SECOND SUPPLEMENTARY TESTIMONY OF DAVID L. MCADAMS PH.D. 
ON BEHALF OF NEW ENGLAND POWER GENERATORS ASSOCIATION

SEPTEMBER 29, 2010
SECTION 1: INTRODUCTION

Q PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.

A My name is David McAdams. I am Associate Professor of Business Administration and Economics at Duke University. My business address is Fuqua School of Business, Duke University, Durham, NC 27708.

Q IS THIS YOUR FIRST TESTIMONY IN THIS PROCEEDING?

A No, I previously provided written testimony in this proceeding on July 1st, 2010 and on September 1st, 2010. I refer readers to that prior testimony, especially for the definition of terms and for background discussion. As in my previous testimony, I will refer to the APR proposed by ISO-NE in February as the “February APR” and the revised APR proposed by ISO-NE in its Opening Brief on July 1 as the “July APR.”

Q WHY ARE YOU SUBMITTING ANOTHER ROUND OF TESTIMONY?

A This testimony responds to the deeply flawed testimony on the issue of benchmark prices by a load-side expert, Mr. James Wilson. While it would have been possible to demonstrate and refute Mr. Wilson’s errors one-by-one, they are more cogently addressed as part of an exposition of a comprehensive theory of benchmark prices.

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Correcting the record on this matter is essential, as the success or failure of APR reform hinges critically on getting benchmark prices right.

In addition, the theory of benchmark prices developed here helps to resolve certain ambiguities in the most recent testimony of the Internal Market Monitor (IMM), Mr. LaPlante, and avoid disastrous potential misconstruction.

Q WHAT IS THE PURPOSE OF THIS SUPPLEMENTARY TESTIMONY?

A There have been several rounds of exchanges between the parties to this proceeding. Underlying the status quo is a proposal by ISO-NE to calculate an “APR Price” based on the use of proxy or “Benchmark” offers for units that are determined to be out-of-market (“OOM”). There has been controversy between the parties as to whether the ISO-NE’s characterization of the Benchmark is correct. The purpose of this testimony is to resolve this controversy through formal economic analysis of each party’s Benchmark proposal.

Q PLEASE DESCRIBE THE BENCHMARK PROPOSALS THAT YOU WILL ANALYZE IN THIS TESTIMONY.

A ISO-NE has proposed a Benchmark (“ISO-NE Benchmark”) for each OOM resource that reflects the annuity payment (i.e., the annual amount, to be received every year for that resource’s operational lifetime) that would generate a present value equal to the (net) costs of new entry.

Load’s expert Mr. James Wilson rejects the ISO-NE Benchmark, arguing instead that any rational bidder will ignore its sunk costs and only offer into the auction at a price that reflects its annual (i.e., one-year) going-forward costs. Although Mr. Wilson does not offer any specific proposal, his testimony supports the notion of Benchmark offers...
equal to going-forward costs at the time of the FCA (“Going-Forward Cost Benchmark”).
NEPGA’s expert Dr. Roy Shanker in turn rejected Mr. Wilson’s preferred Going-
Forward Cost Benchmark. Dr. Shanker argued that the Going-Forward Cost Benchmark will fail to achieve the APR’s objective of correcting the price-suppressing effect of OOM entry, since OOM resources will no longer be designated as OOM once they have sunk enough costs to clear at going-forward cost. Dr. Shanker recommended the use of a Benchmark based on the levelized cost of new entry, similar to the ISO-NE’s annuity value.

Finally, I will consider a “Total Cost Benchmark,” in which OOM resources’ Benchmark offers reflect all costs of new entry, no matter whether incurred before or after the FCA. The Total Cost Benchmark has not been proposed by any party to this proceeding, as far as I am aware. However, the Total Cost Benchmark emerges from my analysis as a credible candidate to achieve the objective of fully correcting (but not over-
correcting) for the price-suppressing effect of OOM entry.

WHAT DO YOU MEAN BY “THE ISO-NE BENCHMARK”?

