ICAP Willingness To Pay (Demand Curve)

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Overview

The New York ICAP market has exhibited serious problems. ICAP prices have proven to be extremely volatile, tending to be either near $0 or near the deficiency charge ($12.50/kW-month, approximately 3 times the cost of a new peaking unit), depending on whether supply is adequate or tight. Suppliers have complained that if they add capacity, ICAP prices may crash to near $0, so they cannot rely on ICAP revenues to finance new capacity. On the other hand, LSEs have complained that, even where physical supply has been adequate, prices have sometimes approached the deficiency charge, suggesting market power abuse (economic withholding). As a result, consumers may end up paying excessive prices for ICAP without effectively encouraging new capacity.

To reduce the excessive price volatility in the current deficiency approach, we suggest establishing a variable ICAP rate schedule that would automatically, but gradually, adjust ICAP rates in response to changes in ICAP supply. To simplify the analysis, we will assume that the ICAP market is centralized, with the ISO purchasing ICAP on behalf of LSEs and billing LSEs based on their peak loads. The ICAP rate schedule would represent the ISO's willingness to pay for ICAP (i.e. an ICAP demand curve). This rate schedule would be set to reflect the ISO's estimate of the marginal benefit of ICAP. At low levels of ICAP, reliability might be compromised and additional ICAP should provide a large marginal benefit, so the ICAP rate would equal a deficiency rate. As levels of ICAP increased, the marginal benefit of ICAP should gradually decline, so the ICAP willingness to pay would gradually decline.

The ICAP rate schedule would be keyed to some measure of ICAP supply. An obvious measure would be the supply offered into the ICAP market. This is the simplest measure, and reflects suppliers' voluntary commitments. One potential drawback is that it is subject to economic withholding (i.e. a supplier may choose not to offer a portion of its capacity in order to drive up the price on its remaining capacity). However, under the Willingness To Pay approach, withholding supply would only cause a small increase in price, and is thus less likely to be profitable. An alternative measure of ICAP supply would be the physical quantity of ICAP in the region. This alternative would not be subject to economic withholding, but would require a process for determining the physical quantity of regional ICAP. The following analysis assumes that the quantity of ICAP supply reflects the amount offered into the market by suppliers.

The Willingness To Pay proposal allows the market to determine the ICAP price and quantity as a function of market supply and ISO willingness to pay (demand). The ISO's Willingness To Pay schedule (demand curve) would be fixed in advance, as a function of percentage of (forecast) peak load. The ISO would accept ICAP supply offers for the upcoming period and compare these supply offers to its willingness to pay (demand curve). The intersection of the supply and demand curves would determine the market-clearing price and quantity of ICAP. An increase in supply offers (or a decrease in peak load) would shift the supply curve to the right, leading to a higher quantity purchased at a somewhat lower price, protecting suppliers from sudden, drastic drops in ICAP prices. A decrease in supply offers (or an increase in peak load) would shift the supply curve to the left, leading to a smaller quantity purchased at a somewhat higher price, protecting LSEs from market power abuse by suppliers.

The Willingness To Pay schedule would have to be set administratively, just as the reserve requirement and deficiency rate are currently set administratively under the Deficiency Charge approach. However, if the Willingness To Pay schedule is based on % of peak load, like the current installed reserve margin, adjustments in it should be rare. This approach permits the market offers of suppliers to determine the actual ICAP price and quantity.

Analysis

The problems with the ICAP market can be analyzed by considering how much New York LSEs are willing to pay for ICAP. Under the current market design, NYISO requires each LSE to purchase sufficient ICAP to equal 118% of its peak load. LSEs which do not purchase sufficient ICAP are assessed a deficiency charge based on 3 times the annual cost of a new peaking unit, to provide an incentive for LSEs to procure adequate ICAP. The deficiency charge effectively caps the amount LSEs are willing to pay for ICAP when supplies are below 118% of peak load. ICAP in excess of 118% of peak load provides little value to an individual LSE, since ICAP provides neither energy price hedge nor any priority in load curtailment by NYISO in the event of energy shortages. Because ICAP provides a social benefit that for the most part cannot be claimed by the purchasing LSE, the LSE's willingness to pay fails to reflect the full value of ICAP. As a result, the LSEs' willingness to pay (demand curve) for ICAP is essentially a step function, equal to the deficiency charge for quantities up to 118% of peak load but dropping steeply to almost zero for quantities in excess of 118% of peak load.

