GOVERNMENT INTERVENTION INTO WHOLESALE ELECTRIC MARKETS TO ASSURE GENERATION ADEQUACY

By: Mark Reeder[1]
November 6, 2002

[1] Chief of Regulatory Economics, New York State Department of Public Service (e-mail: mark_reeder@dps.state.ny.us; telephone number 518-474-8267). The views expressed in this paper are those of the author, and do not necessarily represent the views of the Department of Public Service or the New York Public Service Commission. This paper and the concepts it contains benefited greatly from the contributions of Harvey Arnett, Steven Keller, Tom Paynter, and Saul Rigberg, all of whom are staff at the Department of Public Service.

GOVERNMENT INTERVENTION INTO WHOLESALE ELECTRIC MARKETS TO ASSURE GENERATION ADEQUACY[2]

By: Mark Reeder

November 6, 2002

Introduction

There has been much discussion in recent years about wholesale electric markets and the need for a better market design to ensure the adequate reliability of wholesale electricity systems.[3] It is generally agreed that the existing market designs for Installed Capacity (ICAP) markets have not worked well and/or are not likely to work well. In this paper, I start by taking a step back and examining how markets in general, in products other than electricity, naturally yield reliability levels. This exercise is valuable in providing a perspective for evaluating mechanisms designed to assure electric reliability, and to understand the limitations involved in establishing such mechanisms. Next, after taking a brief look at the facts and figures regarding capacity reserves in New York at this time, I briefly reiterate the original impetus for creating the ICAP markets at the time of electric deregulation. I then turn to the specifics of the existing New York market design and describe its now well-known weaknesses. This is followed by a description of NYPSC staff's recent proposal for a Resource Adequacy Assurance Mechanism (RAAM).

---

[2] Based on a presentation made at the Multiple Intervenors' 30th Anniversary Annual Meeting, October 3, 2002, Syracuse, New York.

[3] In this paper, the term "reliability" is used repeatedly. It is being used loosely to generally encompass the concept of "generation adequacy." Engineers tend to use the former term as a short-run measure of the electric system's ability to withstand shock, and the latter as a measure of medium-run and long-run ability of the system to possess sufficient generation capacity. For ease of discussion, this paper will use the term reliability to refer to what engineers prefer to call generation adequacy.

The Role of Entry in Driving the Outcome of a Natural Market

Any businessman knows well the importance of entry and how it drives the results of the marketplace. Ultimately, it is the cost of new entrants that determines overall price levels and it is the amount of new entry, and exit, that determines the reliability of service seen by a buyer in the marketplace. If prices are high relative to the cost of new entry, new entrants will be attracted into the marketplace, and prices will be pulled back down. If prices are low compared to the cost of new entry, there will be little or no new entry, exit may occur due to the inability to make a reasonable profit, and prices will be pushed up. The process of prices affecting entry, and entry affecting prices, yields an equilibrium price that is tied to the cost of entry. Over time, prices will fluctuate up and down in cycles of several years, even many years, depending on the industry, with the price gravitating toward and fluctuating around the cost of entry.

The very same process also yields a natural level of quantity, also known as reliability. It is often the relative scarcity of a product that pushes its price up, and, at the point where the degree of scarcity yields a price that is just right, i.e., equal to the cost of new entry, the natural level of reliability in that marketplace is established. For example, consider the market for hotels in New Orleans. In equilibrium, hotel rooms are prevalent during off-peak periods, but are in short supply during peak periods, such as during Mardi Gras. During a peak period, prices are pushed up and the ability to obtain a hotel room is difficult, if not virtually impossible. The overall annual revenue stream of a hotel operator is greatly enhanced by high prices during peak periods, and there needs to be at least some of these high-priced peak periods (often accompanied by shortages) in order to boost the overall annual revenue stream to a level that adequately compensates the hotel operator for its annual fixed cost. In its natural equilibrium, the hotel market yields an overall annual price level that matches the cost of new entry and overall reliability level that falls out naturally as part of the market. Virtually all markets for capital-intensive products and services use this process to yield the two outcomes of price and reliability.

