

New England States
Committee on Electricity

To: NEPOOL
From: NESCOE
Date: October 18, 2016
Subject: Some Analysis on Two-Tiered Pricing Proposals

NESCOE appreciates the work that market participants have done to develop and advance proposals in the Integrating Markets and Public Policy (IMAPP) process.

As we have noted during IMAPP meetings to date, we are assessing proposals and their elements. To assist consideration of several two-tier pricing proposals, we asked Wilson Energy Economics to provide a critique. We share information here with NEPOOL to add to the body of information available to all participants evaluating the various proposals. We welcome feedback, constructively critical or otherwise, on the substance of the memo from two-tier pricing proponents or any other entity.

There are multiple two-tiered pricing proposals in the IMAPP process at this time. They are not identical. This memo does not suggest and should not be interpreted to mean that the two-tiered proposals are the same or would have the same market or consumer implications aside from the issue specifically discussed in the memo.

TO: NESCOE

FROM: James F. Wilson, Wilson Energy Economics

SUBJECT: **IMAPP “Two-Tier” FCM Pricing Proposals: Description and Critique**

This memo provides a summary and critique of the proposals for “two-tier” pricing in ISO New England’s Forward Capacity Market (“FCM”) that have been put forward in the NEPOOL IMAPP process.

I. The Problem

Proposals for two-tiered pricing in the FCM (described in detail below) arise from concerns around the potential impact of state-funded resources (such as result from state renewable resource procurements for energy and capacity) on FCM clearing prices: if these resources are permitted to offer into FCM at lower prices reflecting the state funding, this raises a concern that FCM clearing prices will be “suppressed” below the competitive levels needed to attract sufficient new entry and to properly compensate existing resources. But if, on the other hand, the state-funded resources are mitigated and, as a result, fail to clear in the FCM and do not receive Capacity Supply Obligations (“CSOs”), consumers will be forced to pay twice for capacity (once through retail rates that recover the costs of the state-funded resources, and again through FCM for duplicative capacity resources cleared as a result of the mitigation of the state-funded resources). For the purposes of this memo, resources that are subject to offer price mitigation in the FCM (because they are state funded, or have other contractual arrangements or sources of revenue; this may include some self-supply resources) are referred to as Subject To Mitigation (“STM”) resources.

The presence of STM resources in the FCM creates a conflict between three competing capacity market design objectives:

1. recognizing the contribution of the STM resources to resource adequacy by granting them CSOs;
2. establishing a “competitive” FCM price for compensating existing and attracting new non-STM resources, that is not suppressed by the offers of STM resources; and
3. clearing a reasonable total amount of capacity at a reasonable total cost.

Proposals involving two-tiered FCM pricing are one approach to partially reconciling the conflict between these objectives.

Also note that this problem will likely still be present even if the IMAAP process results in a Forward Clean Energy Market or other market design changes, due to legacy contracts for renewable resources.

II. Some History of Two-Tiered Capacity Market Pricing Proposals

Recall that in 2010 the ISO had proposed a two-tiered pricing approach in a proceeding pertaining to its “Alternative Price Rule” (ER10-787, EL10-50), and the Joint Filing Supporters, with my affidavit

attached, were critical of the proposal at that time ([link](#)). FERC rejected the proposal because it would have cleared a quantity of capacity in excess of the Net Installed Capacity Requirement (“NICR”), thereby violating what it referred to as a “bedrock principle” of the New England capacity market at the time, which used a vertical demand curve ([link](#) at P 164). Some parties have expressed the view that because FCM now uses a sloped demand curve, the “bedrock principle” of not clearing more than NICR has been removed, which could open the way for FERC approval of a two-tiered pricing proposal.

At present, minimum offer price mitigation is applied in FCM, along with a limited exemption for certain resources. This compromise is working for now, however, more renewable resource procurements are underway, so the conflict between the three competing objectives listed above is likely to again become problematic.

Very recently, PJM proposed a two-tier pricing proposal for its capacity construct, in the context of a “Grid 2020” meeting with a similar scope to the IMAPP effort ([link](#)). I am not aware of any market in which a two-tiered capacity pricing proposal has actually been implemented.

