Still More on Flowgates, FTRs, Options and Obligations

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1. INTRODUCTION AND STATEMENT OF THE ISSUES

In a recent note (Oren\(^1\)), Professor Shmuel Oren replies to my recent note\(^2\) on the relative merits of link-based flowgate rights (FGRs) compared to point-to-point financial (or firm) transmission rights (FTRs) for dealing with situations involving counterflows on the transmission grid. This note replies to Professor Oren’s reply.

The issues of interest here arise when the efficient dispatch or market-clearing solution requires that some high-cost generators run “out of merit” in order to relieve transmission congestion so that lower-cost generators can run more than they otherwise would. In such situations, which are not uncommon on real electricity systems, the extra transmission capability resulting from the counterflows cannot safely\(^3\) be sold in advance unless the generators that can produce the counterflows take on binding obligations either to run in real time or to pay the cost consequences of not running. The only real issues here concern whether, when and how the generators needed to produce the counterflows take on such obligations.

In a system based on FTRs, the system operator – assumed here to be a regional transmission organization (RTO) – can define FTRs either as two-way obligations or as one-way options,

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2. Larry Ruff, “Flowgates vs. FTRs, and Options vs. Obligations,” August 26, 2000.
3. Terms such as “safely” here refer only to financial consequences, not operational reliability. There is now general agreement that operational reliability will be assured by the RTO using a real-time LMP market – although some advocates of flowgate or “physical” markets maintained until recently that “physical transmission rights” would make a spot market unnecessary. Oren and his coauthors agree with LMP advocates that this real-time market should price and settle all congestion, not just congestion on prespecified “commercially significant flowgates,” but this view is not shared by all flowgate advocates.
or can operate a periodic, say annual or monthly, auction in which both FTR/obligations and FTR/options are offered, letting market participants choose the mix they prefer. In a counterflow situation, an FTR/obligation has a negative value or market price, in the sense that the holder must be paid to take it because it requires the holder to produce the promised counterflow or to pay the locational marginal price (LMP) differential between the source node and the sink node if it fails to do so.

One of the principal issues in the current debate is that FTR advocates see nothing perverse about a paying somebody to take on such an obligation, while Professor Oren and his coauthors assert in an earlier paper (CPOW⁴, p. 9) that:

“This negative price [of an FTR defined as an obligation] would adversely affect the incentives of market traders, which cannot be corrected without introducing additional complexities that would increase the cost of implementing a property right system.”

In his August 29 reply, Professor Oren has repeated and strengthened the CPOW condemnation of negative-value FTRs.

An FTR/option avoids the alleged problems of negative prices by paying compensation for any positive congestion between the source node and the sink node but not requiring the holder to compensate the RTO if the holder fails to provide counterflow when congestion is in the other direction. Such FTR/options reduce the quantity of FTRs the RTO can safely issue because there is no guarantee that the counterflows will be there and no compensation to the RTO if they are not; this reduced hedging increases the volatility of the congestion rentals accruing in the RTO’s settlement system and paid by system users. But there is no fundamental reason that FTRs cannot be options if that is what the market wants.

In a system based on flowgates and FGRs, the FGRs issued by the RTO could in principle be either two-way (financial⁵) obligations or one-way options just as FTRs can be, but are

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almost always proposed as one-way options. Indeed, the fact that FGRs are options is usually cited as one of their principal advantages over FTRs. This gives rise to the other principal issue in the current debate: The fact that FTR advocates see little difference between FGR/options and FTR/options, while Professor Oren and his coauthors have said (CPOW, p. 9):

“We conclude that unlike the flow-based [FGR] approach, a point-to-point transmission-rights [FTR] system is inherently limited and cannot be fully efficient.”

In summary, there are two principal questions here:

1. Is there something wrong with the RTO issuing FTR/obligations (or FGR/obligations, for that matter) that require the holder to deliver the services for which he is paid or pay the cost consequences if he fails to deliver?

2. Do FGR/options have any fundamental advantages over FTRs/options?

This note discusses these two issues in turn and then offers some concluding – but probably not final – observations on this debate.