The New York State Capacity Reserve Situation

According to the NYISO Gold book,[4] the generation reserve margin for New York State (NYS) as a whole in 2002 equals 23%. This is 5% above the minimum level of 18%. The 18% minimum equates to the commonly used reliability target of one shortage per 10 years. Given a NYS peak load of about 30,000 MW, each percentage point of the reserve margin equates to 300 MW. The current 5% excess reserve level equals about 1,500 MW.

Quite recently, NYS was described as a state with a tight capacity reserve environment. The relatively flush current environment is due to three factors: (1) the installation of new New York Power Authority Turbines in summer 2001 (440 MW); (2) the installation of new generation on Long Island (400 MW); and (3) the change in rules that enabled Special Case Resources (SCR), which are either generation behind the meter or demand reduction, to qualify as providers of generation capacity (530 MW). Load growth is currently forecast to be about 500 MW per year; this means the current excess reserves are good through the end of the summer of 2005.

[4] New York Independent System Operator, 2002 Load and Capacity Data, filed with the New York State Energy Planning Board pursuant to Section 6-106 of the New York State Energy Law.

Is NYS in trouble in the post-2005 time frame, as regards sufficient capacity? The answer depends on several new plants that are under construction. The Athens Plant upstate is scheduled to come on-line in 2003 and equals 1,080 MW. It is over halfway constructed and is expected to be completed, although doubts have surfaced recently. The Bethlehem project, which represents a net increase of 350 MW, is scheduled to come on on-line in 2006. The Ravenswood expansion, scheduled for late 2003, represents 250 MW. Finally, the East River Project, a net 200 MW addition, is scheduled for 2004. These three plants taken together add up to 1,880 MW. Assuming that all four plants come on-line, NYS, as a whole, has adequate generation capacity through the year 2008.

The excess supply has affected New York's ICAP market. It has caused market clearing prices for upstate ICAP to drop to very low levels, below $1.00/kW-month for the winter of 2002-2003. The average market clearing price for the most recent 12 months has been about $1.00. This compares to estimates of the cost of new entry for a combustion turbine that are in the $5 to $10 range. Energy market prices are also depressed by the 5% excess capacity, although not nearly to the extent that the ICAP market is.

The above picture appears to be a reasonably comfortable one from a resource adequacy perspective. There is a wild card in the story, however. That is the assumption inherent in the discussion that all of the existing plants will stay in business. A problem is that at the current very low ICAP price level, the continued operation of at least some of NYS's weakest plants is in doubt. The Oswego plant, for example, is a 1700 MW facility in upstate New York that was designed as a baseload plant, but hardly ever runs due to poor heat rates and high fuel costs (its capacity factor for 2001 was 3%).

It is doubtful that this plant is making money at today's ICAP prices. The Bowline Plant in the Hudson Valley, a 1200 MW plant, is also a fairly high-cost plant that has a fairly low capacity factor (16% in 2001). It may not continue to be viable at existing depressed ICAP prices. These two plants combine for 2900 MW, which, if subtracted from existing supplies, would bring New York into an immediate deficit. The importance of this point is that, while many talk about the need to see ICAP price levels high enough to support new entry, there is also the concern, perhaps a very real one, about the need for ICAP prices to at least remain above some minimal level necessary to keep existing plants viable. Of course, the retirement of old and inefficient plants is a normal thing in all markets, and it would be wrong to assume that this phenomenon should be prevented. Nevertheless, in examining markets for generation capacity, it is important to consider the possibility of retirements. This concern is magnified when one sees that a fairly small capacity surplus can depress ICAP prices so much so that retirement could then immediately eliminate the entire surplus. As will be discussed more fully below, there is a need for the market to provide a more stable price signal for generators so that dramatic price crashes that threaten retirements are minimized.

As for the current low ICAP prices upstate, they cannot last. No market can operate over the long term at prices that lie below the cost of new entry. In the long run, prices must equilibrate around the cost of new entry. There is no way around that, and there is no point in attempting to pursue policies that would buck the force of the economics of the market and try to permanently hold prices down.