III. IMAPP Two-Tiered Pricing Proposals: The Public Power Proposal

Two proposals for two-tiered FCM pricing have been put forward in the IMAPP process; an original ([link](#)) and updated proposal ([link](#)) by NRG, and an alternate proposal by Public Power ([link](#)). While the NRG proposal was floated first, this memo will first describe and critique the Public Power proposal, which is more straightforward and similar to the PJM proposal noted above. The NRG proposal, which has provisions that attempt to address some of the shortcomings of the PJM and Public Power proposals, will be discussed second.

A. Description of the Public Power proposal

The basic idea of two-tiered pricing, which is reflected in the Public Power proposal, is as follows. The FCM Forward Capacity Auction (“FCA”) is run twice, in two “stages.” In what this memo will call Stage 1, STM resources are not mitigated, so presumably they are offered at low prices and “clear” the auction (meaning, are chosen to receive a CSO). Call the resulting Stage 1 clearing price and quantity P1, Q1. Then in Stage 2, the STM resources (identified in more detail below) are mitigated (ORTPs), but all other resources’ offers are unchanged, so presumably the supply curve shifts to the left. This will in general result in some of the mitigated resources no longer clearing, causing a higher clearing price and lower cleared quantity in Stage 2. Call the resulting Stage 2 clearing price and quantity P2, Q2 (see the two figures below, discussed in the context of an example).

All resources that cleared in Stage 1 (Q1 MW), including any STM resources that cleared, will get CSOs. However, all allegedly “competitive” (non-STM) resources that cleared in Stage 1 will be paid not P1, but the higher Stage 2 price, P2. The STM resources that cleared in Stage 1 but not in Stage 2 will be paid the lower Stage 1 price, P1.

Under any two-tiered pricing proposal, the issue arises of what to do about so-called “in between” or “tweener” resources: those that offered at prices below the allegedly “competitive” Stage 2 clearing price P2, and so are apparently economic and deserving of a CSO, but offered above the Stage 1 clearing price, and so are not part of the Stage 1 cleared quantity, Q1. Under the Public Power (or PJM) proposal, the tweener resources do not clear and do not receive CSOs (treatment of the tweeners is significantly

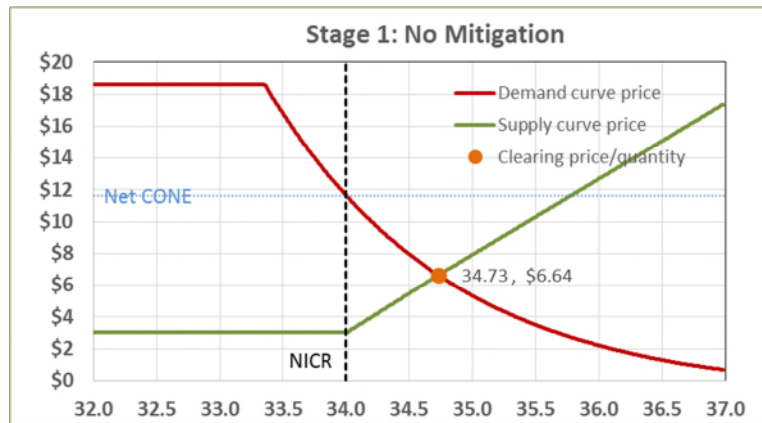
different under the NRG proposal discussed later in this memo). There are various other details of this (or any) two-tier pricing proposal, of which a few are noted later in this memo.

This approach addresses the three-way conflict identified above in the following way:

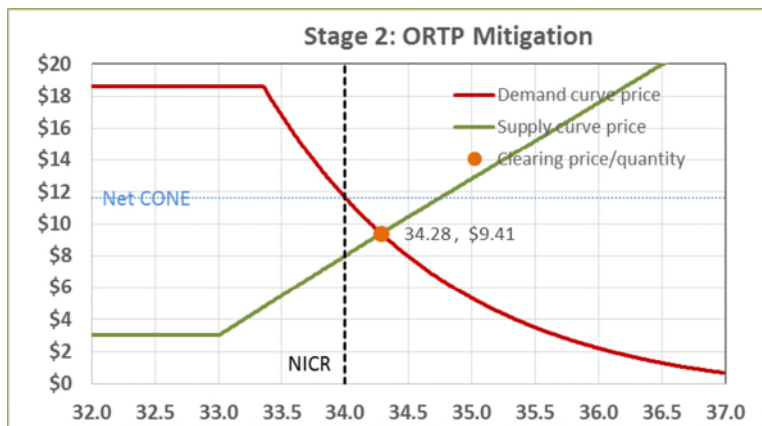
- ✓ STM resources get CSOs; and
- ✓ non-STM resources (at least those that cleared in Stage 1) get an allegedly “competitive” price P2 based on mitigation; while
- ✓ there is some compromise of the reasonable quantity/cost objective (discussed further below).