Formal economic analysis of any Benchmark proposal requires that the proposed method of computing Benchmark offers be completely specified. Unfortunately, ISO-NE has not provided complete details on its proposed Benchmark, leaving some specifics as “rules of implementation.” Thus, my analysis will be based on an interpretation of how ISO-NE proposes to compute Benchmark offers. This interpretation is based on my reading of ISO-NE’s briefs, the September 1, 2010 comments of the Internal Market Monitor, and input from counsel and other experts. In particular, my interpretation is that ISO-NE proposes to use a “Levelized 40-Month Cost Benchmark.” (Later, I will define the
meaning of “levelized costs” and “40-month costs.”) If this interpretation is not correct, then of course my formal analysis must be modified in order to reach valid conclusions about the actual ISO-NE Benchmark. Bearing this in mind, I have written this testimony with an eye to illustrating principles of Benchmark analysis that can be applied to any Benchmark proposal.

Q ON WHAT BASIS WILL YOU JUDGE EACH BENCHMARK PROPOSAL?

A I will judge each Benchmark proposal on the basis of whether it corrects (but does not over-correct) for the price-suppressing effect of OOM entry. In other words, when this Benchmark is applied within the context of the July APR, will the resulting APR Price be equal to the “Competitive FCA Price” that would have prevailed in a competitive market absent OOM entry?

For a forceful and authoritative discussion of why it is essential that the APR fully correct for the price-suppressing effect of OOM entry—even if some such OOM entry provides efficiency benefits—see the collective September 1, 2010 testimony of Professors Milgrom, Kalt, and myself.

Q PLEASE DESCRIBE THE METHOD BY WHICH YOU WILL ANALYZE EACH OF THESE PROPOSALS.

A I will apply standard equilibrium analysis to a model of the Forward Capacity Auction (“FCA”). Most other analyses of the FCA in this proceeding have been limited by their implicit assumption that bidders’ incentives in the FCA do not depend on the rules of the FCA. My more complete analysis here will endogenize bidders’ incentives in the FCA by considering their pre-auction incentives to make investments and/or sign contracts that cause them to incur (or commit to incur) some of the costs of new entry prior to the
FCA. As I will show, this richer framework—with pre-FCA “investments” and “commitments” as well as FCA bidding—is essential to sort through the (direct and indirect) effects of different Benchmark proposals on market outcomes.

Please summarize your main conclusions.

Analysis of my model of the FCA leads to three main conclusions, which can be summarized as follows:

1. The Going-Forward Cost Benchmark proposed by load’s expert egregiously fails to fully correct for the price-suppressing effect of OOM entry.

2. The Levelized 40-Month Cost Benchmark proposed by ISO-NE can fully correct (but not over-correct) for the price-suppressing effect of OOM entry, under certain conditions.

3. The Total Cost Benchmark fully corrects (but does not over-correct) for the price-suppressing effect of OOM entry.

What do you mean when you say that the Going-Forward Cost Benchmark “egregiously fails”?

One can imagine Benchmark Rules that are well-conceived conceptually, but that do not exactly correct for the price-suppressing effect of OOM entry. In fact, it is reasonable to expect that the ISO-NE Benchmark or the Total Cost Benchmark—although in theory capable of fully and exactly correcting for the price-suppressing effect of OOM entry—will in practice not perfectly correct the APR Price.

By contrast, the Going-Forward Cost Benchmark has no hope of fully correcting the price-suppressing effect of OOM entry. Indeed, the Going-Forward Cost Benchmark seems designed (i) to minimize the APR’s correction of the price-suppressing effect of OOM and (ii) to provide multiple avenues by which load can suppress the APR Price without violating the tariff. Further, as I will explain, Mr. Wilson’s reasoning in favor of the Going-Forward Cost Benchmark depends on an implicit assumption that load will not
induce any resources to enter the FCM that would not have entered anyway in a competitive market. However, since the states have argued that they have a vital public-policy interest to induce certain new resources to enter the FCM that would not be able to clear in the FCA, this assumption is demonstrably counterfactual.

