

The Brattle Group

Cost-Benefit Analysis of Replacing NYISO's Existing ICAP Market with a Forward Capacity Market

**PRELIMINARY
DRAFT – FOR
DISCUSSION
PURPOSES ONLY**

Presented to ICAP Working Group

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May 8, 2009

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Electric Power Financial Institutions Natural Gas Petroleum Pharmaceuticals, Medical Devices, and Biotechnology Telecommunications and Media Transportation

Agenda

Introduction

Evaluation of FCM vs. the Existing ICAP Market

Evaluation of a Multi-Year Price Commitment in FCM

Evaluation of Demand Curves in FCM

Conclusions

Study Objectives

Evaluate the Costs & Benefits, Relative to the Current ICAP Market, of Four Alternative FCM Structures:

- ◆ No demand curve (other than vertical, potentially with collar)
- ◆ Demand curves in forward, reconfiguration, and spot auctions
- ◆ Demand curve in spot auction only
- ◆ With an option for new (and possibly existing) capacity to lock-in prices for several years.

Evaluation Based on:

- ◆ Comments by Stakeholders and NYISO-specific Considerations
- ◆ Experience of Neighboring ISOs' Forward Capacity Markets
- ◆ Qualitative and High-level Quantitative Economic Analysis

Attributes of Interest to Major Participants

Buyer Perspective

- Supplier Market Power
- Rate Stability
- Risk of Insufficient Capacity
- Risk of Over-Procurement
- Interference with Self-Supply
- Price Distortion from Administrative Provisions

Other Key Attributes

- Accommodation of Demand Response
- Accommodation of Energy Efficiency
- Alignment with Planning Process
- Alignment with Neighbors
- Transition Costs

Supplier Perspective

- Rationalize Auction Timing with Development Times
- Price Stability to Support Investment
- Sufficient Prices to Support Investment
- Risks of Taking on Capacity Obligation
- Discrimination between New and Existing Supply
- Reliance on OOM Solutions
- Buyer Market Power

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Benefits of FCM vs. Existing ICAP Market

- ◆ Alignment of procurement timing with development lead times
- ◆ Alignment with planning process
- ◆ Alignment with neighbors' FCMs
- ◆ Reduced dependence on demand curve administrative processes

FCM Could Better Align Procurement Timing with Development Lead Times

- ◆ Most types of generation take 3-4 years to develop (see next slide)
 - The timing between major financial commitment and completion may be shorter; may be longer in difficult-to-permit locations
 - Unlike the current design, a 3-4 year forward period is long enough to transparently signal the need to build more or less generation of many types of technologies
 - A 3-4 year forward period is long-enough for enough types of new resources to foster competition, stabilize reserve margins, and stabilize prices even if it doesn't align with *all* types of technologies

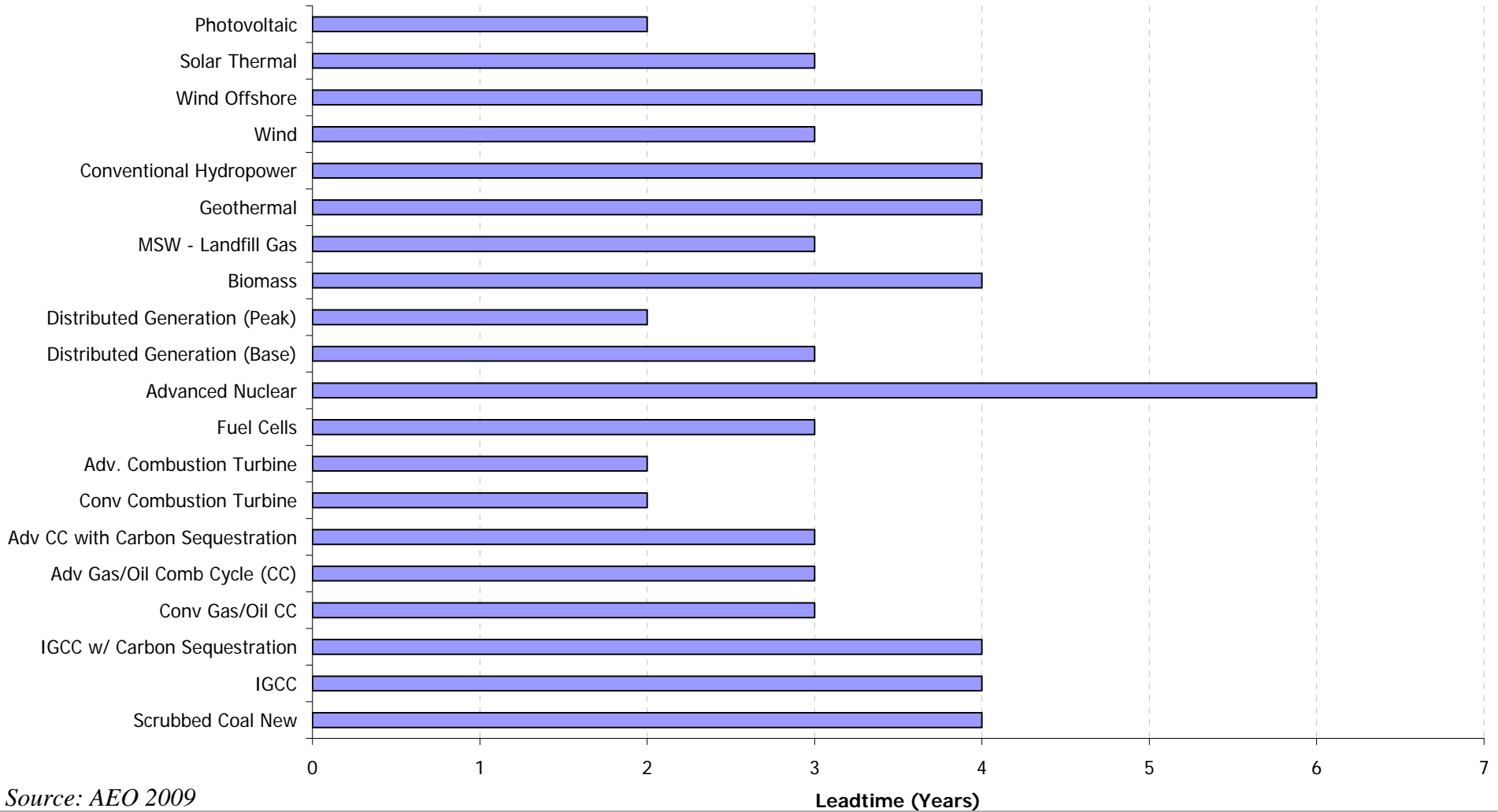
- ◆ However, attracting imports, uprates to existing facilities, and new demand resources can take less time