The supply of ICAP is almost equally steep at its high end. Because of the time required to site and build new generating capacity, existing units must supply most ICAP. Most existing units, which expect to earn the bulk of their revenues from the energy market, can supply ICAP at almost zero marginal cost. Thus most ICAP supply is expected to be offered at very low prices. However, peaking units with high energy costs receive relatively little net revenues from energy and depend on ICAP (or operating reserve) payments to cover much of their costs. If ICAP payments are too low, these plants may be retired. Thus peaking units tend to be a higher-cost source of ICAP supply. Finally, quantities of supply above normal operating limits are very limited and expensive. As a result, the ICAP supply curve is likely to rise steeply near the high end of existing capacity.

The graph below labeled "ICAP Deficiency Charge" summarizes the current ICAP market. In a competitive market, the ICAP marginal cost would be the ICAP supply curve, indicating the quantity of ICAP supplied at each price. Moreover, the LSEs' willingness to pay would be the ICAP demand curve, indicating the quantity of ICAP that LSEs were willing to purchase at each price (118% of peak load for any price below the deficiency charge, and 0 for any price above the deficiency charge). The market-clearing price is given by the intersection of the supply (marginal cost) and demand (deficiency charge) curves.

On the graph, the ICAP supply and demand curves happen to intersect at a price of $4/kW-month. However, the combination of a steep supply (marginal cost) curve and a step function demand (deficiency charge) curve yields an extremely volatile and unpredictable price, which may jump between the deficiency charge and almost zero due to small changes in supply or load. For example, a 3% increase in supply (or 3% decrease in peak load, about 900 MW) would cause the price to crash to $1/kW-month, while a 3% decrease in supply (or 3% increase in load) would cause the price to jump to the deficiency charge of $12.50/kW-month.

