A working group of the MISO Advisory Committee met five times during August to determine whether it is feasible to develop a hybrid market design. The hybrid would be composed of a forward market centered around the trading of flowgate rights (FGRs) and a real-time balancing market that prices real-time energy and congestion using locational marginal pricing (LMP). If it determined that such a hybrid were feasible, the working group had the further opportunity to articulate the key rules and features that would be needed to ensure the hybrid market design could meet FERC’s Order 2000 requirements and support a workable and efficient electricity market in the Midwest. On September 6, 2000, the working group issued its report. This paper addresses several issues raised by that Report.

The Working Group Report acknowledges that its hybrid proposal is not a recommendation but rather an illustration of one example of how a hybrid model might be designed. Importantly, while some members might support this proposal, there is no consensus within the working group that this illustrative example is the preferred or even an acceptable basis for designing the MISO market and its congestion management system. Various members of the working group offered alternative hybrid models for consideration, but due to the limitations of time, the group spent most of its time considering a proposal submitted by APX. At its fourth meeting on August 23, the Chair asked the working group to consider a variation of the APX proposal, described here as “APX23,” and to define some of its essential rules and features. It is the APX23 hybrid proposal that is described in the Working Group Report to the MISO Advisory Committee. However, the working group did not perform the same exercise for other possible hybrids, and it did not have the time to perform any systematic evaluation of the APX23 proposal against a set of preferred attributes (such as those submitted by working group members). Hence, the Report describes an example of one possible approach, but it stops short of recommending its adoption by MISO.


The issues addressed by the working group are complex, and it is reasonable to expect that any hybrid proposal will need to be more thoroughly evaluated. This paper anticipates that MISO members will have a need for further discussion of the various hybrid options and require more analysis of the policy implications of designing the Midwest market under different approaches.

This paper therefore has three purposes. First, it provides an explanation of the policy choices available to MISO, or any RTO, in considering and designing a hybrid market structure. Second, it outlines several concerns raised by the APX23 hybrid approach. These are concerns that the working group identified but did not have time to fully resolve or explain in its Report. Third, it describes two other hybrid approaches that minimize or eliminate these concerns and contrasts their attributes with those of the APX23 proposal. The paper thus provides the MISO Policy and Advisory Committees, as well as the MISO Board, with a record of the important policy and market design choices that are available to MISO and that are likely to be considered by FERC if the MISO decides to submit a hybrid congestion management proposal for approval.

The APX23 Proposal

The Working Group Report contains a description of the APX23 proposal (see pages 6 through 12), which we summarize here. Readers are referred to the actual Report for more details. Generally, in addition to coordinating an LMP-based real-time market, as described below, the RTO would administer a flowgate rights system in the forward time period. There is no precise definition of “forward time period” and when it ends, but some expressed a preference that the scheduling deadline be an hour or less before real time.

The RTO would define commercially significant flowgates and auction or otherwise allocate to the market one-way flowgate rights across those flowgates. Parties could trade these FGRs in secondary markets outside the RTO. The RTO could add or change CSFs on a monthly basis and would then allocate/auction additional FGRs for any CSFs for the coming month.

Parties would not be required to obtain any FGRs in advance of scheduling, but parties that did acquire FGRs would receive credits in the RTO’s real-time settlements for the FGRs they held. These credits would apply as offsets against any LMP-based congestion charges assessed against each party’s schedules.

Under the APX23 proposal, the RTO would use a two-step process to determine the credits and charges for the RTO’s real-time settlements. In Step 1, the RTO would determine the value of the FGRs based on a hypothetical (“commercial”) dispatch that considered only the constraints designated as CSFs and that assumed the grid conditions and power transfer distribution factors (PTDFs) that the RTO had predicted and locked in a month ahead. In Step 2, the RTO would determine the LMP-based congestion charges using the actual constraints (including any constraints that had not been designated as
CSFs) and the actual grid conditions that applied in the real-time (“operational”) dispatch.

The APX23 proposal is not clear on what would happen next, as alternative settlement rules were still under discussion when the Report was issued. The apparent intent of the APX23 proposal is that any party that is “fully covered” – i.e., that has all of the FGRs it needs on the CSFs – would not have to pay any congestion charges (including charges for constraints not designated at CSFs), while parties that were not fully covered would be exposed to congestion charges. In this event, one possibility is that the net congestion charges applied to each schedule would be the congestion charges defined by Step 2 minus the credits defined in Step 1. However, exactly how this intent would be implemented is not clear, and the Report indicates that alternative settlement rules were still under discussion. Moreover, the working group did not resolve whether a party would be compensated for the value of any rights it held but did not schedule, although a “use-it-or-lose-it” rule was proposed by some proponents of APX23.

**Concerns with the APX23 Proposal**

The working group’s compressed time schedule and the resulting inability to flesh out proposals other than the APX23 variation limited the scope and depth of the evaluation, suggesting the need for a continuing process. Any MISO advisory or decision-making body should consider the time limitations imposed on this process when examining the Working Group Report. In fairness to the working group it was probably not possible to examine in detail all of the possible approaches, or even more than two or three major options, within the limited time allocated to the working group. Nevertheless, MISO members should be aware that other potentially viable hybrid approaches are available and have not yet been adequately considered.

The APX23 proposal raises several serious concerns that could be avoided with alternative approaches. For example:

- The APX23 proposal would require the MISO to be very actively involved as a participant in the forward market, despite the expressed concerns of many that RTOs in general should limit their involvement in such markets. The MISO would be involved first in continuous market assessments in defining the commercially significant flowgates (CSFs), as well as setting up and administering the flowgate rights system. On a daily basis, the MISO would actively monitor market and grid conditions and would be required to buy and sell flowgate rights (FGRs) in these forward markets in order to maintain some hard to define balance between the demand for FGRs and the changing capacity of the grid. The MISO would also have to accept, and pass on to its members, some financial risks for its erroneous market predictions and FGR allocation and buy-back decisions.

