplift payments and trading. Traders do not have to pay uplift, so there is no disincentive created by uplift payments to trading. Highly liquid secondary markets for flowgate rights will increase price certainty and induce efficiency in trading, while as a separate matter, the RTO will update the commercial model to ensure the uplift is minimal.

With regard to California, the current market design is not a flowgate model, and so the failures of the market are therefore largely irrelevant to this debate. In fact, the California ISO is considering a flowgate model as a solution to the failures of the current market.5

On the other hand, the empirical evidence suggesting that bilateral contracts for delivery have virtually disappeared in PJM and in New York, reveal the high costs of the gamble already taken with LMP.

4) **Liquidity at the Western hub is a red herring, since the problem is the absence of any contracts for delivery to loads in eastern PJM.**

Activity at the Western hub is not indicative of market liquidity or of the fact that PJM fosters commercial trade, as the paper states. Today empirical evidence obtained from conversations with market participants suggests that there are virtually no contracts for delivery in PJM to any points in eastern PJM, where most of the load is concentrated. That is, no trader is willing to assume the transmission risk from the Western hub to load centers. The LMP market design contributes to this lack of liquidity. Although in theory PJM offers financial products to hedge congestion risk, these instruments are currently held by utilities that acquired them for free. The secondary market for FTRs is non-existent, because these utilities have no incentive to trade them. Thus, the market within PJM is largely inactive.

The costs associated with an inactive forward market are hard to quantify, but glaring for anyone who understand commodity markets. Market designers need to consider this trade off seriously, especially considering the empirical evidence in PJM and New York. Efforts should be focused on moving forward with the hybrid approaches that have the potential for efficient forward markets and efficient congestion cost allocation.

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