- ◆ A 3-4 year forward commitment may be too long for DR for which development time can be as little as a few weeks

- ◆ The suppliers' risks associated with longer forward commitments (especially for DR) are addressed in the *Costs* section

Lead Times for Various Generation Technologies

Leadtimes for New Central Station Electricity Generating Technologies



Source: AEO 2009

Forward Procurement Can Enhance Competition and Efficiency

- ◆ FCM promotes economic efficiency by increasing the range of resource types that can provide capacity by the time of the delivery year
- ◆ Potential new entrants compete with each other and with existing resources
- ◆ PJM and ISO-NE FCM results suggest that participation by potential new entrants is plentiful and competitive (see next slide)

Competition in Neighboring RTOs' FCMs

PJM and ISO-NE's FCMs have attracted a large number of potential new resources competing to meet a limited need

		ISO-NE FCA1	ISO-NE FCA2	PJM BRA5
		[1]	[2]	[3]
New Qualified (MW)	[a]	6,899	7,298	2,834
New Cleared (MW)	[b]	1,814	3,134	2,337

Sources and Notes:

[1a]: From ISO-NE's November 6, 2007 Informational Filing at FERC.

[1b]: From "Summary: First Forward Capacity Auction (FCA_2010_2011)," Mark Tessicini, ISO-NE, March 19, 2008.

[2a]: From ISO-NE's September 9, 2008 Informational Filing at FERC.

[2b]: From "Second Forward Capacity Auction (FCA #2) Results Summary," Roger Bacon, ISO-NE, January 21, 2008.

[3]: Brattle Report

Forward Procurement Should Stabilize Reserve Margins

- ◆ Although IRM requirements are driven by reliability needs, not market design, the market's ability to meet the IRM does depend on market design.
- ◆ FCM signals ideal entry/exit conditions to resources, which helps them to make more efficient investment decisions & timing.
 - FCM prices should reflect the forecasted capacity adequacy conditions in the delivery year.
 - Insufficient price signals “caution” to potential entrants before irreversible and costly investment is sunk.
 - A high-enough FCM market clearing price, which precedes the decision to build, signals that entry will be profitable.
- ◆ With a high-enough price even when capacity payment is guaranteed only for the first year, in expectation, the resource will continue to be needed in the future and will collect a price set by other new entrants.
 - This assumes load growth and retirements create a continued demand for new resources.
 - This does not mean fixed-cost recovery is guaranteed. Future uncertainty about the fundamentals in the economy, the regulatory environment, and new technologies still add a level of uncertainty to this assertion.
- ◆ As a result, capacity that is not needed and does not clear does not get built (note uncleared resources in prior table). This avoids boom-and-bust cycles by stabilizing reserve margin.
- ◆ However, the RNA projects a large amount of surplus capacity over the next 10 years, which largely eliminates capacity needs and FCM's ability to stabilize reserve margins by matching new entry to need

