Memorandum

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From: Frank Felder, KEMA-Consulting Associate and Independent Consultant

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Re: Energy Caps and the Proposed Reduction of the Installed Capacity Obligation Procurement Period from Six Months to One Month

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Overview

The NYISO and market participants are considering whether to shorten the installed capacity (ICAP) Obligation Procurement Period (OPP) from six months to one month. The Brattle Group prepared a report analyzing the economic and reliability implications of this proposed change assuming that caps on electric energy prices or bids were not in effect.[1] That report concluded that changing the procurement period would not materially reduce reliability and recommended monitoring the interaction of the NYISO's energy and capacity markets with those of adjacent regions to evaluate the effectiveness of the NYISO's capacity penalty provisions.[2] It also noted that if the NYISO were to have stringent caps on the price of energy and ancillary services, then the report's conclusions should be revisited.[3]

The purpose of this memorandum is to reassess the Brattle Group's conclusions assuming energy caps are in effect in New York. The concern with the imposition of energy bid or price caps is capacity migration.[4] Capacity migration occurs when owners of installed capacity, whether located in the NYCA or in other control areas, during peak months find it more profitable to sell their products into adjacent control areas that do not have energy caps or as stringent caps.[5] In doing so, they forego the capacity, energy, and in addition, for capacity located in the NYCA, ancillary services revenue available in the New York Control Area (NYCA). Shortening the OPP increases the incentive for capacity migration beyond that due to the imposition of energy caps. For example, with a six-month OPP, generation that migrates out of the NYCA markets loses six months of ICAP revenue; with a one-month OPP, it only loses one month's ICAP revenue.

This memorandum evaluates capacity migration focusing on the implications to the NYCA and concludes the following:

- Capacity migration can occur with a six-month procurement period;

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[1] The Brattle Group, *Shortening the NYISO's Installed Capacity Procurement Period: Assessment of Reliability Impacts*, prepared for the New York Independent System Operator, May 2000 ("Brattle

[2] Brattle Group Report, p. i.

[3] Brattle Group Report, p. iv.

[4] For the purpose of this analysis, there is no need to distinguish between energy bid caps and energy price caps, although in practice the distinction is important. In New York, LBMPs can exceed the bid caps imposed on all supply resources due to transmission constraints. The term "energy caps" is used to refer to either bid caps or energy price caps.

[5] For a discussion of capacity migration in PJM, see Steven Stoft, *PJM's Capacity Market in a Price-Spike World*, PWP-077, University of California Energy Institute, www.ucei.berkeley,edu/uceiw, May 2000.

- Energy caps and a shorter ICAP procurement period increase the incentive for capacity migration than with a longer procurement period for a given ICAP deficiency charge;
- The magnitude of this incentive and whether actual migration occurs depends on the NYISO ICAP deficiency charge, expected energy and ICAP prices in the adjacent control area and in the NYCA, the price and availability of transmission between New York to the adjacent control area, and the length of the procurement period;
- Similar or identical energy caps in adjacent control areas as in the NYCA reduce or may eliminate the incentive for capacity migration;
- If a shorter procurement period is adopted, whether the deficiency charge, which is currently defined per the procurement period as opposed to per month, is prorated (i.e., reduced to reflect the shorter procurement period) could in practice significantly influence the amount of capacity migration;
- If the deficiency charge per month for the one-month OPP is set six times higher than the deficiency charge per month for the six-month OPP, then the probability of capacity migration is not increased by having a one-month OPP replace a six-month OPP; and
- A sufficiently high deficiency charge would prevent capacity migration.

Background

The ICAP market is the means by which load serving entities (LSEs) acquire sufficient resources to satisfy their ICAP requirement, which is 118% of the forecast of their annual peak load.[6] There are two, six-month Capability Periods per year. The Winter Capability Period lasts from November 1 through April 30 of the following year; the Summer Capability Period is the remaining six months, May 1 through October 31 of each year.[7] The OPP is the period of time LSEs are currently required to satisfy their ICAP requirements, which begins and ends on the same dates as the Capability Periods. The proposal that is under consideration is to shorten the OPP to one month. Under this proposal, LSEs would have to continue to demonstrate that they have sufficient capacity to serve their forecast annual peak demand, but this forecast would be modified on a monthly basis to reflect shifts in load among LSEs.[8] Likewise, resource owners could decide to sell or not sell ICAP on a monthly basis versus on a six-month basis.