- Under the APX23 proposal, a significant portion of congestion costs would be socialized rather than charged to those whose transactions caused the congestion.
The MISO would guarantee complete congestion cost hedges for those parties that were “fully covered” with FGRs for their actual transactions.3 This guarantee would apply even when congestion occurred on transmission elements that were not designated as commercially significant flowgates and even when grid and usage conditions changed such that the mix of FGRs held by a party did not match the actual flows of its transactions in real time. The RTO’s costs for managing congestion on these other constraints and under actual conditions would be socialized across all customers responsible for paying grid access fees.4

- The degree to which congestion costs would be socialized would vary from transaction to transaction, depending on the degree to which any given transaction impacted non-designated constraints. Hence, the RTO’s decisions on which constraints to designate as CSFs (and which not) could have a discriminatory effect on parties depending on their expected points of receipt and delivery and the resulting distribution of flows. Some parties could thus bear a larger proportion of the congestion costs associated with their transactions, while other parties would be subsidized to a greater degree.

- These socialized costs would probably be absorbed by the MISO transmission owners, who may or may not be allowed to pass these costs through to their customers, depending on the status and terms of state-imposed rate freezes during some transition period. The only way that those forced to absorb these costs could protect themselves would be to convince the MISO to designate every conceivable CSF – i.e., as many CSFs as possible -- and force the market to choose which of the many CSFs it thought were really important enough to warrant the purchase of FGRs. If this occurred, the flowgate system would provide only partial hedges for trading even though the design intent was to provide full hedges based on socializing the costs of congestion on non-CSF constraints.

- The proposal would require MISO to lock in grid assumptions, including grid availabilities and power transfer distribution factors (PTDFs), a month in advance, and then guarantee complete congestion cost hedges for holders of flowgate rights even when actual grid conditions and PTDFs changed during the month. Again, the additional costs incurred by the RTO in redispaching under the actual

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3 Under the rule outlined in the Working Group Report, a trader would be fully covered if, and only if, it acquired at least the correct amount of FGRs for each of the CSFs designated by the RTO that were impacted by its transaction. Any failure to acquire all of the FGRs a trader needed for any CSP would remove the hedging guarantee.

4 MISO members will recall that the current MISO tariff structure does not contemplate that the MISO will routinely redispach to accommodate infeasible transactions, absorb redispach costs and then socialize the cost recovery. Rather it assumes that MISO will exclude infeasible schedules and implies that redispach options to preserve otherwise infeasible schedules will be arranged and paid for by participants scheduling those transactions. While system redispach is offered in LMP-based markets, such as PJM, the entities submitting the schedules are responsible for paying the marginal cost of the ISO’s redispach, thus making the ISO whole and obviating the need to socialize redispach costs.
conditions, and then guaranteeing these hedges for market participants, would be socialized, with the same implications as above.

- The APX23 proposal would use a two-step process based on a hypothetical dispatch to determine the credit that FGR holders would receive for their FGRs in the RTO’s real-time market settlements. The two-step process could foster infeasible scheduling and could be easily gamed, allowing some FGR holders to be subsidized in the credits they received.

- The APX23 proposal appears to preclude the ability of the RTO to issue point-to-point hedges in the form of FTRs. By making only FGRs available, but not FTRs, the proposal would limit the market's ability to fully hedge point-to-point transactions against point-to-point congestion charges.

Although there are inevitably tradeoffs to be made in any market design, these concerns appear to be serious enough to warrant careful consideration by any prospective RTO considering a hybrid approach. At the very least, the MISO Policy and Advisory Committees, the MISO transmission owners, and the MISO Board should have before them a wider range of policy options, including an uncompromised LMP approach (i.e., with point-to-point FTRs) as well as alternative hybrid approaches not fully considered by the working group, before making any irrevocable commitment to a particular market design. This paper attempts to provide the MISO advisory and decision-making groups with the information they need to make a more informed policy decision.

**The LMP-Based Real-Time Market**

All of the hybrid proposals assume that the MISO/RTO would operate a real-time balancing market and use LMP for pricing energy and transmission congestion. Moreover, there appears to be growing recognition that an LMP-based real-time market coordinated by the RTO is essential in any case, and that it would receive strong FERC approval whether or not a flowgate rights systems can be satisfactorily accommodated within the overall market design.

Further, there is little or no disagreement about the details of the LMP-based real-time market. These have been fairly well defined in LMP-based markets and were not the subject of debate within the working group. Assuming that the basic features of an LMP-based real-time market were not compromised by the requirements of a flowgate-based forward market, the real-time market would have the following features:

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5 See, for example, the paper by Hung-Po Chao, Stephen Peck, Shmuel Oren, and Robert Wilson, “Flow-based Transmission Rights and Congestion Management,” August 18, 2000 (forthcoming *Electricity Journal*). Versions of this paper are often cited by advocates as the theoretical basis for a flowgate system. That system is premised on an RTO-coordinated, bid-based real-time market in which energy and congestion charges are priced using LMP.
• The RTO would accept schedules and voluntary bids from market participants and use those bids to arrange a security-constrained economic dispatch. This dispatch would not merely redisplay enough to relieve congestion; it would use the bids to “clear the market” and balance the system at the lowest as-bid cost.

• The RTO would then price energy and transmission in this real-time market using LMP, and apply the LMP prices in its real-time market settlements. The LMP prices would be determined from the participants’ bids and would be based on the actual dispatch and actual constraints that were binding in the dispatch. Hence, the prices would be consistent with the RTO’s actual dispatch used to maintain reliability.

• All congestion managed by the RTO in real time would be priced at marginal cost using this approach.

• Generators and loads would see these marginal costs reflected in the LMP prices at their respective locations. (LMP prices to loads without interval meters would probably be averaged in some fashion.)

• Bilateral transactions would face these marginal costs in congestion charges defined by the difference between the LMP at the point of delivery and the LMP at the point of receipt.