The graph illustrates the poor incentives for new supply from the current Deficiency Charge approach. Suppose a developer was considering adding supply, and wanted to know how much ICAP revenue could be counted on over the course of the next several years. There might be other competing supply additions, which could shift the supply curve to the right, as well as uncertainties in load forecasts that could change the ICAP requirements. Under the deficiency charge approach, the added supply, or changes in load, could cause the ICAP price to crash. Moreover, if a developer is considering a large, lumpy addition (say, 900 MW), that addition could, by itself, cause the ICAP price to crash, in this case to $1/kW-month (see curve labeled "Supply Added"). These effects weaken the effectiveness of ICAP payments in encouraging new capacity.

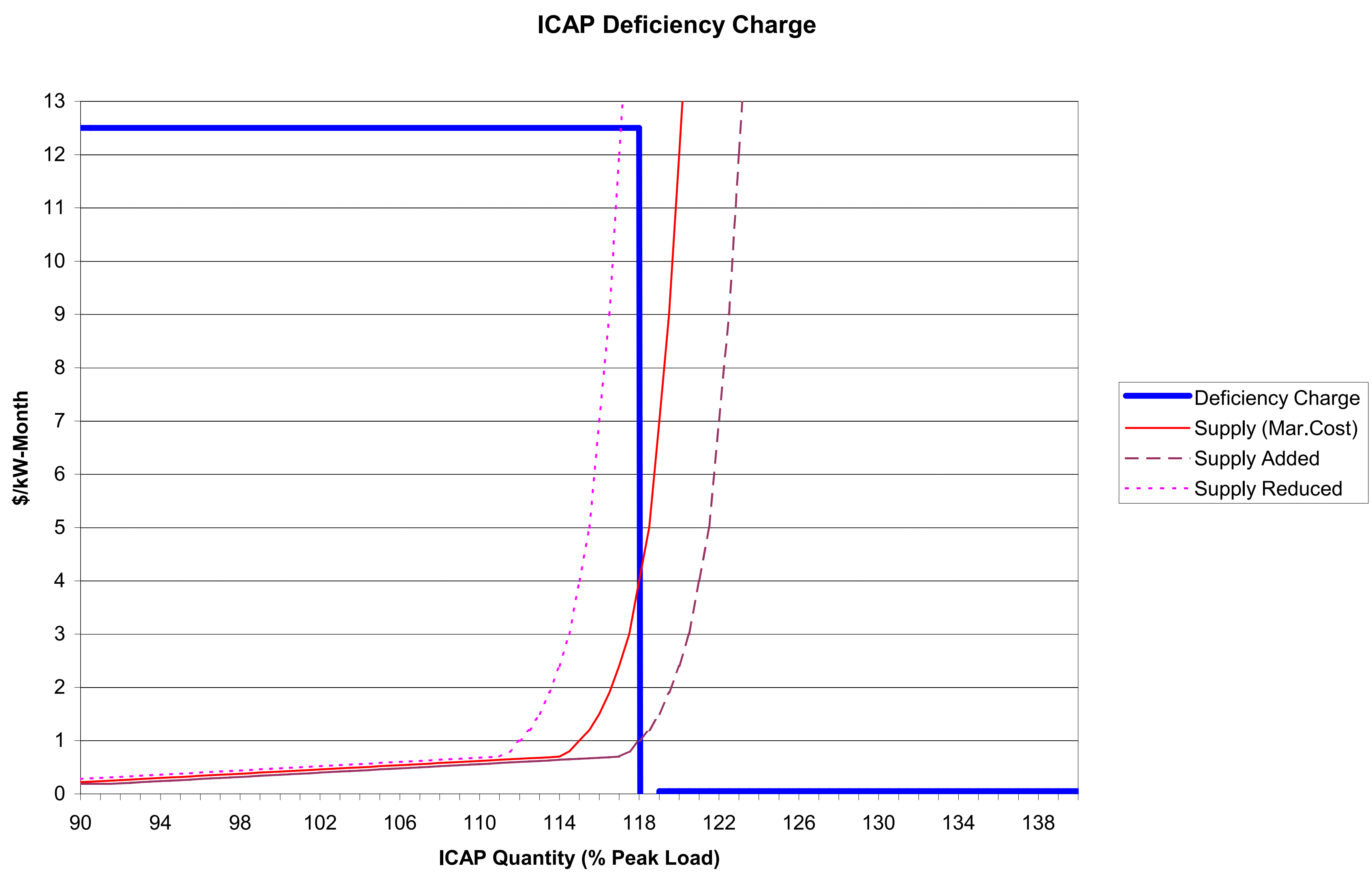
The graph also illustrates the potential for market power under the Deficiency Charge approach. In this example, the competitive outcome (with all supplies bid in at marginal cost) is $4/kW-month at an ICAP quantity equal to 118% of peak load. A supplier who owns 2000 MW would thus earn $8 million from ICAP sales for that month. Now consider whether this supplier could profit by withholding some amount from the ICAP market, say 900 MW. Since 900 MW equals about 3% of peak load, this withholding would shift the supply curve to the left by 3% on the graph (see curve labeled “Supply Reduced”). The withholding causes the ICAP price to jump to $12.50/kW-month, and the supplier's ICAP revenues increase to $13.75 million for that month ($12.50/kW-month x remaining 1100 MW). The supplier foregoes $3.6 million in profitable sales (900 MW x $4/kW-month) but gains $9.35 million on its remaining sales ($8.50/kW-month x 1100 MW), for a net profit of $5.75 million from withholding.