<u>Why Intervene in the Electricity Market?</u>

At the onset of electric deregulation in the United States, policymakers were concerned about whether the electric marketplace would naturally yield reliability levels as high as those that policymakers and electric users had grown comfortable with under the status quo. The obvious default approach was to simply let the market operate naturally, without intervention, i.e., no generation adequacy requirement and no ICAP market. Under such an approach, as discussed above, entry and exit would occur and the market would reach its own natural equilibrium. The result would be energy market prices that just cover the cost of entry and a natural reliability level.[5] It is important to remember that in the wholesale electric market, as in any other market, if prices are too low to encourage new entry, the mechanism that raises prices is the lack of entry (and retirements), which tightens the market, drives up energy prices, and lowers reliability. As such, prices and reliability are the opposite sides of the same coin; to increase the former, the market needs to lower the latter.

Policymakers, at least in the northeast, rejected the natural approach. Not knowing what level of natural reliability was likely to emerge, it was decided to ensure that a minimum level of reliability was maintained (an 18% reserve margin in New York, which is consistent with the one day in ten years reliability standard). Electricity was thought to require a treatment that differs from many of society's other, less crucial, products. For example, society tolerates the market's natural outcome in which several weeks a year people have to be turned away from hotels because they are sold out. It is not as acceptable to have the electric system turn electric users away with the same frequency because of electric shortages.[6] Given this concern, the policy decision was made to intervene in the natural marketplace to produce an altered outcome.

[5] Ancillary services markets would provide an additional revenue stream, but are ignored to keep the discussion simple.

[6] It might be acceptable in the electric industry of the future to have customers go unserved once the infrastructure of real-time prices and other demand-side response mechanisms are more fully developed and the system is able to ration supply via the voluntary decisions of the consumers not to consume. At the

Intervention does have its consequences, however. The extra generation capacity associated with a required reserve margin affects the energy market. It depresses annual energy market revenues for all generators, which in turn leads to the need for an alternative revenue stream via some kind of generation capacity payment mechanism.[7] This extra revenue stream enables the market to entice more entry than would otherwise occur, thereby achieving the goal of enhanced reliability.

It is useful to think of a capacity market mechanism as a government-mandated "thumb on the scale" that puts more revenues into the mix for those that are supplying electricity. This is a normal policy activity for government. For example, it is akin to the policy of deductible interest on mortgages held by homeowners, which gives more money to those who choose to own a home rather than to rent one. The goal is to stimulate increased homeownership, and it works.

Once a decision has been made to intervene in the market, administratively, there are two fundamental alternatives on how to do so, as follows:

1) Administratively establish a desired quantity level (at 118%, for example). With this approach, the intervention takes the form of a quantity target and the market is left to reveal the price adder that it needs in order to achieve that quantity target rather than the natural quantity that it would otherwise provide.

---

current time, however, with the paucity of demand-side response that exists in many parts of the country, the system is not yet able to rely on a fully voluntary rationing approach. See, for example, Alfred E. Kahn, "The Adequacy of Prospective Returns on Generation Investment under Price Control Mechanisms," The Electricity Journal, March 2002, pages 37 to 46.

[7] For a discussion of the relationship between capacity reserve requirements, energy market prices, and generation capacity payments, see Eric Hirst and Stan Hadley, "Maintaining Generation Adequacy in a Restructuring U.S. Electric Industry," ORNL/CON-472, Oak Ridge National Laboratory, October 1999, available at www.ehirst.com.

2) Administratively establish a price adder or a price adder formula. According to this approach, an added revenue stream is made available to all providers of capacity, the amount of that revenue stream is determined administratively, and the market is then left to reveal the amount of extra quantity it is willing to provide. (This is akin to the tax deduction on home mortgages that is provided to stimulate increased homeownership.)

In the northeast, we chose the first of the above two options. We established a 118% capacity requirement and are letting the marketplace reveal the price it needs to achieve this government-imposed target. For the remainder of this paper, we discuss the actual experience with this approach, note its fundamental shortcomings, and recommend a switch to an alternative that works along the lines of option 2) above.