• The congestion pricing would thus be comparable for all parties, whether they relied on bilateral schedules or trading through the RTO’s real-time (spot) market, or any combination of the two. Because this approach ensures that there are no cross-subsidies or incentives for gaming when shifting between spot and bilateral transactions, there would be no restrictions on how much (or how little) the parties were allowed to use the real-time market or either trading approach.

In a complete LMP-based system, the RTO would also issue financial transmission rights – FTRs – that would be defined as point-to-point financial hedges against congestion charges. FTRs would be defined on a point-to-point basis so that the hedges could match the point-to-point schedules and point-to-point congestion charges. By acquiring FTRs, parties could fix in advance the price of transmission and hence fix the delivered price of energy. However, in some hybrid proposals, including the APX23 proposal, the RTO would define and issue only flowgate rights, while point-to-point FTRs would not be available. The absence of point-to-point FTRs is a major compromise for an LMP-based system, and the implications for trading and hedging should be carefully considered when evaluating any hybrid proposal. As this paper will illustrate, these point-to-point rights turn out to be the only effective way to fully hedge point-to-point transactions without the use of subsidies and pricing schemes that raise significant concerns. Indeed the potential difficulty of achieving the equivalent of full point-to-point hedging using a flowgate

6 Within the MISO context, the RTO would attempt to achieve a regional market by coordinating among existing control areas using an approach such as the one described in the paper “Implementing Locational Marginal Pricing In a Multi-Control Area Environment,” August 28, 2000, submitted as Appendix A in the Working Group Report.
approach was a major topic of discussions within the working group, and the “solution” to this problem embedded in the APX23 hybrid proposal raises important questions about market fairness and efficiency.  These concerns are discussed in detail below.

Nevertheless, one approach was offered to the working group that would allow for both FTRs and FGRs.  Because of the obvious need for full point-to-point hedges, the concept of offering both types of rights received some support within the group.  However, this concept was not further explored by the working group and is not mentioned in the Working Group Report.  The approach is defined further below.

Although there were essentially no disagreements about the basic LMP features, there were disagreements about how the possession of FGRs would affect settlements in the LMP-based real-time market.  There are also concerns about how the flowgate market would be structured, how flowgate rights would be defined and valued, whether the hedging value of flowgate rates should be subsidized and what role the RTO should play in the flowgate system.  These issues are also discussed below.

Threshold Policies and Design Options

The working group identified several policy and market design choices that could be used to frame possible hybrid proposals.  These policy and design choices include: (1) the degree to which the MISO, or any RTO, should be involved in administering a flowgate rights system, (2) the method used by the RTO to price the credits that flowgate rights holders would receive to offset congestion charges in the RTO settlements, (3) the degree to which the flowgate rights should be subsidized to provide more complete hedges against potential congestion charges, and (4) the extent to which the value of FGRs used for settlements should be based on current grid conditions or on assumptions about grid conditions that are fixed in advance for set periods.  Once these threshold issues are understood, it will become apparent that alternative proposals can be constructed from different policy and design choices for each of these issues.

Following is a discussion of these fundamental policy and market design choices and how different choices would produce alternative hybrid proposals.

1. **To what extent should the RTO be involved in administering FGRs?**

   A threshold issue is whether the MISO should be the entity that defines and administers the flowgate rights system or whether these functions should be left to private commercial entities.  The policy decision depends on the extent to which parties wish the forward markets to function in an essentially decentralized fashion or instead prefer to have the MISO play a far more active and centralized role in organizing, administering and even trading in the forward markets.  In general, flowgate rights advocates have claimed to favor more decentralized approaches, which would suggest only a limited.

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7 This issue is in addition to the concern that trading could be more costly and difficult if traders had to acquire many FGRs in the correct proportion to support each transaction, whereas a single point-to-point FTR could fully hedge any transaction.
supportive role for the MISO, but the APX23 hybrid proposal takes the opposite approach, making the MISO the primary (and probably exclusive) issuer and backer of FGRs and an active participant in forward market FGR trading.

As described in the table below, the APX23 proposal would require the RTO to play a substantial role in the forward markets. Even the choice of commercially significant flowgates would require an RTO to engage in significant assessments of market preferences and expected market outcomes. After it designated the CSFs and allocated FGRs for those CSFs, the RTO would be expected to monitor market activity, as well as grid conditions, and determine when and how much to enter the FGR forward markets, either to sell additional FGRs or to buy back excess FGRs, in order to maintain an “acceptable” balance between the market’s demand for FGRs and the grid’s supply capabilities and between the market’s desire for more hedges and the need to limit the RTO’s (and consumers’) exposure to socialized redispatch costs.

In contrast, an alternative approach could be constructed that did not require the RTO to be an active market participant, buying and selling for its own account. This approach would leave the design and day-to-day administration of the flowgate rights system to one or more private commercial entities. These entities would decide which transmission constraints to define as CSFs, how many rights to allocate across these constraints, how to define the FGRs and how to settle with their customers. The RTO’s role would be limited to providing technical data on grid conditions, flowgate capacities under various operating and usage conditions, historical and (possibly short term) expected congestion, and current and potential power transfer distribution factors under a range of grid conditions. These data would be used by the private commercial entities to help them decide how best to design their FGR systems.

The choice between these two approaches is important, because there are clearly significant financial risks in implementing a flowgate system. These risks are exacerbated because some flowgate rights advocates have fostered a general expectation that the number of commercially significant flowgates will be small – “a few” is usually the term used – and that this small number of CSFs will allow a simplified and highly liquid FGR trading system. If there were in fact only a few commercially significant constraints and each were designated as a CSF, then the risks would be minimal, and a private commercial entity could implement the system and cover the minimal risks of occasional congestion on non-designated constraints through the purchase of RTO-issued FTRs. But the reality of the grid may be very different. If the assumption that only a few CSFs would be required is incorrect, and there are many important constraints that should be designated as CSFs, the risks for an RTO-backed FGR system would be significant. In that event, one would expect there to be strong pressure on the RTO from market participants to nevertheless designate only “a few” CSFs and then socialize any costs the RTO incurred in redispatching to relieve congestion on non-designated constraints.