Q WHAT ARE THE “CERTAIN CONDITIONS” UNDER WHICH THE ISO-NE BENCHMARK FULLY CORRECTS (BUT DOES NOT OVER-CORRECT) FOR THE PRICE-SUPPRESSING EFFECT OF OOM ENTRY?

A The ISO-NE Benchmark can fully correct (but not over-correct) for the price-suppressing effect of OOM entry, but only if load does not use out-of-market subsidies to induce what I shall call “out-of-m merit long-lead-time resources” to enter the FCM. So, the ISO-NE Benchmark fully corrects for the price-suppressing effect of OOM entry if (i) there are no out-of-merit long-lead-time resources or (ii) for some reason, load does not provide OOM subsidies to such resources.

An “out-of-merit long-lead-time resource” is one for which (i) entry into the FCM is unprofitable on the basis of total cost but (ii) entry requires that enough costs be sunk prior to the FCA that, at the time of the FCA, entry is profitable on the basis of the “40-month cost” that can be paid after the FCA (i.e., during the 40-month forward period between the FCA and the start of the obligation period). For this to occur, any out-of-merit long-lead-time resource must employ a technology that requires significant lead-time to develop, such that a material fraction of the costs must be invested more than 40 months prior to the commercial on-line date.

Out-of-merit long-lead-time resources would not enter the FCM in a competitive market, because entry is unprofitable on a total-cost basis. Thus, if load can induce out-
of-merit long-lead-time resources to enter the FCM without triggering the APR, then load
will suppress the APR Price without violating the tariff. To see that such a scheme is
feasible under the ISO-NE Benchmark, suppose that load were to provide sufficient out-
of-market subsidies to induce an out-of-merit long-lead-time resource to sink the pre-
FCA costs required for entry. Since this resource finds entry to be profitable on the basis
of its remaining costs at the time of the FCA, its Benchmark offer under the ISO-NE
Benchmark (or under the Going-Forward Cost Benchmark) will be low enough for this
resource to clear while evading OOM designation.

Q WHY DOES THE TOTAL-COST BENCHMARK FULLY CORRECT (BUT NOT
OVER-CORRECT) FOR THE PRICE-SUPPRESSING EFFECT OF OOM ENTRY?
A Entry by a resource with out-of-market subsidies will suppress the price below the
competitive level, absent mitigation, if and only if that resource would not have cleared in
a competitive market absent OOM subsidies. In a competitive market absent OOM
subsidies, the only resources that clear are those that profitably clear, and the only
resources that profitably clear are those whose total cost is low enough for entry to be
profitable at the Competitive FCA Price. So, any resource that would have cleared in a
competitive market absent OOM subsidies must have a total cost of new entry—and
hence Total Cost Benchmark—less than the Competitive FCA Price. Thus, OOM
subsidies to in-merit resources, that would have entered the FCM even without OOM
subsidies, do not have any effect on which resources clear and hence do not affect the
market-clearing price. At the same time, since each such resource’s Total Cost
Benchmark is less than the Competitive FCA Price, the Total Cost Benchmark will not
artificially inflate the APR Price by mistakenly designating an in-merit resource as OOM.
On the other hand, OOM subsidies to out-of-merit resources, that would not have entered the FCM absent OOM subsidies, have the potential to lower the APR Price below the price that would have prevailed in a competitive market absent OOM entry. However, under the Total Cost Benchmark, entry by out-of-merit resources does not suppress the APR Price. To see why, suppose that load were to induce some resource to enter the FCM that would not have otherwise entered in a competitive market absent OOM subsidies. Since this resource would not have entered competitively, its total cost of new entry—and hence its Total Cost Benchmark—must exceed the Competitive FCA Price. Thus, if such a resource is induced to bid less than the Competitive FCA Price and enter the FCM, it will trigger the APR and be designated as OOM, and have its price-suppressing effect fully corrected.

PLEASE SUMMARIZE YOUR CONCLUSIONS ON THE THREE BENCHMARK APPROACHES.