Forward Procurement Stabilizes Prices

With the current demand curve, market volatility is already largely mitigated, however an FCM may further reduce price volatility:

- ◆ More stable reserve margins lead to more stable prices for capacity (and energy).
- ◆ The elasticity of supply is higher in the long-run (i.e., 4 years forward) than in the short run, which should lead to less volatile prices.
- ◆ Having the auction precede the investment decision allows suppliers to incorporate capital cost recovery into their offers. This will result in more stable market clearing prices than short-term capacity markets in which suppliers treat their investment costs as sunk and only recoverable through scarcity pricing/volatility.
- ◆ Enhanced competition reduces supplier market power to increase prices by withholding capacity.
- ◆ However, there is not yet much empirical evidence on how effectively FCM reduces price volatility, and none in the constrained NYC market.

- ◆ Price stability has two benefits:
 - Stable rates are desirable for customers
 - Reduced volatility/risk lowers suppliers' investment costs, which lowers average prices in the long-run

Proposed FCM Would Better Align with Planning Process, which Could Reduce Reliance on OOM Solutions

- ◆ The lack of alignment between the RNA and the existing, short-term capacity market may have contributed to the need for OOM solutions

- ◆ By holding the FCM auction close to RNA:
 - RNA requirements can be incorporated into forward auctions
 - FCM could procure capacity first in base auction, then in intermediate reconfiguration auctions. If there is still a shortage, capacity can be procured in the spot auction.
 - In case market solutions don't work, planners will still have time to implement back-stop solutions

FCM Would Improve Alignment with Neighboring ISOs

- ◆ Neighboring ISOs also have resource adequacy requirements and capacity markets. Transmission enables inter-area transactions, which already benefits the region.
- ◆ Since both ISO-NE and PJM's capacity markets are *forward* markets, inter-area transactions could be more efficient if NYISO also had an FCM.
 - Currently, ISO-NE and PJM's forward markets express prices and signal a regional need 3 years before prices become transparent in NYISO.
 - Absent an FCM, NY might not know until just before the delivery year if external (or internal) resources stop being available. This could have significant market impacts.
- ◆ However, more closely aligning the timing of auctions will not eliminate all effects of the seam.
 - Resources cannot participate in one market until they de-list from the other
 - If one market has a demand curve and another does not, the one with the demand curve can absorb regional excess capacity or lose capacity in a regional shortage

Costs of FCM vs. Existing ICAP Market

- ◆ Risk to suppliers from taking on capacity supply obligation, especially for DR
- ◆ Challenges recognizing EE
- ◆ Risk of over-procurement
- ◆ Transition costs & risks to system and participants

FCM Will Increase Risks to Suppliers from Taking On Capacity Obligation

- ◆ **New generators** have to bid based on expectations of future costs without being certain of actual project costs, project completion date, and even whether they will obtain all permits and financing.
- ◆ **Existing generators** bear the risk of their unit breaking and/or having to perform expensive repairs or environmental upgrades.
- ◆ FCM forward obligation creates **additional challenges for DR**
 - Most end-users are unlikely to sign long-term DR contracts with aggregators or to sell directly in FCM because of uncertainty about business longevity and opportunity costs, and uncertainty about how often they will be activated
 - ISO-NE has nevertheless attracted large amounts of new DR, but only by allowing aggregators to bid potential resources that are not yet backed up by contracts. Aggregators are subject to deficiency penalties, and they must be compensated for taking on this risk (which will reduce the amount of DR and/or increase the price at which it bids)
 - PJM addressed this by holding back some procurement in the base auction (originally having a special provision for DR to enter later, but now using incremental auctions to procure DR and other short lead-time resources).

FCM Will Increase Risks to Suppliers from Taking On Capacity Obligation (cont.)

- ◆ Deficient resources must shed their obligations in reconfiguration auctions at the presently unknown reconfiguration auction price, or else pay punitive deficiency **penalties**
 - For example, deficiency penalties are 20% annual capacity clearing price in PJM and 25% in ISO-NE.
 - The prospect of penalties must increase bids and act as a barrier to entry, although we do not have empirical evidence on how much.
- ◆ To deter speculative projects and provide assurance of suppliers' ability to pay for replacement or penalties, there needs to be **credit requirements and/or financial assurance deposits** for new resources
 - For example, deposit is 3 * monthly capacity clearing price in ISO-NE, and \$27/kW in PJM's latest auction.
 - This can act as a barrier to entry, especially for smaller DR providers.