A generation owner that has sold ICAP in the NYCA must schedule, bid or declare to be unavailable an amount of Energy that is not less than the amount of ICAP it sold from a particular resource.[9] It must do this on each day that it has sold ICAP in the NYCA. If a resource fails to abide by these rules, the NYISO may impose a financial sanction. This sanction may be as high as the product of a daily deficiency charge and the maximum number of megawatts (MWs) for which the NYISO should have received a bid, schedule or other notification of operating status.[10] A resource, however, that is "not fully scheduled in the Day Ahead Market may use the unscheduled Energy associated with its ICAP commitment to NYCA load for an External Transaction, provided that the Energy is recallable at any time by the NYISO."[11] In an hour in which the NYISO recalls energy from an ICAP supplier, if that supplier did not properly schedule its resource, then the NYISO may impose another financial sanction. This additional sanction equals the product of the number of MWs that were not scheduled and the corresponding real-time Locational Based Marginal Price (LBMP) at the applicable Proxy

[6] New York also has locational ICAP requirements within its control area, which this memorandum does not address.
[7] ISO Service Tariff, 2.17, p. 6, March 15, 2000.
[8] Brattle Group Report, p. i.
[9] *New York Independent System Operator Installed Capacity Manual* (*NYISO ICAP Manual*), Section 4.4. There are some exemptions to this requirement, e.g., municipally-owned generation (Section 4.4.4).
[10] *NYISO ICAP Manual*, Section 6.1.2.
[11] *NYISO ICAP Manual*, Section 4.4.5.

Generation Bus.[12] These Suppliers also forfeit payment for the recalled energy for the hour in which the sanctionable activity occurred.[13] On the other hand, generation resources that do not sell ICAP in the NYCA are permitted to sell their energy outside of the control area and are not subject to recall by the NYISO.

LSEs that are deficient in ICAP pay a charge to the ISO equal to the deficiency bid multiplied by the number of MWs by which they are deficient.[14] The appropriate deficiency charge caps the price that a LSE would pay for capacity purchased either through the NYSIO administered ICAP auctions or the ICAP bilateral market.

Given these rules and their corresponding incentives, the NYISO asked the Brattle Group to evaluate the implications of shortening the OPP from six months to one. Its report, issued in May 2000, concluded the following:

- Changing the ICAP procurement period from six months to one month will not materially reduce reliability (assuming no energy price caps)[15];
- During periods when demand is high in several neighboring regions, the region with the highest prices would attract generation from surrounding markets;[16]
- Markets with ICAP requirements, which seek to have a sufficient amount of generating capacity at all times, may unwittingly become the "suppliers of last resort" for non-ICAP markets;[17]
- The fact that the NYISO does not have stringent caps on the price of energy and ancillary services reduces the possibility that New York generation would find it more economically attractive to sell into other markets that do not have such restrictions on prices (if this were to change, then this conclusion would need to be revisited);[18]
- It would be useful to undertake a detailed analysis of the incentives provided by NYISO's penalties during peak load conditions during the upcoming Summer Capability Period;[19] and
- Monitoring the interaction of the NYISO's energy and capacity markets with those in adjacent regions during the upcoming Summer Capability Period is necessary to evaluate the effectiveness of the NYISO's ICAP penalty provisions.[20]

Since the completion of the Brattle Group Report, there have been two major developments in the wholesale electricity markets in the Northeast. First, the Federal Energy Regulatory Commission (FERC) authorized energy bid caps for New York, PJM, and New England. Second, the New England ISO (ISO-NE) has stopped settling its ICAP market and is actively pursuing its elimination, although this market may be replaced with another reserve market. Given these changes, the decision to shorten the OPP should be revisited.

Analysis

The following analysis evaluates the implications for the NYCA of reducing the OPP. It considers the situation in which the NYCA is short or is expected to be short of capacity and the resulting price of ICAP equals the deficiency charge. An adjacent control area, NEPOOL, is assumed

[12] *NYISO ICAP Manual*, Section 6.1.3.
[13] *NYISO ICAP Manual*, Section 6.1.3.
[14] *NYISO ICAP Manual*, Section 5.3. The deficiency charge depends on the year since the Summer 2000, and the location of the load (In-City New York City, Long Island, or All Other LBMP Load Zones in the NYCA) (*NYISO ICAP Manual*, Section 6.1.2.).
[15] The Brattle Group Report, p. i.
[16] The Brattle Group Report, p. iv.
[17] The Brattle Group Report, p. iv.
[18] The Brattle Group Report, p. iv.
[19] The Brattle Group Report, p. iv.
[20] The Brattle Group Report, p. i.

also to have tight supply conditions in order for capacity migration to be potentially profitable.[21] Revenue from operating reserve markets is ignored. For inter-control area transactions, suppliers are not able to participate in reserve markets; for intra-control area transactions, the value of participating in these markets are, for the most part, the opportunity cost of not providing energy.