Before critiquing this proposal, consider a numerical example.

The first graphic shows an example in which Stage 1 sets a clearing price of \$6.64/kw-mo and clears 34.73 GW (P1, Q1). Stage 1 determines which resources will clear and get a CSO: 34.73 GW, including the STM resources.



Then Stage 2 is run, in which STM resources are mitigated based on the ORTP prices. Suppose for purposes of the example there is 1,000 MW of STM resource, and when mitigated in Stage 2 it does not clear, essentially shifting the relevant section of the supply curve to the left by 1,000 MW. This is shown in the second graphic. Stage 2 results in a clearing price of \$9.41/kw-mo (P2).



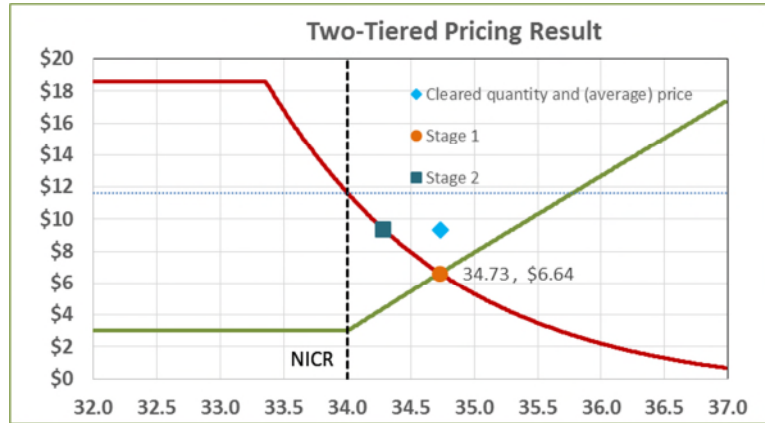
So in the example, all competitive (non-STM) resources that cleared in Stage 1 (the 34.73 GW minus 1 GW of STM resource = 33.73 GW) will get CSOs and be paid the higher, Stage 2 price of \$9.41/kw-mo. The 1 GW of STM resource that cleared in Stage 1 will also get a CSO, but will be paid the lower, Stage 1 price of \$6.64/kw-mo. The “tweener” non-STM resources that offered above \$6.64/kw-mo but below \$9.41/kw-mo will not get CSOs. In the example, there are .55 GW of tweeners (34.28 GW cleared in Stage 2, minus 33.73 GW competitive resources cleared in Stage 1).

B. Critique of the Public Power proposal

While addressing the three competing objectives to some extent, as noted above, the two-tiered pricing approach as put forward by Public Power raises the following three problems.

1. FCA cleared quantity and (average) price, and resulting total cost, are off the demand curve

Under the Public Power proposal the total cleared quantity is Q1, while most resources are paid P2 and only some STM resources are paid P1. In the example shown above, the average price paid is \$9.33/kw-mo while the total cleared quantity is Q1, 34.73 GW. Treated as a price/quantity pair, this is a point that lies well above the stakeholder-agreed and FERC-approved sloped demand curve, as shown in this figure. Put another way, this FCA outcome results in a total cost that is in excess of what the demand curve suggests should be paid for the actual cleared quantity Q1, as summarized in this table.



	Price	Quantity	Total Cost (\$ bil.) [1]
Stage 1 (unmitigated) result	\$ 6.64	34.73	\$ 2.77
Stage 2 (mitigated) result	\$ 9.41	34.28	\$ 3.87
"Competitive" resources outcome	\$ 9.41	33.73	\$ 3.81
STM resources outcome	\$ 6.64	1.00	\$ 0.08
Average price, total quantity/cost	\$ 9.33	34.73	\$ 3.89
[1] For Stage 1 and Stage 2, total cost shown is simply price x quantity x 12 months, as if the stage determined the entire FCA result.			