FCM Poses Challenges in Recognizing EE

- ◆ The effect of energy efficiency on peak load contributions are not embedded in meter data until at least a year of track record.
- ◆ The total capacity procurement is not reduced until the delivery year corresponding to the following auction, i.e., 5-6 years after installation.
 - At that point, the efficiency improvements are likely to have exhausted a substantial amount of their “measure life.”
 - Whether there is over-procurement during the interim depends on the EE assumptions implicitly embedded in the load forecast.
- ◆ Market signals to install energy efficiency can be correct with a lag of only 1 year if the effect on a particular entity’s share of the total installed reserve margin is recognized the following year.

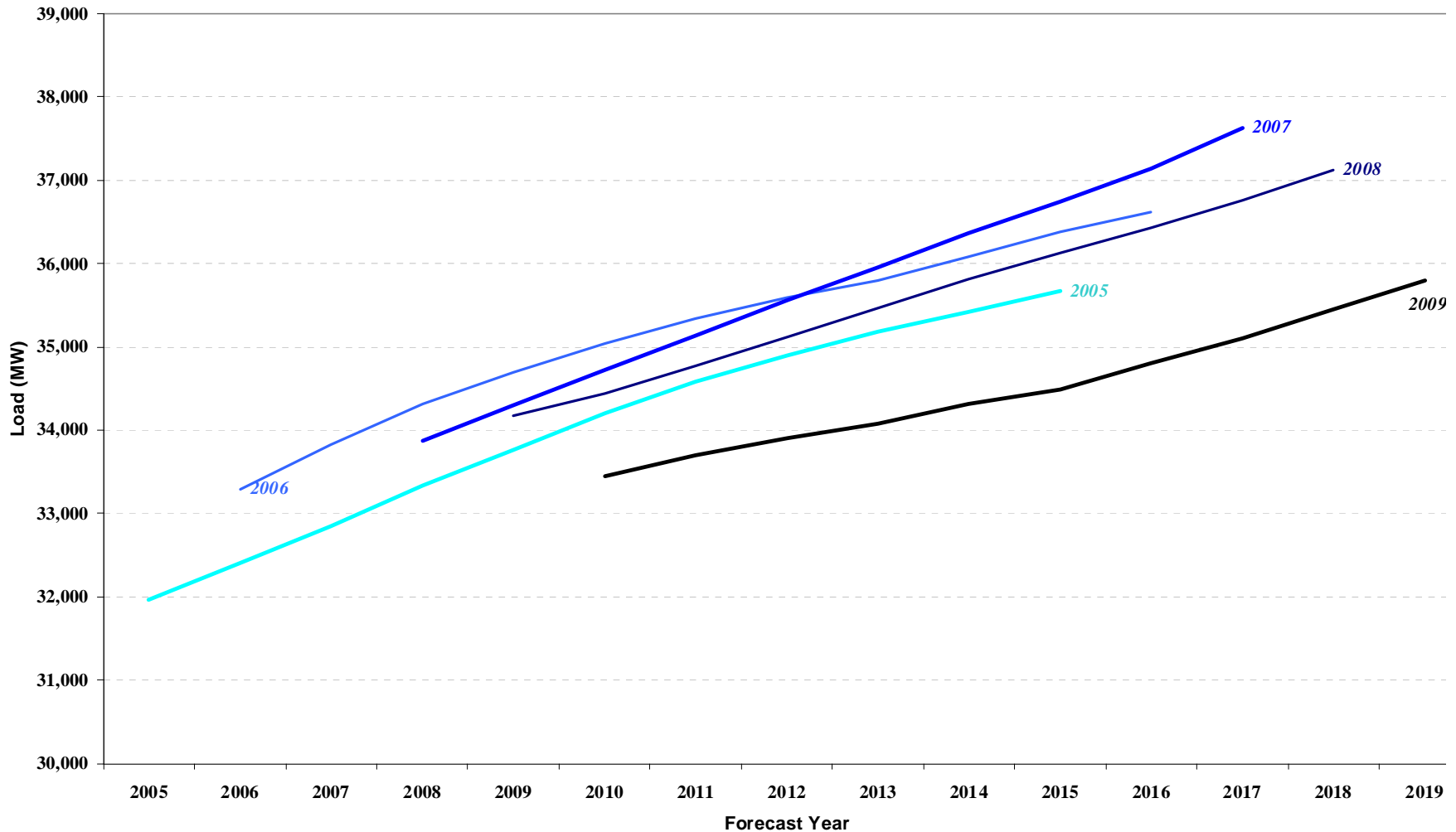
FCM May Increase Risk of Over-Procurement

- ◆ Load forecast uncertainty increases with the length of the forward period
 - Chance of over-forecasting, e.g., if the recession is deeper and longer than expected
 - Need to procure more to avoid the risk of shortages
 - Evidence from NYISO
 - Forecasts have been changing substantially, not just due to recession
 - If 2010 need had been procured 4 years forward in 2006, more than 1,500 MW excess capacity would have been procured (see next slide).
 - Evidence from PJM
 - In determining forward procurement quantities, PJM recognizes similar forecast errors when using a load forecast several years in the future, allowing for several percent of margin of error