The Total Cost Benchmark, described in more detail below, is the benchmark that best aligns the price outcome of the FCA with the price that would have occurred in a fully competitive auction. ISO-NE’s proposed Levelized 40-Month Cost Benchmark is a close second by this standard, provided that there is little or no subsidization of out-of-merit long-lead-time resources that would have a material fraction of their total costs incurred more than 40 months ahead of the Commitment Period. In sharp contrast to these two, the only condition under which Mr. Wilson’s Going-Forward Cost Benchmark results in an APR price matching the competitive clearing price is when there is no OOM entry—that is, the Going-Forward Cost Benchmark will be entirely ineffective in its intended role.
Q How is the rest of this testimony organized?
A Section 2 describes the model of the FCA that I will use in this testimony and defines terms that will be needed in the analysis. Section 3 considers the baseline case of the “Competitive FCA” absent OOM subsidies, in which all resources make competitive investment and bidding decisions. Section 4 then provides my equilibrium analysis: Section 4-A analyzes the ISO-NE Benchmark, while Section 4-B analyzes the Going-Forward Cost Benchmark. Section 5 concludes with some other comments.

Q Please summarize these other comments.
A In Section 5-A, I will argue that the APR can fully correct for the price-suppressing effect of OOM entry without the need for the extensive exercise of IMM discretion. In Section 5-B, I will comment further on the testimony of Mr. Wilson. In Section 5-C, I conclude with some further discussion of the model used here.

Section 2: Model & Definitions

Q What is the purpose of this part of your testimony?
A This section describes in more detail the model of the FCA that I will use in later analysis, and defines several terms.

Section 2-A: Definitions

Q What terms do you need to define?
A Before describing the model in more detail, I will define and discuss several terms in order to make my testimony as clear and precise as possible. These terms include:

1. “forward market;”
2. “deferrable costs;”
3. “40-month cost;”
4. “going-forward cost;”
5. “total cost;” and

6. “equilibrium bid in the FCA.”

Other important terms will defined at the end of Section 2-B, including:

7. “equilibrium in the FCM;”

8. “Competitive FCA Price;”

9. “out-of-merit long-lead-time resource;” and

10. “price-suppressing effect of OOM entry.”

Q WHAT DO YOU MEAN BY “FORWARD MARKET”?

A In a “forward market,” transactions specify the terms of future trade. By contrast, in a “spot market,” transactions specify the terms of immediate trade. The time at which forward contracts are signed in a forward market is the “forward contracting date.” The period of time between the forward contracting date and delivery is the “forward period.”

The FCA is a “40-month-forward market,” in which capacity supply obligations (“CSOs”) are procured 40 months prior to the start of the obligation period.

Q WHAT ARE A RESOURCE’S “DEFERRABLE COSTS”?

A “Deferrable costs” are any costs that would, in the normal course of business, be incurred after the FCA.

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5 In finance, the term “forward market” has the more specialized meaning of an over-the-counter financial market—as opposed to “futures markets” that are centralized exchanges—for contracts specifying terms of future trade.

6 The 40-month forward period of the FCA is designed to reduce the “sunk cost risk” that a resource may incur significant costs prior to the FCA but not be able to recover those costs, and to reduce the market-price volatility that tends to arise in the face of substantial sunk cost risk.
Q WHAT IS A RESOURCE’S “40-MONTH COST”?  
A A potential new resource’s “40-month cost of new entry” is its (net\(^7\)) cost of new entry, when accounting for all of its deferrable costs. Similarly, an existing resource’s “40-month cost of continued operation” is the expected unprofitability of continued operations, again when accounting for all of its deferrable costs.

Q WHAT IS A RESOURCE’S “LEVELIZED 40-MONTH COST OF NEW ENTRY”?  
A A resource’s “levelized 40-month cost of new entry” is the minimal annuity payment\(^8\) that that resource demands at the time of the FCA in order to commit to provide capacity reserves at the start of the obligation period, if it has not incurred (or committed to incur) any deferrable costs prior to the FCA. In other words, a resource’s levelized 40-month cost of new entry is the minimal annual payment that it would demand now and forever to enter the market through the FCM, whereas its (un-levelized) 40-month cost of new entry is the minimal annual payment that it would demand now, given the expected stream of auction payments in future years.