Neither of the two intervention options is perfect, is effortless to calibrate, or allows one to avoid difficult decisions. In summary, the point of this section is that, once one has decided to reject the reliability level the market would naturally produce, and instead decides to intervene to alter that outcome, one will be faced with a challenge, will have to continually reassess the effectiveness of the intervention mechanism, and will need to make adjustments. There is no pure market-based way of intervening.

<u>Current New York ICAP Market Rules</u>

The current rules for the New York ICAP market require Load Serving Entities (LSEs) to buy generation capacity from generation owners to cover their forecasted peak load, plus an 18% margin. LSEs that fail to cover this margin pay a very large penalty. Sellers of ICAP receive the revenues associated with the ICAP market and, in return, obtain an obligation to bid into the NYISO's day-ahead energy market every day. Similar rules govern ICAP markets in the Pennsylvania, New Jersey, Maryland (PJM) ISO, and in ISO-NE (New England).

In theory, one would expect the New York ICAP rules to produce very high market prices when capacity is short and very low ICAP prices when the market is in surplus. This is because the market design puts no value on extra capacity beyond the peak 118% target, while placing a very high value on capacity whenever the system is even slightly short of the target. In practice, the market has lived up to this theory, and market clearing prices in New York have been quite volatile. There was one occasion in which the upstate ICAP market was short and cleared at the extremely high maximum value associated with the penalty, while more recently, given a roughly 5% excess (i.e., 23% reserves), the market has crashed to an exceedingly low value below $1.00/kW-month. Market participants often talk about the 118% reserve level as a cliff, and use the term "falling off the cliff" to represent what happens to price when reserves grow to exceed the target. Although the current 123% reserve margin within NYS does not seem excessive, it has nevertheless driven the market clearing price down dramatically and undervalues the benefit of the additional reserve margin.

From a generation owner's point of view, the New York ICAP market design is fatally flawed. It yields ICAP prices that are highly volatile and it exhibits an excessive tendency for prices to crash toward zero. From a banker or equity investor's point of view, investing in a new generation facility cannot be done with any significant reliance on the expectation of future ICAP revenues. The extreme volatility of ICAP revenues over time forces investors to heavily discount the ICAP revenue stream when performing financial analysis of the likely profitability of a new investment in generation.

The result is that, although significant ICAP payments are made over time, the buying side of the market gets very little for such payments in terms of inducing additional entry.

From a buyer's point of view, the current New York ICAP market design raises another concern, and that is its extreme susceptibility to the exercise of market power. For any period in which the actual generation reserve is just slightly over 18%, a competitive market would yield a reasonable price that lies slightly below the annual fixed cost of a peaker. Yet, at such times, any one of the fairly large suppliers in the market would appear to be able to withhold a portion of its capacity and, in doing so, drive the market into a deficiency causing a dramatic jump in the ICAP price up to its maximum allowable level, which is three times the annual fixed cost of a peaker. This market power concern is magnified by the knowledge that the New York ISO's Market Monitoring Unit has no mitigation measures that apply to the ICAP market. So long as the market is reasonably flush, as is currently the case upstate, buyers do not have any immediate fears, with the possible exception of sudden retirements that might drive the ICAP market into a deficiency state. However, over time, as load growth causes the actual generation reserve to shrink back toward the 118% level, the potential for market power that can artificially drive up the price looms large.

Overall, therefore, the current New York ICAP market design is unsatisfactory to both buyers and sellers. It presents the prospect of a future in which ICAP prices are often low, but can't stay low and still have generators all stay in business. There will inevitably be periods in which the reserve margin shrinks, drops below 118%, and drives ICAP prices to their maximum, yielding short-term bonanzas for generators and nightmares for consumers. These would, in turn, be followed by periods in which new investment occurs yielding sufficient or excess capacity, accompanied by excessively low ICAP prices. Such a pattern of volatile prices, and volatile reliability, is not in anyone's interest.