- ◆ Inability to accurately (or timely) incorporate the effect of EE into the load forecast

NY Load Forecasts Have Been Changing Substantially

NYISO Summer Peak -MW (Base) Long-Term Forecasts



Transition Costs of Moving to FCM May be High

- ◆ A transition from the existing ICAP (spot) market structure to an FCM would involve significant costs to the system as a whole and to individual participants, including:
 - ISO's cost of software development and associated human resources; other staff and administrative costs (see next slide)
 - ISO's opportunity costs resulting from time and attention that could have been spent on other important projects
 - Participants' costs of compliance and adapting to new rules
 - Participants' and ISO's costs from litigation, arbitration, and related procedural issues (the stakeholders are not close to consensus on whether and how to implement FCM)
 - Risk of new rules having significant flaws, even if design builds on neighbors' experience

ISO New England's FCM Phase I Estimates (March 2008) Understates Total Transition Costs

ISO-NE FCM Phase I Budget

Capital Budget Category	2006	2007	2008	Totals
Labor	\$1726.5K	\$5,003K	\$ 750K	\$7,479.5
Hardware		\$250K		\$250K
Contingency			\$50K	\$50K
Total Project:	\$1726.5K	\$5,253K	\$ 800K	\$7779.5K*

***This is a projection based on preliminary February numbers. Final FCM Phase I capital expense will be determined by the end of March. Approved Overall Capital Budget for FCM Phase I: \$8976.5K**

Source: ISO New England "Forward Capacity Market (FCM) Project Update", March 7, 2008

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Multi-year Lock-in for New Resources

- ◆ Some suppliers have emphasized the need for a multi-year forward capacity lock-in like ISO-NE offers.
- ◆ PJM just filed for a multi-year lock-in for new resources, and FERC rejected it on the basis that it was discriminatory.
- ◆ An alternative would be to offer all resources a multi-year lock-in.
 - Expect all to lock-in when prices are rising
 - Locked-in price may not reflect market conditions after the first year
 - Alternatively, consider auctions for multi-year capacity product

Longer Commitment Period May Not be Ideal

- ◆ Multi-year commitment might not be suitable for all resources (e.g., DR, potential retirees)
- ◆ Separating the market into multi-year and single-year tranches can make the market thin (demand for new capacity is already low) and less efficient.
- ◆ Even three years accounts for a small fraction of asset life.

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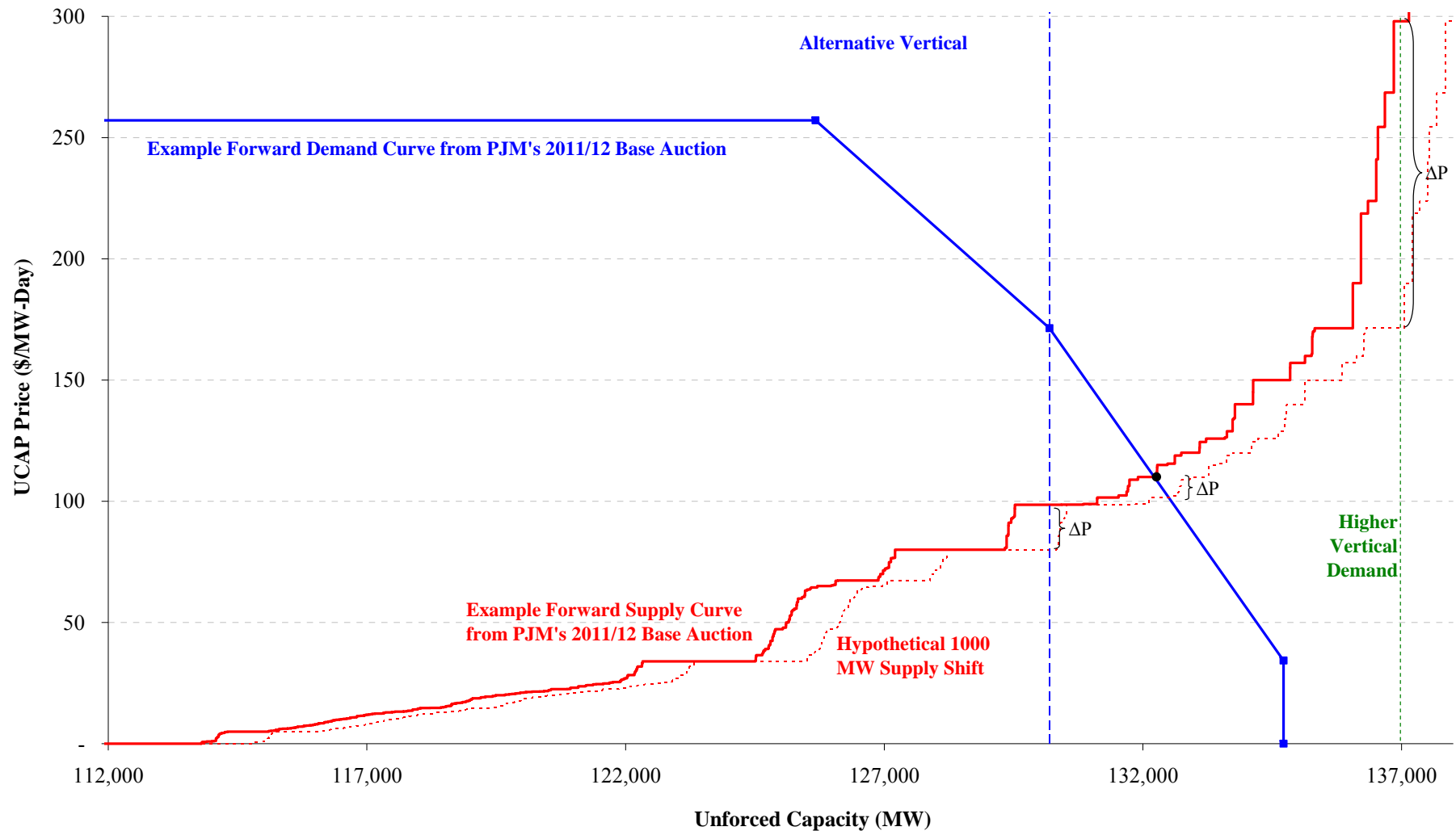
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Sloped Demand Curve Reduces Market Power