In 2010 FERC was concerned that the two-tiered proposal cleared a total quantity in excess of NICR and this violated a "bedrock principle" of the FCM construct, as noted above. The Public Power two-tiered pricing proposal results in a cleared quantity and (average) price that lies above the agreed sloped capacity demand curve, which seems to violate the same principle, as applied to a sloped demand curve. The demand curve associates a price of \$6.64/kw-mo, and a total cost of \$2.77 billion, with the total cleared quantity of 34.73 GW, as shown in the table, while the total cost under the two-tiered approach would be \$3.89 billion, over a billion dollars higher.

Note that in this example, the resulting total capacity cost, \$3.89 billion, is actually quite close to the total capacity cost under the fully mitigated Stage 2 result, which as a stand-alone FCA outcome would result in a price of \$9.41/kw-mo and total cost of \$3.87 billion. However, this comparison ignores the loss of

\$0.08 billion in capacity revenue to the STM resources, which would have to be recovered from consumers in another manner.

2. Incentives to submit competitive offers are distorted

The second concern is that the Public Power two-tiered pricing proposal distorts resources' choices with regard to offer prices.

Under the current FCA structure (or the structure of just about any auction), in principle, a resource's offer into the auction should be the price the resource requires in order to want to clear in the auction. That is, the resource's FCA offer price should be the price needed to make taking on a CSO worthwhile. If the FCA clears at a price above a resource's offer price, it clears and gets a CSO, and is satisfied with this result because the price is enough (likely more than enough) to make taking on the CSO worthwhile. If the FCA clears at a price below the resource's offer price, the resource does not receive a CSO and is again satisfied with this result, because at that clearing price it doesn't want a CSO. An owner might determine the price a resource "needs" to make a CSO worthwhile based on its avoided cost, or an opportunity cost concept, or some other analysis, it doesn't matter; if the auction is well-structured, the incentive is to make an offer based on the price considered needed (setting aside market power considerations). For the purposes of this memo, this will be referred to as the resource's "cost-based" offer price, recognizing that this may be an opportunity cost.

However, under the Public Power (or PJM) two-tier pricing proposal things are different. Under this proposal, the resource will get a CSO and be paid P2 if it clears according to the Stage 1 clearing price P1. In our example above, if the resource offers at less than or equal to \$6.64/kw-mo (the Stage 1 price) it clears, and will be paid \$9.41/kw-mo (the Stage 2 price).

Now suppose the resource's cost-based offer price is, say, \$7/kw-mo. If it offers at this price, it will not clear in Stage 1, and will not receive anything. But the Stage 2 price (that it won't get, because it didn't clear in Stage 1) is well above the price it needs. So if the owner suspects that Stage 1 may clear in the \$6 to \$7/kw-mo range, and Stage 2 might clear well above \$7 (as in the example), the owner might rationally choose to offer at \$6/kw-mo, even though that is below the price it needs. With this strategy the resource will clear in Stage 1 and get paid the higher Stage 2 clearing price. This strategy is more profitable than the initial approach of offering at \$7/kw-mo (the cost-based offer) and failing to clear.

So to the extent the FCA Stage 1 price is reasonably predictable, resources whose cost-based offers are close to the expected Stage 1 clearing price have incentives to shave their prices and offer somewhat lower to increase their chances of clearing in Stage 1. This has been called by some a "race to the bottom." To the extent this occurs, Stage 1 will clear a larger Q1 quantity, at a now lower P1 price, than if all resources submitted cost-based offers.

It could be argued that this incentive problem may be unimportant because FCA clearing prices are not very predictable. While this may be true to some extent, especially in the near term, market designs should be robust and workable from a long-run, equilibrium point of view. If the FCA rules are reasonably stable over time, clearing prices should become rather predictable. It could also be argued that this incentive problem is not important if P1 and P2 are not very different, as would be the case if mitigation does not shift the supply curve very much. This is true, but the market design should be robust under circumstances where the quantities of STM resources may be larger. As the numerical example

shows, if 1,000 MW is mitigated such that it fails to clear in Stage 2, this can drive a substantial wedge between the Stage 1 and Stage 2 prices.