2. WHAT IS WRONG WITH TWO-WAY HEDGES?

Professor Oren finds it “surprising … [that] a seasoned practitioner … argues that there is nothing wrong with two sided rights that may have negative value and that such rights are consistent with economic efficiency.” (Oren, p. 4) According to Professor Oren, “[i]ssuing a property right that has a negative expected value amounts to selling an obligation for a volatile payout in exchange for an upfront lump sum payment,” and “in the real world, risk averse traders will avoid such a deal or will demand a high risk premium to undertake it.” (Oren, p. 4)

5 Until recently most flowgate proponents made much of the fact that FGRs were “physical” rights that supposedly had some operational or other advantages. Once the need for a real-time LMP market was conceded there was no meaning to a “physical” transmission right, because in such a market all “violations” of rights or contracts are automatically “penalized” at the LMPs and flowgate prices.
If Professor Oren is really surprised that a seasoned practitioner can defend negative-valued FTRs, he will be astonished to hear that some seemingly-rational generators sign fixed-price/fixed-quantity power sales contracts and that some seasoned practitioners and even some professors think that such contracts can be consistent with economic efficiency. A contract to deliver a fixed quantity at a fixed price involves the equivalent of “an upfront lump sum payment” – the present value of the future revenue stream – and obligates the seller either to produce the contracted quantity itself or to pay the uncertain market price for it at the time of delivery. This is precisely what a negative-valued FTR does: Exchange a fixed payment for an obligation to produce something – a counterflow – or pay the uncertain market price – congestion charges – if the promised something is not produced. If Professor Oren regards FTR/obligations as too risky and inefficient to be acceptable, he must think the same about many power purchase agreements out there in the real world.

Some traders might demand a large risk premium to accept an obligation to deliver physically or pay the market-determined consequences, particularly if they do not have real production resources and are simply speculating. But real generators or long-term portfolio managers, as opposed to energy day traders, will not necessarily demand a high risk premium for a contract under which they keep physical performance risk but sell most price risk to the buyer. Indeed, it is usually regarded as commercially desirable and economically efficient to allocate each risk to the party that can best manage it, which would seem to imply that generators should take output risk while buyers – who can control their own consumption and for whom energy prices are not usually critical to commercial success – take price risk. In fact, the usual presumption is that a generator will be willing to sell below expected spot prices if it gets a long-term, fixed-price contract that leaves it only with performance risk.

A generator in a position to produce valuable counterflows is probably at a location where the LMPs will be very high occasionally and hence volatile and unpredictable. For concreteness, assume that the generator is in a transmission-constrained load pocket where local prices are very high occasionally and when they are counterflows out of the load pocket are very valuable. Such a generator may choose to live on the risky local LMPs, but would probably
be willing to sign, and even offer a discounted price for, contracts to deliver fixed quantities of energy at fixed prices.

A generator in a load pocket can contract with local load and not worry about congestion prices, or it can contract with load outside the load pocket and buy a transmission right (a “TR”, which may be either an FTR or an FGR) from the load pocket to its contract buyer outside. If it does the latter, it may have a choice between a TR/obligation and a TR/option. Which would a rational, risk-averse generator choose?

The TR/obligation would eliminate the generator’s exposure to congestion prices entirely. When flows from the load pocket to the buyer are congested, the LMP is lower in the load pocket than at the buyer’s location, so (assuming FTR/obligations with contract scheduling for simplicity, although FGR/obligations could be equivalent) the generator must pay congestion charges on its contract flow but is rebated the same amount under its TR/obligation. When the flows into the load pocket from the buyer are congested, the LMP is higher in the load pocket than at the buyer’s location, so the generator must pay the differential under its TR/obligation but is paid that same amount as a negative congestion charge in the energy settlements. Either way, the net effect of the energy contract, LMP and TR/obligation is that the generator pays for the TR and then receives the contract price for its energy with no exposure to congestion charges.

If the generator chooses to buy a TR/option rather than a TR/obligation, it will pay more for it and will be exposed to a more uncertain but higher-expected value revenue stream. When congestion is on flows from the load pocket, the generator must pay congestion charges but receives a compensating amount under its TR/option and hence is unaffected by congestion charges. But when congestion is on flows into the load pocket, the generator is paid negative congestion charges in energy settlements and then does not pay them back under its TR/option as it would under a TR/obligation. The congestion windfalls when counterflows are valuable will no doubt be welcomed when they appear, but such random payments create a risky revenue stream – and one for which the generator paid a fixed amount up front when
it chose to buy the TR/option rather than the lower priced TR/obligation, which is just the kind of contract that Professor Oren regards as risky and inefficient.