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Hence, an important threshold question is whether MISO believes an RTO should put itself in the position of having to accept these risks, absorb the costs and recover them through some socialization scheme. Further, does the MISO want to be actively engaged in the flowgate rights forward markets, including taking market risks on behalf of its members and passing the costs of these risks to its members?

**Policy Choice I.**

Who Should Implement (and Bear the Risks of) an FGR System?

<table>
<thead>
<tr>
<th>Attribute/Issue</th>
<th>Private Implementation</th>
<th>RTO Implementation</th>
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</thead>
</table>
| What role does the RTO play in defining CSFs? | The RTO would be limited to providing technical data on grid conditions, grid capacities, PTDFs and historic or expected congestion, and any other grid information available to the RTO that would assist the commercial entities in developing their FGR systems. | The RTO would:  
- Use modeling to predict expected market use of the transmission system.  
- Make assumptions about the value that market participants would place on alternative transmission uses.  
- Determine thresholds for what the market would accept as commercially significant costs  
- Apply these thresholds to select commercially significant flowgates.  
- Estimate and evaluate the potential flows from market demand for FGRs for these CSFs, in order to determine the appropriate amount of FGRs to allocate during each period. |
| What role does the RTO play in trading FGRs? | None. The RTO would not be a trader in the FGR market.  
- The RTO would define and allocate/auction FTRs.  
- Private flowgate rights issuers could obtain FTRs to hedge the risks of the FGR systems they operated. | The RTO would sell FGRs through periodic auctions and/or whenever it determined that grid capacity could support further FGR allocations.  
- The RTO would repurchase FGRs in the forward market if it thought that the expected grid conditions would not support all of the |
The RTO would settle FTRs in its real-time settlements.

The RTO might need to define price caps for what it was willing to pay to re-purchase FGRs. (APX23)

| What role does the private market play in creating and administering flowgate rights? | Private commercial entities define CSFs, create and sell FGRs, settle FGRs with their customers. Private entities take on the risks of the FGR system. | Private market limited to trading FGRs that are defined, allocated and settled by the RTO. Private entities are shielded from the risks. |

2. *If the RTO implements the flowgate system, what method should the RTO use to determine the credit FGR holders will receive to offset congestion charges in the RTO's real-time market settlements?*

An important feature of the FGRs as defined by the working group is that they provide hedges against potential congestion charges. In this sense, they function as “financial” instruments rather than as so-called “physical” transmission rights. Although some members of the working group prefer to view the FGRs as “physical rights,” the group from the beginning chose to define FGRs as financial hedges, because this approach provides substantial trading and scheduling flexibility. Under typical physical rights concepts, parties must obtain all of the rights they need as a precondition to scheduling their transactions. This forces otherwise unnecessary trading before scheduling deadlines and would effectively deny grid access to those who acquired most, but not all, of the rights they needed. It also tends to complicate the ability to accommodate counterflow schedules that can expand the ability of the grid to accommodate additional transactions. With financial rights concepts, rights are not required as a precondition for scheduling. Parties may, but are not required to, acquire FGRs in advance, either through periodic auctions administered by the RTO or through trading in secondary markets that may be organized by commercial entities in various ways. Parties can then submit schedules with or without FGRs, or with only some of the FGRs they might need to hedge their transactions, providing they are willing to pay congestion charges for any flowgates or constraints not covered by their FGRs. All those with FGRs, no matter how acquired, are credited for these FGRs in the RTO settlements. Those without sufficient FGRs are credited for the FGRs they had, and charged for the congestion management costs associated with the flowgates/constraints to the degree they are not hedged by FGRs. The FGRs defined by the working group are thus financial, and relate to settlements.
The financial approach to FGRs requires that the RTO have a mechanism to determine the value of each FGR, so that when it charges for congestion, the RTO can appropriate credit each party for the FGRs it holds. These credits would offset any LMP-based congestion charges in the RTO settlements for its real-time balancing market. In an LMP-based system parties would be assessed congestion charges for their schedules based on differences between the LMP at the point of delivery and the LMP at the point of receipt – the standard congestion pricing approach used in LMP-based markets and approved by FERC for PJM, New York and New England. This LMP approach effectively prices congestion at the marginal cost of any redispatch that the RTO must perform to accommodate each schedule, thus providing efficient price signals about the value of using the congested grid. (When there is no congestion, there would be no redispatch costs and hence no congestion charges.)

The working group considered two basic approaches for determining the FGR credits. Under the first approach, the RTO would employ a two-step settlement process. In the first step, the RTO would determine the value of each FGR based on a hypothetical (“commercial”)dispatch that considered only the constraints officially designated by the RTO as CSFs. However, there would typically be constraints that were not designated as CSFs. In its real-time (“operational”) dispatch, the RTO would redispatch to solve all congestion and would price all congestion using LMP. In the second step, therefore, the RTO would determine the LMP-based congestion charges for each transaction, based on all of the constraints that were actually binding in the dispatch. The RTO would then credit each party that held an FGR for the FGR values determined in the first step.

The working group examined potential concerns with the two-step process. One concern is that the use of a hypothetical dispatch that does not account for all of the actual constraints in real time allows FGR values to be determined based on a set of schedules that could be infeasible in the real-time dispatch, when all the constraints (and the actual PTDFs) must be considered. Hence, the FGR values would not accurately reflect actual grid conditions, and the approach might actually encourage parties to submit infeasible schedules.