Potential ICAP suppliers to the NYCA compare the expected revenues from providing energy and ICAP to New York versus those from serving NEPOOL, which for this analysis is assumed not to have an ICAP market.[22] With a shorter OPP, a supplier has a potential strategy that it does not have with a longer OPP. It can sell ICAP into New York during those months in which NEPOOL energy prices are expected to be similar to those in New York. During months in which NEPOOL energy prices are expected to exceed the energy cap in New York, it can forego the New York ICAP revenue and sell its energy into NEPOOL. For example, with a one-month OPP, if an ICAP resource expects low energy prices in NEPOOL during five of the six months of the Summer Capability Period, it could sell its ICAP into the NYCA for these five months. During the sixth month, however, it would forgo the NYCA ICAP and energy revenue and instead sell its energy into the NEPOOL market.[23]

In order to evaluate whether capacity would migrate, the spot market price of ICAP needs to be determined. As noted above, this price should equal, or be close to, the ICAP deficiency charge during periods of tight ICAP supplies, which is when capacity migration is a concern. As currently written in the NYISO ICAP Manual, the deficiency charges in Section 6.1.2 are determined per OPP. Literally, if the OPP is shortened and Section 6.1.2 is not modified, the deficiency charges do not change. In other words, deficiency charges for the one-month OPP are not prorated under this literal reading. On the other hand, deficiency charges may be prorated, which would be consistent with a charge that reflects the carrying costs of a combustion turbine during the OPP.[24] Table 1 presents the deficiency charge for the six-month OPP and for the one-month OPP for both the non-prorated and prorated cases for the summer of 2001 for the non-New York City and non-Long Island load zones.[25]

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[21] NEPOOL is used an example, and the same analysis would apply to PJM. Capacity, if it does migrate, would migrate to the control areas with the highest prices. The Brattle Report, page 24, notes that the load in New York and New England are highly correlated and therefore prices in New England will peak about the same time as New York's load. It is not always the case, however, that tight supply conditions in one control area result in similar situations in other control areas due to the random and independent outages of generation units and transmission facilities.

[22] Forecasting price spikes is difficult, and risk adverse generation owners may prefer more certain capacity payments than less certain energy payments even if the expected values of these payments are identical.

[23] Another strategy is for the resource to sell its ICAP in New York for all six months. If energy prices in NEPOOL are sufficiently high, it would schedule its energy to serve New England and pay the associated daily deficiency charge per MW of unscheduled energy and disobey the NYISO's recall order, if issued. The Brattle Group Report concludes that the generator will ignore the recall order if the penalty per MW (i.e., LBMP at the generator bus) is materially less than the spot prices in the adjacent control area (page 24). Of course, if the NYISO can identify those that violate its recall order and not schedule the associated transactions, then that resource would not receive payments from the adjacent control area. For generation units located within the NYCA that have sold their ICAP into New York, the NYISO must schedule their external transactions. Presumably, it can therefore ensure the recall of the energy from those units by not scheduling energy exports from them. This is not the case with units located outside the NYCA. In addition, the participant will forfeit payment for the energy that the NYISO recalled.

[24] Deficiency charges could be changed to other values that are not prorated.

[25] NYISO ICAP Manual, Section 6.1.2.

Table 1: Comparison of Deficiency Charges for Six- Month vs. One-Month OPP (Summer 2001, All Other LBMP Load Zones in NYCA)

	Deficiency Charge per OPP	Deficiency Charge per Month
6 Month OPP	$57.50/kW	$9.58/kW
1 Month OPP		
Not Prorated	$57.50/kW	$57.50/kW
Prorated	$9.58/kW	$9.58/kW

Table 2 compares the revenues that a supplier could make by selling its ICAP and energy into the NYCA to selling its energy into NEPOOL.[26] It does so for two cases: a six-month and one-month OPP in New York. It assumes that the cost of providing energy to the NYCA and NEPOOL are identical (e.g., inter-control area transmission charges are ignored), that NEPOOL does not have an ICAP market, and that NEPOOL does not have energy price caps. It shows only the number of hours in which the energy prices in New York differ from New England and the associated prices.[27] Table 2 also assumes that the deficiency charge is not prorated for the one-month OPP. Table 3 is identical to Table 2 except that the deficiency charge for the one-month OPP is prorated.[28]

Table 4 summarizes the results of tables 2 and 3. Fundamentally, with a one-month OPP an ICAP Supplier only forgoes one month of ICAP revenue to collect the high NEPOOL energy prices; with a six-month OPP, it forgoes six months of ICAP revenue. When the one-month OPP deficiency charge is high enough, then capacity does not migrate given the assumptions in Table 2. When it is too low, capacity migrates given the assumptions in Table 3. It is possible to set the deficiency charge in such a way as to not increase the probability of capacity migration when changing the OPP. Setting the deficiency charge per month for the one-month OPP six times higher than the deficiency charge per month for the six-month OPP does this. If this is done, when capacity migration occurs with the one-month OPP, then it also occurs with the six-month OPP and visa-versa. Of course, if deficiency charges were set high enough, then capacity migration would not occur regardless of the OPP duration.