The "Willingness To Pay" approach is designed to reduce the volatility of ICAP prices, in order to provide more effective incentives for new capacity and to mitigate market power. Higher quantities of ICAP would automatically lead to lower ICAP prices, providing a price signal to ICAP suppliers without requiring repeated regulatory battles. Of course, the level and slope of the Willingness-To-Pay schedule (demand curve) would have to be established in the first place. Because of higher construction costs and more stringent reliability requirements in NYC, a separate, higher schedule may be appropriate for NYC.

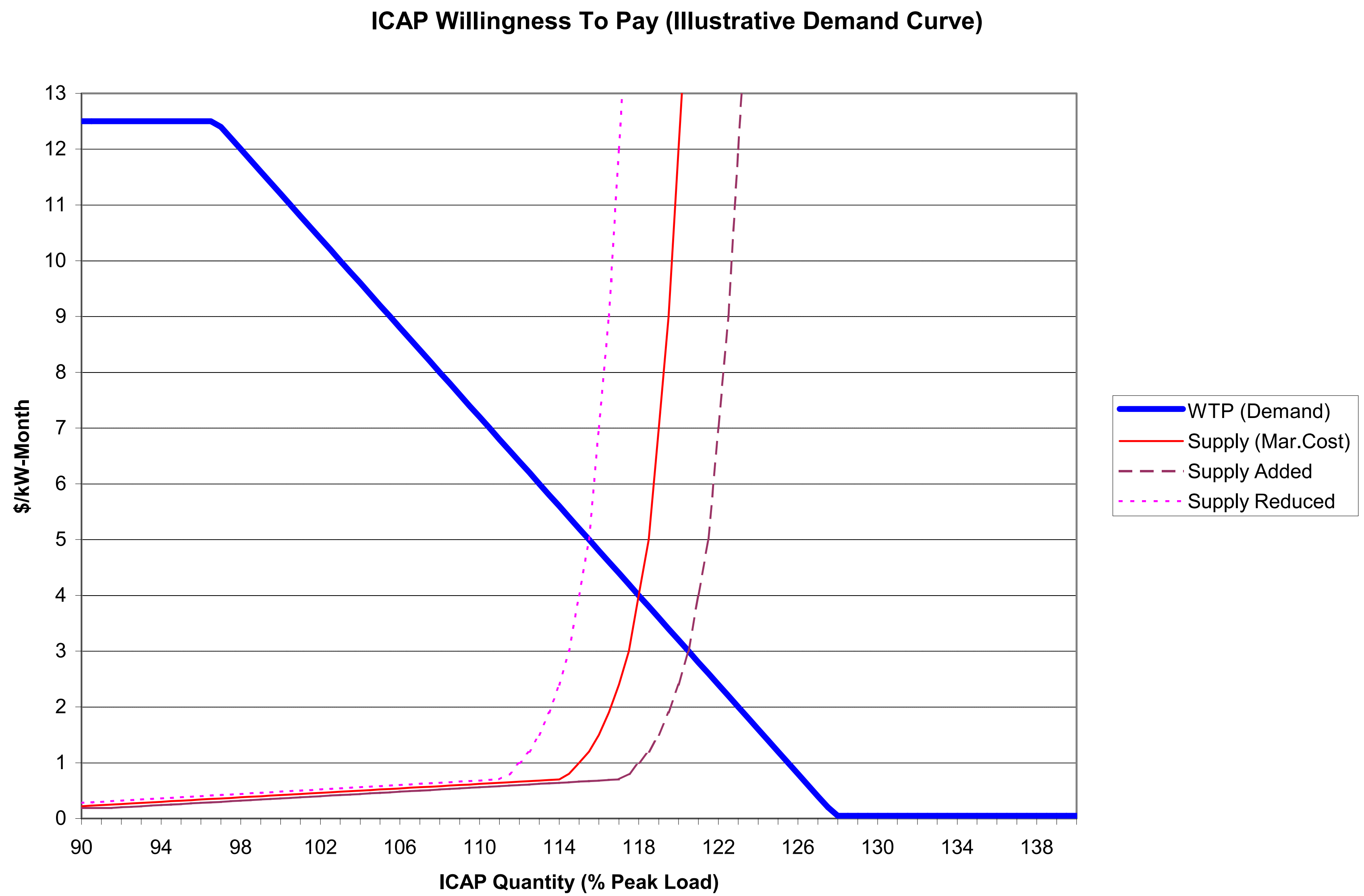
In the graph labeled “ICAP Willingness To Pay (Illustrative Demand Curve)”, if total ICAP purchased equals 118% of installed capacity, LSEs would pay $4/kW-month. Lower quantities of ICAP purchased would lead to gradually higher ICAP payments, e.g. $5/kW-month if ICAP equals 115.5% of peak load. Conversely, if total ICAP equaled 120.5% of peak load, the ICAP price would drop to $3/kW-month. In this example, the price would not reach $0 unless ICAP quantities reached 128% of peak load. This variation in willingness to pay for ICAP reflects the fact that, when ICAP is tight, additional ICAP is quite valuable to the electric system in improving reliability and avoiding energy price spikes; but as quantities increase, the marginal benefit of additional ICAP gradually diminishes. The gradually declining willingness to pay for ICAP thus reflects the gradually declining value (diminishing marginal benefit) of additional ICAP to the ISO.

The graph illustrates the improved incentives for new supply under the Willingness To Pay approach. As before, the competitive outcome (with all supplies bid in at marginal cost) is $4/kW-month at an ICAP quantity equal to 118% of peak load. In this example, an increase in supply of 3% (900 MW) would only cause the ICAP price to decrease by $1/kW-month (see curve labeled “Supply Added”), one-third of the decline under the Deficiency Charge approach. Thus a developer would face much less business risk in the ICAP market.

The graph also illustrates how the Marginal Benefit approach reduces market power concerns. A supplier who owns 2000 MW and bids this at marginal cost would earn $8 million from ICAP sales for that month. If this supplier withholds 900 MW from the ICAP market, the supply curve shifts to the left by 3% (see curve labeled “Reduced Supply”) and the ICAP price increases. However, the price only increases to $5/kW-month, and the supplier's total ICAP revenues actually decrease to $5.5 million for that month ($5/kW-month x remaining 1100 MW). The supplier foregoes $3.6 million in lost sales (900 MW x $4/kW-month) but gains only $1.1 million on its remaining sales ($1/kW-month x 1100 MW), for a net loss of $2.5 million from withholding.



ICAP Deficiency Charge
$/kW-Month
ICAP Quantity (% Peak Load)
Deficiency Charge
Supply (Mar.Cost)
Supply Added
Supply Reduced



ICAP Willingness To Pay (Illustrative Demand Curve)
$/kW-Month
13
12
11
10
9
8
7
6
5
4
3
2
1
0
90
94
98
102
106
110
114
118
122
126
130
134
138
ICAP Quantity (% Peak Load)
WTP (Demand)
Supply (Mar.Cost)
Supply Added
Supply Reduced