The “race to the bottom” is one bad incentive created by the two-tiered pricing proposal. There is a second one. Now consider a resource whose cost-based offer price is around \$8/kw-mo. Suppose the owner considers it too risky to shave the offer price enough to clear in Stage 1 (down to the \$6 to \$7/kw-mo range), so the owner won’t join the race to the bottom, that he would likely lose. So does he still offer the resource at \$8/kw-mo? If the owner accepts that the resource won’t clear in Stage 1 and won’t receive a CSO, what difference does the offer price make?

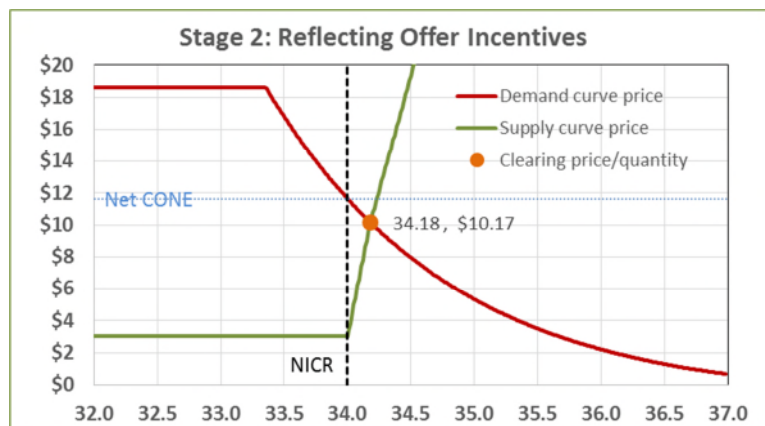
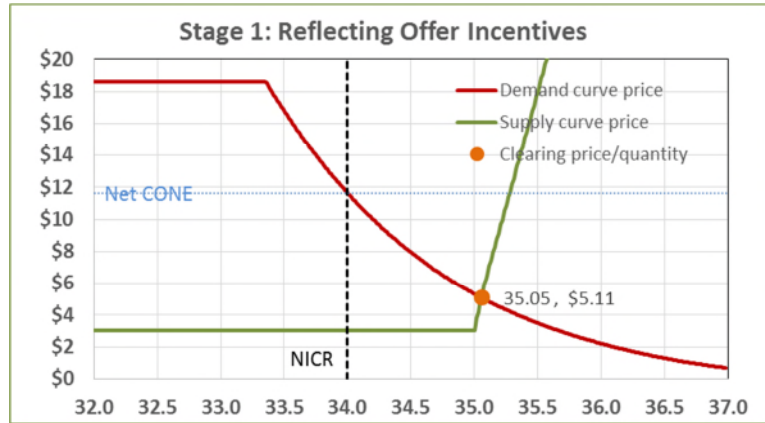
The offer price won’t determine whether the resource will clear (it won’t clear), but the offer price will affect the Stage 2 clearing price. Suppose the owner anticipates that Stage 2 will likely clear at a price in the \$8 to \$10/kw-mo range, above his cost-based \$8/kw-mo offer price. Then if he instead offers at, say \$10/kw-mo, Stage 2 might clear at a somewhat higher price than it otherwise would have. If the owner has only the one resource, this still makes no difference to the owner. But if the owner has any other capacity that will clear in the auction, then it will increase profits to offer this resource not at its cost-based \$8/kw-mo price, but at a higher price, in order to support a higher Stage 2 clearing price that will be earned by the rest of the owner’s portfolio.

To summarize, resources with costs expected to be close to the Stage 1 clearing price have an incentive to shave their offer prices to increase their chances of clearing in Stage 1, while resources that do not have much hope to clear in Stage 1 may have an incentive to offer at high prices to contribute to a higher Stage 2 clearing price. The result is that, compared to cost-based offer prices reflecting what a resource needs, Q1 is likely to be larger (due to the first incentive) and P2 is likely to be higher (due to the second incentive) further raising the quantity, price, and cost of capacity.

Returning to the numerical example, suppose these incentives change the supply curve as shown in the next pair of figures, reflecting some resources offering at lower prices to attempt to clear in Stage 1, and other resources offering at higher prices to support a higher Stage 2 price, resulting in a steeper supply curve.