- ◆ The potential to exercise market power exists on both sides of the capacity market:
 - Suppliers may drive prices up via physical or economic withholding of capacity
 - Buyers may depress prices by creating excess capacity
- ◆ A vertical demand construct will yield significant shifts in price when subjected to the above actions by market participants
- ◆ A sloped demand curve reduces market power in two ways:
 - It moderates the price impact stemming from the exercise of supplier and buyer market power by reducing price volatility
 - It discourages the very exercise of market power by making it less attractive/profitable

With Vertical Demand, Price Impact Is Often Larger



Source: "Review of PJM's Reliability Pricing Model (RPM)," by J. Pfeifenberger, S. Newell, et. al., The Brattle Group, Inc., June 30, 2008.

Reduction in Price Volatility Due to Lumpiness and Short-Term Shifts

- ◆ Lumpiness and other factors can cause short-term shifts in supply:
 - Lumpiness of added (or retired) generation capacity
 - Short-term shifts due to various reasons (other than exercise of market power)

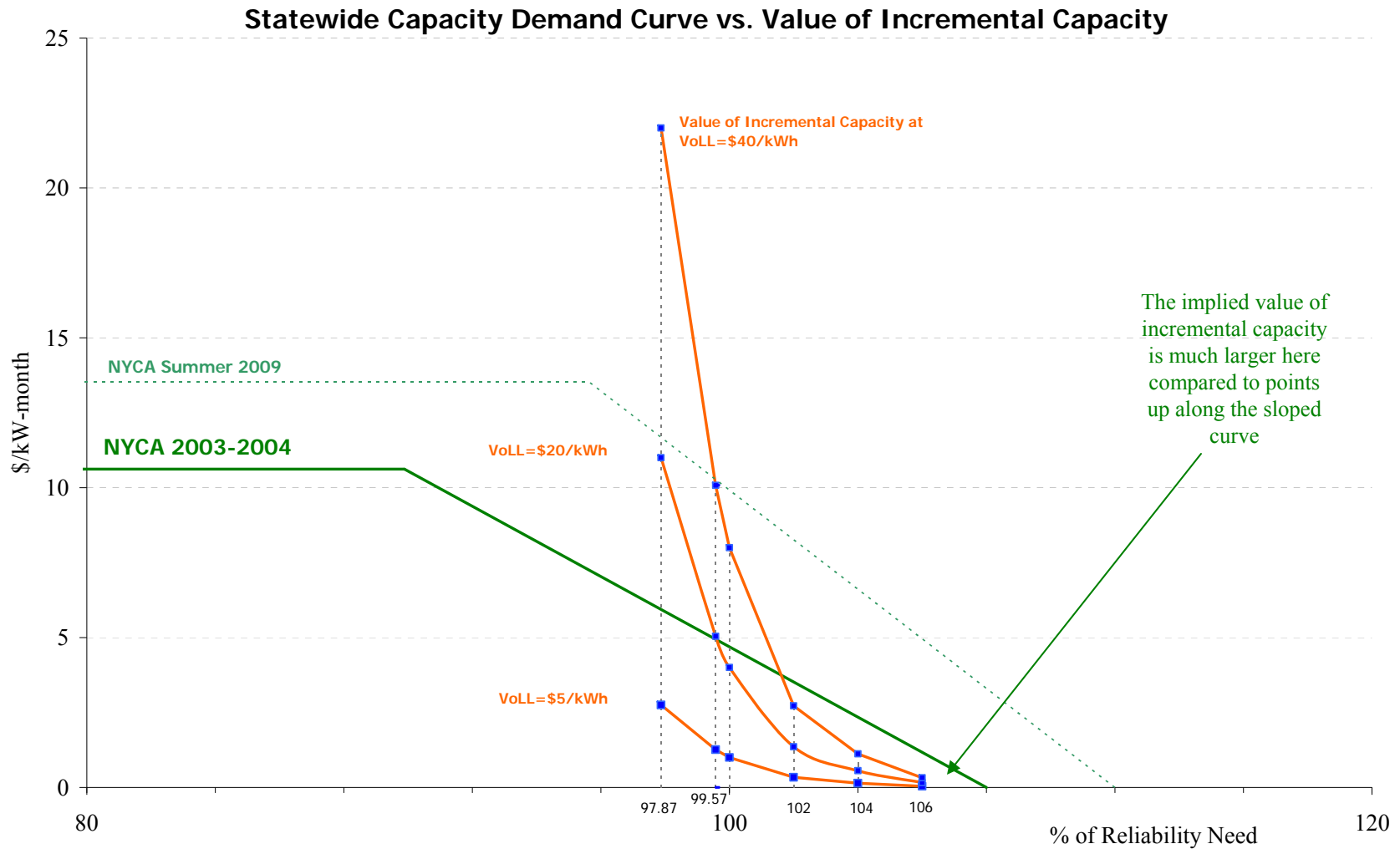
- ◆ Short-term supply shifts can cause price volatility, especially with a vertical demand curve