Table 4: Summary of Suppliers' Decision to Migrate Based on Length of OPP and Deficiency Charge (Rounded to the Nearest Hundred Dollars)

	New York Revenue	**New England Revenue**	**Supplier Decision**
Not Prorated			
6 Month OPP	$61,500	$24,000	No migration
1 Month OPP	$349,000	$311,000	No migration
Prorated			
6 Month OPP	$61,500	$24,000	No migration
1 Month OPP	$61,500	$71,900	**Migration**

Table 5 presents a situation in which capacity migration occurs with a six-month OPP. In this example, the revenues gained by selling into New England exceed those from selling ICAP and energy in New York.

[26] It does not consider the time value of money.

[27] This assumption is not as strong as it might first appear. The tables identify the expected number of hours and associated expected prices when NEPOOL energy prices are substantially above those in New York. For all other hours it is assumed that on average, the energy markets provide the same or almost the same amount of revenue. (Since marginal costs are ignored, differences in revenues are equivalent to differences in profits.)

[28] The assumptions used are for illustration purposes and should not be interpreted as a forecast of what would occur if a six-month or one-month OPP were in place.

It is not critical whether NEPOOL has or does not have an ICAP market. What is critical is the amount of revenue that a supplier can expect from NEPOOL. NEPOOL currently has an uncapped ICAP market (i.e., there is no deficiency charge), although this market is not being administered and may be eliminated. If capacity is sufficiently tight in NEPOOL and this market has high clearing prices, then migration would occur when the combination of ICAP and energy revenues exceed that which can be obtained in New York. In terms of Tables 2 and 3, the supplier would have two sources of revenue from NEPOOL: ICAP and energy. Of course, if NEPOOL has a well-functioning ICAP market, its expected energy prices should be lower than without such a market. The combination of energy and ICAP revenues may be as high or exceed energy revenues in NEPOOL than without an ICAP market. (PJM, like New York and unlike New England, has deficiency charges for ICAP, which is $58.40 per kW-yr, adjusted by its effective forced outage rate.[29])

If energy caps are imposed in adjacent control areas as well as in New York, then migration due to a shorter OPP becomes less of a concern than without such price caps. As the difference between the energy price caps decreases, this concern is reduced. Using the assumptions in Table 3 — the case in which prior to NEPOOL energy caps migration occurred with a $1,000/MWh price cap in New York — with the additional assumption of a price cap of $2,000/MWh in NEPOOL, the result is that capacity migration does not occur. Table 6 presents these results.

Table 7 presents the results of a sensitivity analysis that varies the level of high energy prices in NEPOOL and the number of times those hours occur to calculate the minimum deficiency charge that New York would need in order to prevent capacity migration with a one-month OPP. It assumes a $1,000/MWh energy cap in New York.

Table 7: Sensitivity Analysis of Changes in the Level and Number of Hours of "High NEPOOL Energy Prices" and the Minimum Deficiency Charge per Month to Prevent Capacity Migration from New York to NEPOOL with a One-month Obligation Procurement Period

NEPOOL Energy Price ($/MWh)	NY Energy Cap ($/MWh)	Number of Hours of Energy Price Difference	Minimum Deficiency Charge ($/kW month)
$6,000	$1,000	4	$20
$6,000	$1,000	8	$40
$6,000	$1,000	16	$80
$6,000	$1,000	32	$160
$3,000	$1,000	4	$8
$3,000	$1,000	8	$16
$3,000	$1,000	16	$32
$3,000	$1,000	32	$64

Conclusion

This memorandum has discussed two means of capacity migration. The first is capacity explicitly avoiding the New York ICAP markets to participate in adjacent markets with higher prices. A shorter OPP increases the incentive for capacity to migrate by lowering the lost revenue associated with participating in the New York ICAP market. Whether deficiency charges are prorated to reflect the carrying cost of a combustion turbine over a specific period of time may be critical in whether capacity migration occurs with a shorter OPP. The conclusions from this analysis are assumption dependent. Additional examples supported by actual forecasts of future situations may be necessary before making final decisions regarding the length of the OPP and whether the level of deficiency charges should be increased.

[29] *Reliability Assurance Agreement Among Load Serving Entities in the PJM Control Area,* September 19, 2000, p. 11-1.

Capacity can also migrate to adjacent control areas by violating the NYISO's scheduling and recall rules. For capacity located within the NYCA, the profitability of this strategy is eliminated because the NYISO, via its scheduling function, can in real time recall energy that it has the requisite authority to do so. For capacity located outside of the NYCA, the profitability of this strategy depends on the associated penalties and expected profits of not abiding by the NYISO's scheduling and recall rules.