A second concern is that the use of two inconsistent dispatches – a hypothetical dispatch for FGR valuation and the actual real-time dispatch for congestion charges – may cause the RTO’s collections of congestion charges in the actual dispatch to be insufficient to fund the credits it must pay to holders of FGRs. This possibility arises because there is no relationship between the prices calculated in these two inconsistent dispatches that would ensure that the FGR funding mechanism would be revenue adequate. If the FGR settlement mechanism is not revenue adequate, the RTO would need to reduce the credits awarded to FGR holders or make up the difference by drawing funds from the FGR

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9 An explicit assumption of the flowgate rights approach is that only some constraints are commercially significant, and that there is little value in identifying, or obtaining flowgate rights for, constraints that are infrequent or involve only commercially insignificant costs to manage. By definition, there will therefore sometimes be constraints whose costs are not covered by the FGR system. Experience in other markets – New England, PJM, and California – suggests that RTOs are often incorrect in predicting which constraints will actually bind, how often, or at what cost. However, the flowgate rights approach assumes that these difficulties will not arise in the Midwest or can be overcome.
auction revenues that would otherwise be available to reduce transmission access fees, thus effectively charging customers who paid these fees to pay for the FGR subsidies. Moreover, the likelihood that the FGR funding would be inadequate is enhanced by the opportunities provided by the two-step process for parties to arbitrage between the two results and game the valuation process in ways that result in subsidies to the FGR holders. In the short period it had to do its work, the group worked through several examples of how such gaming could occur and was unable to rule out this potential concern.

The second approach, offered by Commonwealth Edison, would determine both the value of FGRs and the real-time congestion charges in a single step. The RTO would determine the value of FGRs – and hence the hedges or credits against congestion charges -- using the same grid conditions, assumptions and actual dispatch that the RTO used to determine the congestion charges. No hypothetical dispatch would be created or used to define FGR values, thus removing the potential for revenue inadequacy and gaming. Hence, the pricing of FGRs and the pricing of congestion would be internally consistent.

Despite the concerns with the two-step process, the APX23 proposal requires the two-step approach, at least to determine the credits for traders that are only partially covered. Hence, an important policy choice for the MISO is whether a single-step, consistent approach should be used for both FGR valuation and congestion charges. It appears that a single, consistent approach would avoid the potential for encouraging infeasible schedules in the forward market (which would require MISO redispatch in real time) and would eliminate opportunities for gaming and subsidies.

### Policy Choice II. How Should an RTO Determine FGR Credits?

<table>
<thead>
<tr>
<th>Attribute/Issue</th>
<th>APX23 Proposal</th>
<th>Alternative Proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>How should the RTO determine the value of the FGR credits?</td>
<td>Use a two-step approach with a hypothetical dispatch to determine the hedging credit for FGRs and the actual dispatch to determine the congestion charges.</td>
<td>Use a single-step approach, that uses the same dispatch and grid condition to define both the congestion charges and the hedging credit of the FGRs.</td>
</tr>
<tr>
<td></td>
<td>In Step 1, RTO constructs a hypothetical dispatch that assumes that there is no congestion on any elements that are not designated as CSFs. The value of FGRs is based on this step.</td>
<td>Keep congestion pricing and FGR valuation consistent to avoid gaming and other wrong incentives, and to avoid the potential for revenue inadequacy.</td>
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10 See, Memos from Bill Hogan to Reem Fahey, dated August 4, 9, and 17, 2000, and various responses by APX, all considered by the working group.
In Step 2, RTO uses the actual dispatch, including all of the constraints (CSF and non-CSF) that were binding, to define the LMP-based congestion charges.

The RTO then applies the FGR credits determined from the first step to the congestion charges determined in the second step, to find the net congestion charges to be paid by (or to) each party.

3. If the RTO administers the FGR system, should the RTO guarantee (subsidize) the hedges against all congestion charges, including congestion costs that occur on constraints not designated as CSFs?

Early in the working group’s work, it became apparent that transmission rights defined across selected flowgates might often not provide complete hedges against all congestion charges without some form of cross subsidies. The reason is intrinsic to the flowgate approach, which assumes that only some constraints are commercially significant while others are not.

Typical flowgate models identify some constraints as CSFs while assuming that all other constraints are unimportant. FGRs are then allocated and traded only for the CSFs. Logically, if a constraint other than one identified as a CSF became binding, then the RTO would incur redispatch costs. The RTO could avoid cross subsidies if it imposed congestion charges on those whose schedules contributed to this congestion. Under that rule, FGRs issued only for the CSFs would provide no financial hedge against these congestion charges. In theory, the RTO and market could reduce this risk by attempting to predict and identify all such constraints in advance and designate them all as CSFs, thus affording the market an opportunity to obtain FGRs to cover all of the congestion charges. However, since there could be dozens or perhaps hundreds of potentially binding constraints in a region as large as the Midwest, this strategy could effectively require market participants to acquire and/or trade dozens or potentially hundreds of FGRs for each transaction. There is no logical reason, or any real world experience, to suggest that a system requiring the trading of many rights for each schedule, or each schedule change, would be workable, let alone easy, efficient and liquid.

An assumption of most flowgate models is that the actual number of important constraints will be relatively small, thus leaving a more manageable task for participants in acquiring and trading the necessary flowgates to be fully hedged. However, if this assumption is incorrect, and there are many potentially binding constraints in the
Midwest, then the flowgate model poses a dilemma for participants and the RTO. If the RTO designates only a few CSFs, when there are many other constraints that may become binding, then market participants will not be able to obtain complete hedges when these other constraints are binding, and they will be required to pay congestion charges on these non-CSF constraints. On the other hand, if the RTO designates all conceivable CSFs, the number of required flowgates may become too large and trading too cumbersome and costly for market participants.