Professor Oren is no doubt correct that anybody paying a fixed price for an uncertain revenue stream will apply a risk premium in deciding how much to pay for that revenue stream. Where he is wrong is in his assumption that a TR/obligation is always riskier than a TR/option. A TR/obligation may be riskier for day traders who are taking purely speculative positions, but is probably less risk for somebody hedging a physical position. Physical market participants are often willing to take performance risk but do not want to be exposed to price risk even when they do perform.

Given the inability of either practitioners or professors to predict what the market will want, surely the best approach – if it is not too complex to be worth the trouble – is to offer both TR/options and TR/obligations and let the market choose the mix it wants. That is the direction in which LMP/FTR markets such as PJM are now moving. There is no fundamental reason that Professor Oren could not propose that FGRs be offered as obligations as well as options – although doing so would undermine his assertion that there is something wrong with such two-way options when they are FTRs.

3. ARE FGR/OPTIONS BETTER THAN FTR/OPTIONS?

The other major issue in this debate is whether FGR/options have some fundamental advantage over FTR/options. The original CPOW assertion was that, “unlike a flow-based approach,” a system based on FTR/options “is inherently limited and cannot be fully efficient” (CPOW, p. 9) because the RTO cannot safely issue enough FTR/options to fully hedge all transactions but (by implication6) could do so with FTR/options. Professor Oren

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6 CPOW does not explicitly state that the RTO could issue enough FGR/options to hedge all transactions in the presence of counterflows. But CPOW bases its criticism of FTRs purely on the fact that the RTO cannot issue enough FTR/options to do so, gives no hint that an FGR system has the same problem unless private FGR/obligations are somehow defined and traded, and never discusses how these private obligations might be negotiated or why the same thing could not be done with FTR/options. If the authors of CPOW realized that private (continued)
now concedes that an FGR system cannot provide full hedges in the presence of counterflows unless decentralized markets somehow define and enforce enough private FGR/obligations\(^7\) to cover all counterflows not covered by FGR/options issued by the RTO. He also concedes that “indeed the assertions in CPOW should be qualified to state that FGR options allow full hedging of all possible transactions without requiring that the RTO handle obligations.” (Oren, p. 9)

This statement clearly implies that, although both FGR/options and FTRs can deal with counterflows, FGRs are still better because only they, and not FTRs, can do so without “requiring that the RTO handle obligations.” Leaving aside the question of why Professor Oren thinks it is such a bad thing for the RTO to “handle obligations,” there is no basis for saying that only FGR options allow full hedging without RTO involvement. The fact is that market participants can define and trade private FTRs without involving the RTO at least as easily as they can do so with private FGRs.

Professor Oren fails to recognize the possibility that FTRs can be privately issued and traded because he assumes that privately-issued FTRs must meet the same sort of simultaneous feasibility test used to assure revenue adequacy of RTO-issued FTRs. For example, he says:

“FGR’s are more amenable to decentralized trading and do not require as intense central coordination as point to point FTRs since they do not require a simultaneous feasibility test.” (Oren, p. 4)

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\(^7\) Professor Oren states that “all FGRs whether those based on property rights to the physical capacity of a flowgate [i.e., those issued by the RTO] or those resulting from counterflow [i.e., those created privately] are defined as financial options.” (Oren, p. 8) But selling an option to the counterflow is equivalent to taking on the obligation either to produce the counterflow or to pay for not doing so when the counterflow has value. Elsewhere, Professor Oren says: “Ruff is correct … that in order to fully hedge transactions that are enabled by counterflow the counterflow producer must sell its FGR options to the counterflow user and this amounts to a bilateral obligation.” (CPOW, p. 9) For clarity, the discussion here refers to FGR/obligations rather than “FGR options to the counterflow.”
FGR/obligations “can be relegated to a decentralized secondary market or bilateral agreements. Such separation is not possible with point-to-point FTRs that require central coordination.” (Oren, p. 11)

Apparently Professor Oren thinks that no private party can sell a financial instrument obligating the seller to pay the buyer the LMP differential between two points without first clearing it with the RTO, who will approve the contract only if it meets some sort of system-wide simultaneous feasibility test. If this is what Professor Oren thinks, he fundamentally misunderstands FTRs, the RTO’s process and the ingenuity of private markets. The RTO uses a simultaneous feasibility test to assure that it does not allocate so many FTRs that it will have a revenue adequacy problem. If some of those FTRs are options in the presence of counterflow, the simultaneous feasibility test will be run assuming that these counterflows are not there, because the RTO cannot be sure that they will be and the FTR/options will not compensate the RTO if they not. But there is nothing to prevent private entities from issuing and trading their own FTRs, taking whatever financial risks they choose, and it is probably easier for private entities to do this with FTRs than with FGRs. These issues are discussed further below.