- ◆ A sloped demand curve can diminish the extreme price outcomes associated with booms and busts
 - This is especially important because booms and busts can be asymmetric due to the need to observe reliability criteria.

Recognition of (Reduced) Value of Capacity Even When there is Excess

- ◆ Vertical demand implies that capacity has very high value (subject to cap) below the requirement and zero incremental value above the requirement.
- ◆ A sloped demand curve recognizes the incremental, albeit decreasing value of excess capacity beyond the required reliability level.
- ◆ NYISO's demand curve corresponds very roughly to the incremental value of capacity based on the LOLE and VOLL
 - The slope is shallower, but this provides greater mitigation of market power and volatility
 - The implied VOLL is very high at the right edge of the demand curve
 - See graph on next slide

NY Capacity Market Demand Curves 2003/4 vs. Value of Excess Capacity



CONE is Set Administratively

With the current demand curve methodology, CONE is set administratively, which makes it susceptible to errors in:

- ◆ Determining the correct reference technology
 - Ideally, the clearing of supply and demand in the forward market should determine the “correct” reference technology that sets the marginal price of capacity
 - Imposing an administratively chosen outcome on the market might result in inefficiency
- ◆ Estimating the costs and rate to charge (closely related to the above)
- ◆ Determining the energy and ancillary services offset
- ◆ The administrative process could, however, incorporate market data as the market matures and information becomes reliable

Slope Is Set Administratively

- ◆ A slope that is too steep might not be sufficient to mitigate market power and its effects on price:
 - Additional mitigation rules might be needed
 - Price volatility can increase as a function of administratively determined parameters
- ◆ A slope that is too flat could result in price being set by new generation that is not needed:
 - A slowly declining slope in effect gives higher incremental value to excess capacity, which is obviously not needed
 - It encourages excessive entry, which depresses prices in current auctions and in subsequent auctions

Demand Curve Variants in the Context of FCM

- ◆ A forward capacity market would reduce the dependence on the demand curve's administratively-determined parameters:
 - The short-run supply curve is relatively inelastic, i.e., nearly vertical. Thus, the clearing price depends largely on the administratively-determined price at that point.
 - The long-run supply curve is more elastic, i.e., more horizontal. If the supply curve were horizontal at the true Net CONE, the clearing price would be the true Net CONE, independent of the parameters of the demand curve.