To solve this dilemma, the APX proposal offered what might be called a “cost socialization” option (called “option 2” in the working group meetings). This option would allow the RTO to designate fewer constraints as FGRs – to simplify FGR trading and acquisition costs. The RTO would then guarantee traders that they would not be exposed to the congestion costs for constraints not designated as FGRs. In effect, if a trader were “fully covered” – that is, it had acquired the correct number and combination of FGRs for all of the designated CSFs implicated by its schedules – the RTO would not only credit the trader with full hedges on the designated CSFs but also would not charge that trader congestion charges associated with managing congestion on non-CSF constraints. Instead, the RTO would absorb these costs and socialize them by recovering them from those who are responsible for paying the transmission access fees (i.e., all transmission customers).

How this settlement rule would apply for “partially covered” cases was not resolved in the working group meetings. Initially, proponents of the APX23 proposal explained that if a trader’s schedule was uncovered to any degree (i.e., it had insufficient FGRs for any designated flowgate), then the trader could be exposed to the congestion charges on both CSFs and non-CSF constraints, presumably to the degree it was uncovered. The Working Group Report states (at page 11) that two options were considered to implement this rule, and that the Group did not decide which is preferable. In fact, one of these options would excuse traders from any obligations to pay for non-CSF congestion, even if they had no FGRs at all. We believe this rule was rejected during the group meetings. The second option would presumably produce an “all-or-nothing” result, shielding traders with 100 percent coverage from having to pay congestion costs for non-CSF congestion and additional costs arising from changed grid conditions, but exposing traders with 99 percent coverage to the full costs of non-CSF congestion and changed grid conditions. A third settlement rule that would make exposure to non-CSF congestion charges and costs of changed conditions “proportional” to the degree a trader was covered for CSF constraints was considered but found to be so complicated as to be unworkable.

11 Important details of how this rule might apply were not defined. Recall, however, that this rule requires the RTO to use the two-step approach, under which the amount that a trader is paid for its FGRs is based upon a hypothetical (commercial) dispatch that ignores non-CSF constraints, while the amount it must pay for its schedule is based upon the actual (operational) dispatch that considers these constraints. It is possible that the payment to the trader based on the value of FGRs in the commercial dispatch might exceed the amount it is charged for a corresponding schedule in the operational dispatch. As a result, traders might have an incentive to be less than fully covered for their schedules in some cases, because they might receive a positive net settlement if they did so, while the settlement rule would presumably give the fully hedged trader a net settlement of zero. The working group did not have time to work through these issues.
It is clear from this experience that any rule that starts by allowing parties to be excused from having to pay congestion costs on non-CSF constraints will be problematic when applied to different degrees and types of “partial coverage.” One trader could have all of the FGRs it needed for all but one CSF, while another might have 95 percent of the FGRs it needed for every CSF, but the partial coverage rules would impact the two cases in ways that were not only different but essentially arbitrary. Further, the implications of any method to solve this problem will probably be controversial, since it will determine the degree to which congestion costs are socialized.

There are obvious concerns with any rule that allows congestion charges to be subsidized and requires that the costs be recovered in some socialized fashion. In this case, the use of cost socialization would appear to be both unnecessary, since efficient cost allocation is clearly possible, and undesirable.

- From an efficiency perspective, costs should only be socialized if there is no rational way to allocate costs fairly on a cost causation basis. Here, however, the RTO could easily and efficiently allocate congestion charges to those whose schedules contributed to the congestion on the non-designated constraints. An LMP-based system that charges each transaction the difference between the LMP prices at delivery and receipt points meets that objective without subsidies or socialization of costs.

- Moreover, not charging transmission users the full marginal costs of their usage will tend to send inappropriate price signals regarding the value of transmission use, the value of generation (or consumption) at different locations, and the value of investments to relieve congestion.

- Further, if the RTO excused traders from having to pay for congestion costs on non-designated CSFs, we would expect traders to pressure the RTO to designate only a few CSFs, so that more congestion costs could be socialized.

- Finally, this proposal would result in discriminatory treatment of different market participants as a result of decisions made by the RTO. If market participants are required to pay for congestion on CSFs resulting from the transactions they schedule, but they are not required to pay for congestion (or pay to buy FGRs) on non-CSF constraints, then the RTO’s choice of which constraints to designate as CSFs will determine which market participants have to pay for most or all of the congestion associated with their transactions and which only have to pay for smaller proportions of the congestion associated with their transactions. As a result, some market participants will be favored over others, because the RTO’s decisions about which constraints to designate as CSFs will cause these participants to be subsidized to a

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12 For example, the Working Group Report notes that the trader with 95 percent coverage on every CSF could limit the impact of the all-or-nothing rule by splitting its transaction into a “fully” covered schedule and a small residual “uncovered” schedule, whereas this escape would not be available to the trader that had sufficient FGRs on all but one CSF but no FGRs on that one CSF.
greater or lesser extent than their competitors. The RTO’s decisions about which constraints to designate as CSFs would therefore be subject to endless contention between the RTO and affected market participants.

These adverse affects could be avoided if the RTO simply rejected rules that were premised on permitting cross subsidies and socializing the costs. At least two alternative approaches that avoid socializing congestion costs and the concerns with alternative settlement rules were offered to the working group. Under the first approach, as indicated in Policy Choice I, it is possible to have a flowgate rights system that does not require the RTO’s administration at all (although the RTO would support the system by releasing data on grid conditions, congestion and PTDFs, etc.). Hence, the issue of cost socialization would not arise for the RTO. The private flowgate right issuer would determine which flowgates it wished to designate, how many FGRs to issue and how to settle them. This private entity would also decide how best to manage the risks of this private enterprise, and the RTO would make point-to-point FTRs available to allow it to do so. If the private entity did a poor job in managing its risks or providing a valuable service to traders, it would fail; if it did a good job, it would reap the rewards. But it would not be up to the RTO to backstop or subsidize the risks of this private market activity in any way.