The NYPSC Staff's Proposed Resource Adequacy Assurance Mechanism

In recent months, the NYPSC staff has proposed a different kind of mechanism called the Resource Adequacy Assurance Mechanism (RAAM).[8] It would replace the current ICAP market rules with a substantially different approach. The proposal is designed to achieve the following three goals:

1) Smooth out the pattern of capacity prices over time, i.e., reduce the market's price volatility, thereby giving greater assurance to potential new entrants and their bankers that they can count on capacity revenues in considering investments in new generation facilities.

2) Reduce the vulnerability of the capacity market to the exercise of market power by suppliers.

3) Foster a visible forward market in capacity supplies, with posted prices that are available to guide both small and large players alike in entering long-term capacity and/or energy contracts.

In the context of the earlier discussion of the two possible types of government intervention in the market, the RAAM is the second type, i.e., the intervention is in the form of a revenue enhancement whose goal is to boost the quantity of capacity above the level that the market would naturally produce.

The NYPSC staff proposal derives in part from an acknowledgement that the existing ICAP market design contains a willingness to pay for capacity that is

---

[8] It should be noted that, while the methodological aspects of the PSC staff proposal have been favorably received by a number of market participants, there are three or more variations being considered, each having different numerical values for the key parameters of the mechanism.

schizophrenic; it insists on acquiring capacity right up to the 118% level (as expressed by the huge price per kilowatt during a deficiency), but then expresses absolutely no willingness to pay for any megawatts at capacity levels that are even slightly beyond 118%. This is a highly artificial construct that does not represent the true value to the electric system of one more or one less megawatt of capacity at or near the 118% target. An assumption behind the current mechanism is that, in equilibrium at 118%, the reliability value to the electric system of one MW of additional capacity equals the annual carrying costs of a combustion turbine. This feature is lost, however, by the mechanics of the proposal in which: 1) the penalty is set at three times the annual cost of a combustion turbine whenever capacity is even slightly short of 118%; and 2) the market clearing price is allowed to crash to a level dramatically below the annual carrying costs of a combustion turbine whenever capacity exceeds 118%.

The RAAM attempts to more realistically represent the true value to the system of a little more or a little less capacity at or near the target level. The key to the proposal is a much smoother willingness to pay or "demand curve" for capacity. According to the RAAM, the system is willing to acquire more than 118% capacity reserves, albeit at somewhat lower prices than it will pay at a level equal to 118%. Similarly, when reserves fall short of 118%, the system will pay a price that is higher than the annual fixed costs of a peaker, but not nearly so high as the current mechanism's extremely large penalty.

Whereas the current New York ICAP market design is one in which the natural market is altered via the administrative establishment of a quantity target of 118%, and the market is left to determine the price, the NYPSC staff proposal is one in which a price for capacity is established, and the market is then left to reveal the quantity that it will supply at that price. The difficult part is to choose a price that will elicit the right quantity response, i.e., a capacity reserve in the appropriate range of 18% or slightly larger.[9] Rather than establish a single price and passively observe the quantity that results, the price adder the RAAM provides to the market is not fixed, but varies depending on the actual quantity of capacity offered. The price that is paid to capacity declines gradually as the quantity that emerges from the market exceeds the 118% goal; this automatically dampens the amount of quantity the market creates in the event that the price adder one has chosen is stimulating too much quantity. Conversely, if the quantity of capacity coming forth from the market falls short of the desired quantity goal of around 118%, the price rises in an attempt to automatically bring forth more quantity.[10] If, over time, it becomes apparent that the overall schedule of prices inherent in the mechanism is too high or too low, the whole price schedule can be adjusted up or down to improve its ability to yield approximately the right amount of capacity. A detailed description of the NYPSC staff proposal is beyond the scope of this paper.[11]

---

[9] If a price is chosen that is too high, one can be saddled with a large amount of capacity that is not needed and which gets overpaid. New York and several other states have experienced this problem in the context of the Public Utilities Regulatory Policy Act (PURPA), in which an overstated estimate of avoided costs led to overstated prices being offered for independent generation, which led to too much of it. If a price is chosen that is too low, an insufficient amount of capacity will result.

[10] Energy market prices will also rise if the quantity of capacity falls short of the desired level, further stimulating new capacity additions.