The example suggests that Stage 1 would now clear 35 GW at \$5.11/kw-mo, while Stage 2 would clear at \$10.17/kw-mo. The larger cleared quantity and higher P2 price would of course increase capacity cost compared to the outcomes under bidding not influenced by these incentives.

As a general matter, any proposal under which who clears is determined by one price threshold, while what price the cleared resources actually get paid is substantially different, will create incentive issues.



3. The rate P2 is established arbitrarily

A third problem with this two-tiered proposal focuses on formation of the Stage 2 price P2 paid to all but STM resources. Assuming the Stage 1 and Stage 2 prices, P1 and P2, are substantially different, as in the numerical example, the P2 clearing price would likely be set by an offer from a resource whose owner knew it would not clear and would not receive a CSO. Accordingly, the P2 price, which becomes a rate upon which over a billion dollars in capacity payments will be based, is rather arbitrary, as it is set by offers from resources that don't have anything at stake in selecting their offer prices (except for the incentive, described above, to inflate the offer price to support a higher P2 clearing price, which only makes things worse). Furthermore, the P2 price formation also reflects the administrative mitigation of STM resources, which likely results in resources that already exist being treated for price formation purposes as if they do not exist. FERC may find this proposed basis for setting the P2 rate unacceptably arbitrary.

Finally, I note that in my 2010 affidavit in the APR proceeding I raised additional issues with the two-tier pricing concept, of which some are applicable to this proposal (summary on p. 36 of the affidavit, which was linked above).

IV. IMAPP Two-Tiered Pricing Proposals: The NRG Proposal

A. Description of the NRG proposal

The Public Power (and PJM) two-tier pricing proposals leave out the tweener resources with offer prices between the Stage 1 and Stage 2 clearing prices – the tweeners do not get CSOs. To the extent it is accepted that the P2 price is the “right”, competitive price, these resources are economic, so leaving them without CSOs seems unfair to those resource owners. And, as described above, this also gives the lower-cost tweener resources incentives to shave their offer prices to try to clear in Stage 1, and the higher-cost tweener resources incentives to inflate their offers to support a higher P2 clearing price.

The NRG proposal attempts to address these problems. (This description of the NRG proposal, for consistency, will use the nomenclature of the PJM and Public Power proposals, which is different from NRG's document; in this memo, Stage 1 is the unmitigated stage, and Q1 and Q2 refer to the total quantity cleared in each stage).

The NRG two-tiered pricing proposal is the same as the Public Power proposal, with the following principal differences:

1. The “tweener” resources that offered below P2 in Stage 2 also clear and will receive CSOs, but
2. All resources' cleared quantities are reduced on a pro-rata basis such that the total market capacity cost is held equal to the Stage 2 total cost ($P2 \times Q2$).

Specifically, all resources' CSO quantities are reduced by the ratio of the total capacity cost, based on the nominal Stage 1 and Stage 2 outcomes, to the total capacity cost based solely on the Stage 2 outcome. Under the nomenclature of this memo, the ratio for reducing CSOs is $(P2 \times Q2)/(P2 \times Q2 + P1 \times Qs)$,

where Q_s is the quantity of STM resource that clears in Stage 1 but not Stage 2 (1 GW, in the example above).

Table 2 summarizes the result of the previous example, under the NRG proposal. Under these assumptions, the total capacity cost and average price happen to be very close to their values under the Public Power proposal; the main differences are that, under the NRG proposal, 1) the tweeners also get CSOs, and 2) all CSO quantities are reduced by 2%.

Table 2: Summary of Two-Tiered Pricing Example (NRG Proposal)			
	Price	Quantity	Total Cost (\$ bil.) [1]
Stage 1 (unmitigated) result	\$ 6.64	34.73	\$ 2.77
Stage 2 (mitigated) result	\$ 9.41	34.28	\$ 3.87
Total Capacity Cost (Stage 2 result)			\$ 3.87
Cost, including STM resources			\$ 3.95
Ratio for reducing CSOs			98.0%
“Competitive” resources outcome	\$ 9.41	34.28 x 98%	\$ 3.79
STM resources outcome	\$ 6.64	1.00 x 98%	\$ 0.08
Average price, total quantity/cost	\$ 9.33	34.57	\$ 3.87
[1] For Stage 1 and Stage 2, total cost shown is simply price x quantity x 12 months, as if the stage determined the entire FCA result.			