The simple logic of the situation is that, in the presence of counterflows: (1) neither FGR/options nor FTR/options issued by the RTO will allow full hedging; (2) both FTR/options and FGR/options allow market participants to try to work out private transmission hedging arrangements outside the RTO; (3) in either case these private arrangements will have to impose **obligations** on the sellers of transmission hedges (even if the instrument is written as an option on the positive value of a counterflow); and (4) there are good reasons to think that it would be easier to work out such private transmission hedges in an FTR world than in an FGR world.

As a practical matter, decentralized definition, trading and administration of transmission hedges of any kind is likely to be complex, costly and inefficient. Professor Oren has faith that decentralized markets can do all this more easily, cheaply and efficiently than the RTO can do it centrally. But this is ultimately an empirical question, not a strictly logical one. The logical proposition is that, however well or badly decentralized markets may be able to
deal with counterflows (or anything else), they can do at least as well with FTRs as with FGRs.

Professor Oren acknowledges that the system defined in CPOW can provide full hedging of counterflows only if private, decentralized markets are able to define and trade FGRs that – even if defined as options to the counterflow – **obligate** the seller either to produce counterflows in real time or pay the LMP-defined cost of failure to do so. But the best he can do to explain how this might actually be done is the following (Oren, p. 8):

“In the FGR system the RTO only issues and settles (property) rights that are backed by physical capacity of the flowgates. FGRs resulting from scheduled counterflow are automatically endowed (at no cost) to the counterflow producer. Hence, the set of all FGRs including those issued by the RTO and those endowed to the counterflow producers provides a complete set of hedging instruments that can cover the entire set of feasible transactions (unlike FTR options). However, it is up to secondary trading to get these rights into the right hands and reconfigure them into desirable hedges that will mirror the real time transactions.”

It is not at all clear what process Professor Oren has in mind here or why this process – whatever it might be – overcomes his objections to RTO-defined obligations or would not work at least well with FTRs as with FGRs. In particular, he does not define by whom, when or how the “scheduled counterflows” are defined and the resulting FGR/obligations are “endowed (at no cost) to the counterflow producer,” or even what “scheduled” and “endowed” mean in this context.

Professor Oren’s statement that “FGRs resulting from scheduled counterflow are automatically endowed (at no cost) to the counterflow producer” (Oren, p. 8) suggests that “endowment” occurs when flows are scheduled by the RTO, which occurs only a day or so ahead of real time. If this is what he means, there will be no longer-term hedges and little time for the secondary trading that he is counting on to “get [FGRs] into the right hands and reconfigure them.” Or does “scheduled” here refer to the result of some private forward market activity? If so, would FGR/obligations determined in private processes be reported to the RTO for administration and settlement in the RTO’s real-time LMP process? Will the RTO “endow” multiple, offsetting FGRs, e.g., 1,000 MW in one direction and 800 MW in
the other direction, which would be a likely outcome of trading in multiple forward markets? Must the private FGRs meet any sort of simultaneous feasibility test? Who will take payment risk for FGRs “endowed” in private markets and handed to the RTO for settlement? Just what does Professor Oren have in mind here?

Although Professor Oren does not describe a process for defining, trading and administering private FGRs, his distaste for RTO involvement suggests that any such process should operate totally outside the RTO. For example, a generator in a position to produce valuable counterflows could sell private financial FGR/obligations under which the generator commits to pay the holder the flowgate prices determined in the RTO’s real-time LMP market. The generator would then schedule with the RTO the point-to-point transaction(s) that produce counterflows more-or-less corresponding to the FGR/obligations it has sold.

The RTO’s real-time market would determine both the price of each flowgate and the nodal energy prices, and when the counterflow is valuable would pay the generator the point-to-point nodal price differentials (if the generator runs as planned) less the price of all implied flows over flowgates for which the generator did not have FGRs. The generator would then pay holders of its privately-issued FGRs the RTO-determined value of their FGRs. If the generator sells the right mix of FGR/obligations, buys the right mix of RTO-issued FGR/options, and schedules the right combination of point-to-point transactions, taking into account changes in the commercially significant flowgates (CSFs) and power transfer distribution factors (PTDFs), and gets enough for the FGRs it sold, it should make, on average, about what it would make selling energy at its local LMP.