A second approach is available if the MISO chose to administer the flowgate rights system. Under this approach, the RTO could charge for congestion and define the credits for FGR holders without any unnecessary use of subsidies or socialization of costs. The RTO would make best efforts to define all potential CSFs, but would be responsive to market requests to designate as many constraints as CSFs as the market thought appropriate. The resulting FGRs would provide hedges for congestion charges on the CSFs, but only for the CSFs, while each party’s transactions would be subject to congestion charges for all constraints. Non-designated constraints would therefore not be hedged by FGRs. Working with the RTO, the market could then decide how meticulous the RTO should be in designating CSFs. That is, the market would decide how best to trade off the ability to be fully hedged against the potential costs of having to acquire and trade FGRs for many CSFs. If the market could manage the trading of many FGRs for each transaction, it would have an incentive to encourage the RTO to designate and offer FGRs for as many constraints as the market thought it could handle. If only a few constraints were really important, the market could pursue a system with few designated CSFs and only occasional unhedged positions. The RTO would not absorb or subsidize redispatch costs for non-designated constraints, so the RTO would not need to socialize the cost recovery for such redispatch in any way. Under this approach, price signals at the margin would remain efficient, thus encouraging appropriate short-run operations and long-run investments.
Policy Choice III.
Should the RTO Guaranteed FGRs as Hedges for Non-CSF Constraints (And Socialize the Costs of Managing Non-CSF Congestion)?

<table>
<thead>
<tr>
<th>Attribute/Issue</th>
<th>APX23 Proposal</th>
<th>Alternative Proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>What congestion charges do FGRs hedge?</td>
<td>FGRs hedge congestion charges on all constraints, whether CSF or non-CSF.</td>
<td>FGRs hedge congestion charges on CSFs, but not on non-CSFs.</td>
</tr>
<tr>
<td>How does the RTO allocate the costs of congestion on non-CSF constraints?</td>
<td>RTO socializes costs of congestion on non-CSF constraints.</td>
<td>RTO charges each transaction the marginal costs of redispatching to accommodate it. RTO gives credit against such charges for value of FGRs on the CSFs.</td>
</tr>
<tr>
<td>What entity pays the costs of congestion on non-CSF constraints?</td>
<td>Costs are recovered from those responsible for paying access charges, but transmission owners may be stuck with costs that cannot be recovered under rate freezes.</td>
<td>Each transaction pays the congestion charges associated with its own flows.</td>
</tr>
</tbody>
</table>

4. *If the RTO administers the flowgate system, should its FGR valuations use current assumptions (i.e., PTDFs) about grid conditions or should it fix those assumptions in advance and hold them fixed for some designated period (e.g. a year, or a month, etc)?*

The working group recognized that grid conditions could change frequently. It particularly recognized that PTDFs that define the flows of each transaction across each flowgate could change daily or even hourly. PTDF changes would occur as a result of line outages, but they might also arise more frequently from changes in grid usage that changed the relevant binding contingency that constrained system operations. This means that in a pure flowgate rights system, the precise mix of FGRs required to hedge each transaction might also change frequently and at the last moment. This reality would either require traders to restructure their FGR holdings as often as grid conditions changed or accept the risk that their FGR holdings might not fully hedge their transactions in real time.
If transmission rights were defined as point-to-point FTRs – financial transmission rights – this problem would be relatively straightforward. The RTO could define the congestion charges and the credit value of the FTR hedges in the same single-step process, using the actual dispatch and the actual grid conditions – including PTDFs – that applied for the actual dispatch. The feasibility test used by the RTO to determine the FTRs that were allocated/auctioned would verify that the RTO would collect sufficient revenues to fund payments to FTR holders, regardless of which contingency was binding (and hence regardless of which set of PTDFs was relevant), unless line failures or other changed grid conditions reduced grid capacities below those assumed in the FTR allocation. If such a reduction did occur, then for a given settlement period, the RTO could collect insufficient congestion charges to fully fund all of the FTRs at their full value. The RTO would then have a policy decision about whether to fully fund the FTRs in some manner or to pro-rate the funding.

If the RTO chose to fully fund the FTRs, it could manage this funding through an FTR balancing account, in which the RTO collected net congestion charge surpluses in some periods and paid out net FTR payments in others. Periodically, such as annually, the net accumulations or deficits in this account could be credited or debited to the transmission access fees. It would also be possible to design a PBR incentive that would reward the transmission owners for effective maintenance that minimized such conditions and held the owners liable to cover the underfunding created by line outages.

A similar issue arises if the transmission rights are defined as FGRs. Changes in grid conditions and usage can result in changed PTDFs, which can mean that a set of FGRs acquired under one set of grid conditions might be insufficient for another set of grid conditions. The issue would then be whether the RTO should give the FGR holders the full hedging credit of their FGRs as though the conditions had not changed from the time their FGRs were allocated, or whether instead the RTO should give the holders the credit calculated under the changed/current conditions.

Working in the FGR framework, and not FTRs, the APX23 proposal would require the RTO to give the FGRs holders the full hedging credit. The APX23 proposal would allocate FGRs initially on an annual basis, but the RTO’s assumptions about grid conditions would be advisory only and would not be guaranteed. However, on a month-ahead basis, the RTO could change two important factors. First, it could add or change flowgates to the list of CSFs. Parties that wished to be fully hedged for the coming month would need to acquire the corresponding FGRs for any newly designated flowgates. Second, the RTO could change its grid condition assumptions, including the PTDFs that would apply during the coming month. The CSFs and PTDFs would be fixed after the “freeze date” and remain fixed for the month ahead. To remain fully hedged for the coming month, a trader might have to acquire a somewhat different mix of FGRs to match the revised flows of its expected transactions, given the revised PTDFs. For all settlements during the month, the RTO could neither consider the effects of new constraints nor consider the effects of changed grid conditions and PTDFs in Step 1 of the two-step approach; these parameters for defining the credit value of FGRs would remain fixed for the month.
While the underlying concepts are similar for FTRs and FGRs, there are important differences. As a point-to-point hedge, an FTR is designed to hedge all of the congestion that may arise between the points, irrespective of changing PTDFs, where or when the constraints arise and whether or not they are designated as “commercially significant.” Importantly, the FTR mechanism does not depend on constant PTDFs and does not require cost subsidies for changing conditions that are under the control of the system operator as it maximizes utilization of the grid. The case of FGRs is different, because it is premised on the assumption that only some of the constraints are commercially important and the rest can be safely ignored, and it depends critically on the assumption that PTDFs will not change, even if they do. However, when changed grid conditions render these assumptions invalid, and other constraints or PTDFs become relevant, the argument that a set of FGRs that did not attempt to cover all constraints or all the conditions should now be treated as though it did is not convincing. The fact that traders might wish their FGR hedges to shield them from all such contingencies is understandable, but their interest does not make the argument for granting such guarantees and socializing the costs any stronger. Further, the implementation details differ for the two cases, and the differences are important.