- ◆ Forward procurement does provide some of the benefits a demand curve can provide.
 - If there is a need for new capacity, price should reflect long-term cost of entry
 - Higher potential number of entrants naturally mitigates supplier market power by reducing the ability to withhold profitably
 - Thus, with FCM, a steeper slope on the demand curve could be considered

- ◆ Having a demand curve in spot-only is an indirect way to work the effects of a sloped demand curve backwards into the forward market (via suppliers' bids that could incorporate expectations of spot market prices)

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Major Pros & Cons of FCM vs. Spot

Pros

- ◆ Alignment of procurement timing with development lead times
 - Fosters competition from new resources, which increases market efficiency
 - Having the auction precede investment commitments...
 - Allows developers to build if and only if needed, which stabilizes reserve margins and prices
 - Allows competitive offers to include recovery of fixed costs, which creates a favorable framework for investment
- ◆ Alignment with planning process reduces reliance on OOM solutions
- ◆ Alignment with neighbors' FCMs increases regional competition and efficiency
- ◆ Less dependence on the demand curve's administratively determined parameters

Cons

- ◆ Challenges with accommodating DR
- ◆ Challenges recognizing EE
- ◆ Risk to suppliers from taking on capacity supply obligation
- ◆ Credit risk / cost of credit
- ◆ Risk of over-procurement
- ◆ Transition costs to system and participants

Major Pros & Cons of a Sloped Demand Curve in FCM

- ◆ Pros and Cons of a demand curve in a forward market are similar to those in short-term ICAP markets.
- ◆ However, the forward clearing price is largely set by the relatively elastic supply curve and is less dependent on the administratively-determined demand curve

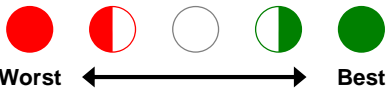
Pros	Cons
<ul style="list-style-type: none">◆ Reduces market power by reducing the price impact of suppliers withholding or buyers creating excess capacity◆ Reduction of price volatility caused by lumpiness and short-term shifts◆ Recognition of (reduced) value of capacity even when there is excess	<ul style="list-style-type: none">◆ CONE is set administratively<ul style="list-style-type: none">• Prone to error w/reference technology, costs, charge rate, and E&AS offset, but could incorporate market data◆ Slope is set administratively<ul style="list-style-type: none">• If very steep, there is little mitigation of market power and price volatility• If not steep enough, price can be set based on new generation even when it is not needed; curve might deviate from incremental value◆ Relationship to incremental value is loose

Context for Considering Market Design Changes

- ◆ Next 5-10 years: the urgency for action is low
 - The RNA projects capacity surpluses through 2018
 - The existing market is generally working

- ◆ The long term
 - There will be a need for new capacity
 - PJM and ISO-NE will have gained additional experience with their forward capacity markets

Scorecard

 Attribute	Weight Over Next 5-10 Years	Weight in Long Term	Spot Market with Demand Curve (Existing ICAP Market)	FCM with Demand Curve	FCM w/ No Demand Curve	FCM w/ Lock-In and No Demand Curve
Capital Recovery from Future Prices ^[a]	1	3				
Price Stability	2	3				
Mitigation of Buyer Market Power	2	3				
Mitigation of Supplier Market Power	2	3				
Dependence on Admin. Determinations	2	3				
Stability Around IRM Requirement	1	3				
Risk that IRM is too High	2	1				
Alignment w/ Planning Process	1	3				
Accommodation of DR	2	3				
Recognition of EE	3	3				
Supplier Risk of Obligation	1	3				
Credit Risk	3	1				
Alignment with Neighbors	1	2				
Continuity, Avoiding Transition Costs	3	1				
TOTAL SCORE -- NEXT 5-10 YEARS			0.7	0.0	-0.2	-0.4
TOTAL SCORE -- LONG TERM			0.4	0.5	0.4	0.2

[a] Confidence that once there is a need, new entrants can expect that subsequent prices will reflect the cost of new entry
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Overall Conclusions

- ◆ Starting from a blank slate, FCM (with provisions to accommodate DR and recognize EE) makes more sense.

- ◆ However, there is near consensus among stakeholders that the existing ICAP market is working and there is no projected need for new capacity, and thus the risks and transition costs of a major redesign are not warranted now.
 - With no projected need for capacity in the next 10 years, there is little motivation to “fix” anything
 - Many stakeholders would rather defer consideration until PJM and ISO-NE have more fully demonstrated the success of their FCMs
 - Stakeholders far from agreement on the design, especially whether to have a demand curve.

- ◆ We did not find evidence that the benefits of FCM would be sufficient to justify change at this time in the face of stakeholders’ doubts.

Recommended Next Steps

- ◆ Continue to monitor NYISO's market performance:
 - Updates to RNA projections regarding reliability needs
 - New entry, by type and location
 - Locational capacity prices
 - Market power
 - Imports and exports
 - The extent of any need for OOM solutions with the existing market design

- ◆ Monitor PJM and ISO-NE as they gain experience with their FCMs
 - New entry by type and location; retention of existing capacity
 - Participation of DR in the auctions; performance of DR in the delivery year
 - Level of bids, clearing prices
 - Stability of reserve margins and capacity prices
 - Full implementation and operational costs of FCM