B. Critique of the NRG proposal

This critique follows the issues raised around the Public Power proposal.

1. FCA cleared quantity and (average) price, and resulting total cost

The NRG proposal clears the twener resources, and then scales CSO quantities in order to hold the total market cost to the cost based on the price and cleared quantity from Stage 2. The scaling of CSO quantities is of course a drawback of the approach; no resources are held harmless due to the presence of STM resources, as all resources, including competitive and self-supply resources, receive reduced CSOs under this proposal.

Under the numerical example shown above, the resulting total cleared quantity, average price, and average cost with the NRG approach are very close to the results under the Public Power proposal (before considering impacts due to the incentive effects of the Public Power proposal). The price, quantity and cost outcomes are slightly different but still above the demand curve, as under the Public Power proposal. The differences between the two proposals (before considering incentive effects) could of course be larger if the quantity of STM resource is larger, or if a different region of the demand curve is implicated.

2. Incentives to submit competitive offers

Under the NRG proposal, resources clear and get a CSO as long as they offer at less than the P2 price; and if clearing, they are paid the P2 price. Therefore, this proposal repairs the incentive problems created

by the Public Power and PJM two-tier pricing proposals under which the price determining whether a resource clears, and the price that will be paid, can be significantly different.

On the other hand, because CSO quantities are reduced pro-rata, resource owners that need a certain minimum revenue may be inclined to raise their offer prices, to make up for the pro rata quantity reduction. The magnitude of this distortion will depend upon how much CSOs are reduced (which will depend upon several factors; in the example the reduction is rather small, 2%) and also the owner's cost structure and risk tolerance. This distortion would seem to be less significant than the distortion raised by the Public Power approach, however, it is still a distortion of offer incentives.

3. The rate P2

Because the offer price distortion is repaired, the P2 clearing price is less arbitrary than under the Public Power proposal. However, the P2 price is still the result of an abstract notion of a "competitive" clearing price formed based on a calculation under which some resources that are in the market (the STM resources) are essentially treated as if they are not in the market, through administrative mitigation; and this mitigation may continue for years. Thus, the P2 price is still a hypothetical.

As noted above, my 2010 affidavit in the APR proceeding raised additional issues with the two-tier pricing concept, of which some are applicable to these new proposals (summary on p. 36 of the affidavit, which was linked above).

V. Two-Tiered Pricing Proposals: Other Details

A few other details of the two-tiered pricing proposals are notable:

1. Both proposals refer to Market Rule 1 Appendix A.21 as the definition of resources subject to mitigation.
2. Both proposals call for expanding this definition to include Existing Resources.
3. The Public Power proposal would add a new definition of "Certified Load Asset Resources" that would offset the capacity resource obligations of specified Load Assets, in effect providing a self-supply exemption. (FYI, for PJM's capacity market, FERC approved a self-supply exemption that is subject to "net long" and "net short" limits.)
4. The NRG proposal calls for eliminating the 200 MW Renewable Technology Resource Exemption, while the Public Power proposal calls for retaining it.
5. Both proposals call for STM resources to continue to be subject to mitigation in subsequent FCAs, until such time as they are able to clear under the higher Stage 2 price.

VI. Two-Tiered Pricing Proposals: Summary

As noted above, two-tiered FCM pricing proposals attempt to resolve the conflict between three competing capacity market design objectives:

1. recognizing the contribution of the STM resources to resource adequacy by granting them CSOs;

2. establishing a “competitive” FCM price for compensating existing and attracting new competitive (non-STM) resources, that is not suppressed by the offers of STM resources; and
3. clearing a reasonable total amount of capacity at a reasonable total cost.

The two proposals put forward at IMAPP both fulfill the first objective, so perhaps the main tension is between the second objective (which may be highest priority for capacity sellers) and the third objective (which may be highest priority for consumer interests).

In addition, a satisfactory solution must also adhere to other market design principles and not create significant new problems, such as the incentive issues described above.