In the case of FGRs, fixing the grid assumptions in advance and holding them constant for settlement purposes over a month requires that the RTO use a two-step process to define the value of the FGRs. That is, the RTO would need to define the FGR credit values using the fixed grid assumptions, while defining the LMP-based congestion charges using the actual grid conditions used in each interval’s real-time dispatch. As noted above under Policy Choice 2, the two-step settlement process is problematic for several reasons. It invites parties to schedule infeasible transactions (made infeasible because the schedules do not account for their effects on non-designated constraints and ignore changed PTDFs), raises the potential for FGR underfunding, provides opportunities for gaming to subsidize the credits given to FGR holders and results in prices that send inappropriate signals to market participants.

Finally, the choice of when to freeze grid assumptions for the FGR approach is essentially arbitrary but creates a dilemma no matter what the choice. If the freeze date is months or a year or so in advance, grid conditions and assumptions could be hopelessly out of date by real time; if the freeze date is much closer to real time, it becomes impossible for traders to acquire transmission pricing certainty for any longer period. The working group’s use of a month-ahead freeze date simply means that grid conditions and assumptions could be no more than a month out of date but traders could not obtain price certainty for any longer period.

These problems could be avoided if the RTO’s transmission rights were defined on a point-to-point basis, as are FTRs. As noted above, defining rights as FTRs would be possible under one of the alternative approaches described in this paper, and it would allow those who preferred to trade under a flowgate rights system to establish such a system on a private commercial basis. On the other hand, if the choice is to require the RTO to administer the flowgate rights system, then there is no obvious rationale for
giving FGR holders full hedging credit when grid conditions change, nor any obvious method to do this without socializing some costs and using the problematic two-step settlement process.

The simplest way to avoid the two-step approach would be to require the RTO to define both FGR credit values and congestion charges using the current grid conditions assumed in the actual dispatch. This would either require traders to adjust their FGR holdings to match the latest PTDFs or leave the FGR holders subject to potential congestion charges on flowgates for which they previously had sufficient rights. There is no apparent way out of this dilemma given the inherent features of flowgate rights.

Policy Choice IV.
Who Should Bear the Risks of Changed Grid Conditions?

<table>
<thead>
<tr>
<th>Attribute</th>
<th>APX23 Proposal</th>
<th>Private FGRs</th>
<th>Alternative Proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>How are changes in grid congestion handled?</td>
<td>Grid conditions – e.g., PTDFs – are fixed month ahead</td>
<td>Up to the private FGR issuer to determine this.</td>
<td>RTO uses current grid conditions and PTDFs assumed in actual dispatch to define credit value for FGRs and congestion charges</td>
</tr>
<tr>
<td>What type of rights does the RTO define and allocate?</td>
<td>FGRs are financial hedges against congestion charges on flowgates</td>
<td>FTRs are point-to-point financial hedges against congestion charges between two locations.</td>
<td>FGRs are financial hedges against congestion charges on CSFs</td>
</tr>
<tr>
<td>Who defines, issues and settles the rights</td>
<td>RTO defines, issues and settles only FGRs</td>
<td>RTO defines, issues and settles FTRs. Private issuers define, issue and settle FGRs</td>
<td>RTO defines, issues and settles only FGRs</td>
</tr>
<tr>
<td>Settlement process</td>
<td>Two-step</td>
<td>Up to FGR issuer</td>
<td>One-step</td>
</tr>
<tr>
<td>What is the effect of changed conditions on hedge value?</td>
<td>If trader has all FGRs required based on grid assumptions/PTDFs defined month ahead, it is fully hedged.</td>
<td>For FTRs, RTO can guarantee full funding of FTRs regardless of changed grid conditions.</td>
<td>Changed conditions may require trader to trade to realign its FGR holdings with new PTDFs.</td>
</tr>
<tr>
<td></td>
<td>Changed conditions affect only those</td>
<td>For FGRs, private FGR issuer</td>
<td>Traders who elect not to realign their FGR holders, and</td>
</tr>
</tbody>
</table>
who are not fully hedged as above. | determines who bears the risks for changed conditions and sets its “insurance” fees accordingly. | those without FGRs accept the risks of not being fully hedged.

**Conclusions**

The APX23 hybrid proposal described in the Working Group Report contains several problematic features and raises concerns about efficiency, fairness and workability. The proposal would involve the RTO as a direct participant in the forward markets and require substantial effort in administering and settling a flowgate rights system. The proposal eliminates the ability of traders to obtain complete point-to-point hedges against congestion costs. Full hedges would be available as FGRs only through means that require subsidies and cost socialization. These pricing schemes would send inappropriate signals regarding the value and costs of transmission usage on a congested grid, and they would discriminate against some market participants in favor of others. The proposal would also require settlement accounting methods that would determine the value of FGRs using inconsistent and hypothetical dispatches, which would create opportunities for gaming and encourage infeasible schedules, thus complicating the RTO’s job in managing congestion.

Alternative approaches are available that would largely avoid or completely eliminate these concerns. However, these approaches were not fully considered by the working group because of time constraints. MISO should examine these alternatives fully before reaching a final decision on the type of congestion management system it will propose to FERC.