The traders who bought the financial FGR/obligations issued by the generator could trade them freely as long as the seller knows who owns them at settlement time. The ultimate owners could schedule transactions with the RTO that exceed their holdings of RTO-issued

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8 Anybody with deep enough pockets, even if it has no physical or contracted generation, can issue private FGRs to counterflows and try to outguess the market. But this would be a very risky game for somebody without the physical ability to produce the counterflow and collect its value from the RTO’s LMP market.
FGR/options and use the private FGR/obligations to complete their hedge. With the right portfolio of RTO-issued FGR/options and privately-issued FGR/obligations the payments from the generators/speculators who sold the FGR/obligations should cover a trader’s payments for inadequate RTO-issued FGRs in the real-time market.

It is (barely) possible to imagine such a process working in principle, but there are some obvious practical difficulties. The generator selling a portfolio of counterflow FGR/obligations would need to back these with a carefully assembled portfolio of scheduled transactions and RTO-issued FGRs on non-counterflow flowgates, with the required portfolios changing every time new CSFs are identified or PTDFs changed. The traders buying the FGR/obligations would have a similar portfolio balancing problem. Ownership of the private FGR/obligations would have to be recorded and validated so that invoices could be sent, payments recorded and bad debts chased. It is hard to imagine how this could all be done without creating a single, and hence monopoly, trading and settlement process.

As difficult as all this may sound, it may not be much more difficult that trading of FGRs even in the absence of counterflows and FGR/obligations. The main thing added by the need for privately-issued FGR/obligations is some way to assure that anybody selling FGR/obligations has the wherewithal to deliver physically or pay financially, and some such prudential requirements would be required for FGR trading anyway. If private markets are as efficient as Professor Oren believes, this way of dealing with counterflows should work about as well – or as poorly – as a flowgate market in the absence of counterflows. And market-makers such as APX, Enron, Dynegy, etc., would love it.

Although this system might work after a fashion, it would create two fundamental problems for Professor Oren’s argument. For one thing, the privately-issued FGR/obligations would have all the problems he ascribes to FTR/obligations, e.g., generators must take on obligations to perform or pay for nonperformance. Although some “seasoned practitioners” may see “nothing wrong with two sided rights that may have negative value and [even think] that such rights are consistent with economic efficiency” (Oren, p. 4), Professor Oren has made it clear that he is not in this camp, because he thinks that two-sided rights create
unacceptable risks and inefficiencies – for market participants, not just for the RTO. Unless he thinks that these problems go away if obligation-creating FGRs are issued by private entities rather than the RTO, he presumably would not support any process that results in such obligations. 9

The second problem this process creates for Professor Oren is that if privately created transmission hedges can deal with counterflows in a system based on FGRs, they can do so at least as well in a system based on FTRs. 10 Professor Oren rejects the possibility that FTRs can be privately defined and traded because, as discussed above, he thinks that nobody can issue private FTRs unless the RTO approves the FTRs after applying some sort of system-wide simultaneous feasibility test. But there is nothing to prevent anybody from issuing and trading any FTRs they choose, in the form of options or obligations, without telling the RTO anything about it. And it is probably easier for an issuer of private FTRs to hedge itself in the RTO’s real-time LMP market than it is for an issuer of private FGRs to do the same.

To illustrate this last assertion, consider the generator in the example above that is in a position to produce valuable counterflows. Even if the RTO offers only FTR/options and must restrict the number offered in order to assure revenue adequacy, the generator can safely sell private point-to-point FTRs, either as options or as obligations, to its location from any other locations, up to its expected generation capacity. These FTRs can be traded freely among traders whether or not those traders plan to schedule precisely the same point-to-point

9 Professor Oren will probably respond that the privately issued FGRs are one-way options to the value of a counterflow, not “two sided rights that may have negative value.” But this is a distinction without a difference. His arguments about the unacceptability of negative-value FTRs have just as much – or as little – validity in either case.

10 Professor Oren says: “Ruff’s claim that ‘ … anything along these lines that can be done in a flowgate/FGR regime could be done at least as well in an LMP/FTR regime.’ [sic] However, he has not shown us what type of private contracts that require no RTO intervention would complement point-to-point FTR options to enable full hedging capability. Chances are that such contracts would be much more complex and less liquid than counterflow based FGRs.” (Oren, p. 10) It is up to the reader to judge whether the FTR-based process outlined here is more or less plausible than the FGR-based process hinted at by Professor Oren – remembering that it is Professor Oren who thinks that private transmission hedges are a good idea.
transactions, and will have value for the same reason that financial FGRs have value: because they are financial instruments that can be used to create hedging portfolios.