[11] For a detailed description, go to www.pjm.com, and look under Committees; Joint Capacity Adequacy Group; Agenda Items #4.

A look at the features of the RAAM shows that it will greatly stabilize the spot market clearing price for generation capacity. At times of modest excess supply, the price will fall only slightly, rather than crash. This makes it much easier to forecast the likely future stream of capacity market prices. Not only will this be pleasing to generation entrants and their bankers, it will also help facilitate forward markets for capacity, since both buyers and sellers will feel they can reasonably predict the future spot market for capacity, which will give them confidence that the forward price they negotiate is within a reasonable range. As for market power, the slope of the demand curve for capacity in the RAAM has been specifically chosen to be gradual enough to ensure that even fairly large generation owners will be unable to profitably withhold supply.

Forward Markets for Generation Capacity (and Energy)

To foster the development of forward markets for generation capacity contracts, the NYPSC staff proposal could contain a requirement that all LSEs purchase 75% of their expected capacity needs three years ahead of time. This requirement forces LSEs and generation suppliers to come together well ahead of time and attempt to make bilateral contracts with one another. Since only 75% of the market's generation will be required to be bought at the three-year-ahead of time point, it is highly unlikely that the three-year-ahead market could be gamed by generators through the exercise of market power. In essence, the three-year-ahead market has a 25% excess supply. Suppliers that are interested in locking in a price ahead of time will come to this market and will offer the generation capacity needed to satisfy the 75% requirements of the buyers. It would be expected that the prices in such a market would reflect both buyers and sellers forecasts of the future spot market that would prevail three years later.[12]

The combination of the more stable spot market for generation capacity created by the demand curve feature and the 75% forward purchase requirement will facilitate activity in forward markets. It is reasonable to expect that forward markets for the combined product of capacity and energy will also thrive. This would accomplish a key goal of policymakers.

<u>Rate Impacts and the Need for a Phase-In</u>

For upstate New York consumers, an immediate implementation of the RAAM presents an important problem. It would appear that the proposal would produce an immediate shift in capacity prices from the current market clearing price of about $1.00 per kW-month to a significantly higher level. The amount by which the existing price would be exceeded is difficult to predict and would depend in large part on the amount of imports that are drawn into New York by its willingness to pay for extra capacity. Even if the new approach yields prices in the $2 to $3 range, the immediate impacts on upstate consumers would be substantial. One reasonable way to address this concern is to phase in the RAAM. This can be accomplished by starting with a demand curve that is lower than the one to which the proposal eventually settles in at. Each year

[12] It should be noted that a forward market purchase requirement that would call on buyers to obtain 100% of their needs in advance could be highly subject to the exercise of market power by suppliers. The problem is that suppliers could withhold supply to drive up the three-year-ahead price knowing that any supply not sold at that time would still be available for sale in the spot market, and at a fair price. In normal commodity markets, such market power in forward markets is not possible, since buyers have the discretion of simply side stepping a high forward price by waiting until later to make the purchase. The problem with a 100% three-year-ahead buyers' requirement is that it would take away the discretion of buyers to defer purchases without taking the very same deferral option away from the selling side of the market, creating an asymmetrical and distorted three-year ahead of time market price. While this lack of symmetry is present in a 75% requirement, it has a very small likelihood of creating a market power problem given that the level of the requirement is just 75% and not 100%. Put in terminology recently used

the demand curve could be raised until at the end of an appropriate phase-in period, three or four years, for example, the final proposal is fully in place.

From a generation entrant's point of view, a phase-in will work well, since any entity currently considering whether or not to enter would not have its plant built and on-line until three or four years hence. Existing generators should also welcome such a proposal, since it represents an increased revenue stream in each year relative to retention of the status quo, and will ultimately yield the full implementation of the RAAM, and all its beneficial features, within three to four years. In essence, the RAAM is seeking long-run benefits and the only thing necessary in the short run is to assure that there are no excessive short-run customer impact problems. A phase-in would appear to perform this job well.

---

by the FERC, there are no pivotal sellers in a market with a 75% requirement, whereas there are such sellers in a market with a 100% requirement.