For real-time operations, the generator submits to the RTO its offer to generate near its variable cost and is dispatched accordingly. When counterflows are valuable so that the generator must pay out under the FTRs it issued, the local LMP will be high and the generator will make money in the spot market, so its position is hedged. The traders holding the private FTRs will receive payments from the generator that will offset some or all of the congestion rentals they must pay in the LMP market. Obviously, both the generator and traders must do some analysis to determine how many of which FTRs they can sell or buy without risking financial overcommitment. But this is a purely private activity that does not involve the RTO, and does not require market participants to worry about multiple flowgates, FGRs and PTDFs.

In summary, there is nothing in a system based on FGR/options that cannot be done at least as well, and probably much better, in a system based on FTRs.

4. CONCLUSIONS

Professor Oren’s defense of the CPOW assertions reaffirms and clarifies the basic analytic errors underlying those assertions. The most important and fundamental error clarified by Professor Oren is the assumption, which is only implicit in CPOW, that FTRs cannot be privately defined and traded without the RTO performing some sort of system-level simultaneous feasibility test. Apparently Professor Oren, who thinks that private markets can efficiently define, trade and administer instruments based on dozens, perhaps hundreds of flowgates, FGRs and ever-changing PTDFs, does not think that private markets can define, trade and administer financial instruments promising a payment equal to the difference between two published prices.

What Professor Oren’s August 29 note clearly reveals is the extent to which his assertions reflect an aversion to centralized processes or, more accurately, a love of decentralized processes. He says it is not surprising that “the father of the POOLCO concept” would
express “disbelief in the potential of decentralized electricity markets.” (Oren, p. 1) But he has himself accepted the need for a central spot market and dispatch process to deal with complexities that must be assumed away to make decentralized trading feasible (e.g., congestion on other than commercially significant flowgates, changing PTDFs, etc.) and with the many events that occur too close to real time to be reflected in forward markets. (CPOW, p. 14) He even concedes that a “highly desirable feature of the [centralized] spot market is to provide a transparent price determination and settlement process ...” (CPOW, p. 20) Even Professor Oren, a long-standing critic of the POOLCO concept, recognizes that there are severe limits to “the potential of decentralized electricity markets” and much that the RTO must be centrally.

What Professor Oren and other proponents of flowbased markets seem to want is not to eliminate or even reduce the importance of the centralized RTO, but rather to use the RTO to support and in some cases subsidize decentralized trading activity largely for its own sake. Professor Oren does not want the RTO to issue transmission hedges in the form of two-way, point-to-point FTRs, primarily because RTO-issued FTRs would reduce the need for privately-issued FGRs traded in decentralized markets. But he has made no plausible case that decentralized private processes are more efficient than or otherwise preferable to centralized RTO processes for dealing with counterflows (or anything else), or even outlined a decentralized process that might work at all. His proposals are based primarily on the implicit assumption that a lot of decentralized trading is desirable whether or not it has been shown to be the best solution to some specific problem.

If a flow-based market really could achieve reasonably efficient outcomes with a smaller role for RTO it would be preferred by most reasonable analysts – even by “the father of the POOLCO concept.” The problem is that a flowbased system would not reduce the role of the RTO but would merely redefine and even expand it in ways that are less consistent with efficient markets and outcomes. The RTO in a flowbased system would have to make market forecasts and judgments to identify the commercially significant flowgates, the number of FGRs and the PTDFs, would need to trade FGRs actively based on its ever-changing best estimates of actual transmission capability some time in the future, and would end up
absorbing or socializing much of the cost of closing the gap between the artificially simplified forward market and real-time reality.\textsuperscript{11} This is a more active, difficult, and intrusive market role for the RTO than the relatively passive role of auctioning FTRs and administering an LMP market.

\textsuperscript{11} Professor Oren and his CPOW coauthors, theorists all, propose that the RTO price all congestion and real-time events in the LMP market, so that there would be little subsidization of forward trading. The problem is that such efficient real-time pricing would make forward trading based on flowgates very complex or even pointless. In practice, any effort to develop a flowbased market would be strongly influenced by commercial trading interests who want the RTO to absorb or socialize many costs required to make forward trading easy and risk free. This is happening in the policy discussions around the country right now.