Q WHAT IS A RESOURCE’S “GOING-FORWARD COST”?  
A A potential new resource’s “going-forward cost of new entry” is its cost of new entry, when accounting only for those costs that it has not actually incurred prior to the FCA. Similarly, an existing resource’s “going-forward cost of continued operation” is the expected unprofitability of continued operations, again accounting only for those costs that have not been incurred prior to the FCA.

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\(^7\) All cost measures (including total costs) that I discuss in this testimony are net of expected earnings from the sale of energy, ancillary services, and other non-capacity products.

\(^8\) An “annuity payment” is a fixed payment that is received every year during a resource’s operational lifetime.
Q WHAT IS A RESOURCE’S “TOTAL COST OF NEW ENTRY”? 

A A potential new resource’s “total cost of new entry” is its cost of new entry, when accounting for all costs, no matter when they may be incurred.

Q WHAT ARE “EQUILIBRIUM BIDS” IN THE FCA? 

A The “equilibrium bid” of a potential new resource is its cost of new entry, when accounting only for those costs that it has not actually incurred or committed to incur prior to the FCA. Similarly, the equilibrium bid of an existing resource is its cost of continued operation, when accounting only for those costs that it has not actually incurred or committed to incur prior to the FCA. Thus, for instance, a potential new resource that has voluntarily incurred (or committed to incur) some deferrable costs of new entry prior to the FCA will submit an equilibrium bid that is strictly less than its 40-month cost of new entry. Similarly, any OOM resource that has committed to enter the FCM prior to the FCA—but has not yet incurred any entry costs at the time of the FCA—will submit an equilibrium bid that is strictly less than its going-forward cost of new entry.

SECTION 2-B: MODEL DETAILS

Q PLEASE DESCRIBE YOUR MODEL OF THE FCA. 

A The FCA is a bidding game embedded within the FCM. Thus, any complete model of the FCA must also model the “larger game” of the FCM. I will model each period of the FCM as a two-stage “FCM Game.”

Stage 1 of the FCM Game: Contracting / Pre-Investment. At the beginning of each period, before the FCA, every potential new resource has (i) the opportunity to

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9 In my First Testimony, I showed that each bidder has an incentive—technically, a “weakly-dominant strategy”—to submit such equilibrium bids in the FCA under the July APR. Furthermore, this conclusion applies regardless of the Benchmark Rule.

10 “Game” is the standard term in economics and applied mathematics to refer to any strategic interaction.
contract with load and (ii) the opportunity to incur some of the costs of new entry (“pre-investment”). Such a contract can serve to commit that resource to enter the FCM and/or commit it to incur some of the costs of new entry prior to the FCA. Such a contract could also specify what that resource will bid in the FCA but, to emphasize that load need not control OOM bids in order to suppress such bids, I will restrict attention to contracts in which each contracted resource is free to bid in the FCA according to its own self-interest. Of course, such self-interest is shaped by the terms of the OOM contract that has been signed.

Incentives in the Contracting Stage: A resource has an incentive to sign an OOM contract with load exactly when such a contract mutually benefits itself and load, when each subsequently acts in its rational self-interest. For example, since entry into the FCM is unprofitable for inefficient OOM, such resources must be subsidized to enter. However, load will be willing to provide such a subsidy, but only if such OOM entry sufficiently suppresses load’s auction payments. In other words, load is willing to induce inefficient OOM to enter exactly when doing so is mutually profitable for load and that inefficient OOM.

Stage 2 of the FCM Game: FCA. Each resource in the FCA decides what to bid. The FCA Rules then determine (i) which resources clear, (ii) which resources are designated as “OOM” (and “carried-forward OOM”) for the purpose of computing prices now and in future periods, and (iii) what each clearing resource is paid.

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11 Other third-parties could also contract with some resources and influence their FCA bids. I focus on load (and allied interests) because I am unaware of any example of any other sort of third-party engaging in the FCM in this way.
Rules in the FCA: My analysis assumes that the Commission will adopt the July APR; hence, that new resources will receive the FCA Clearing Price and that existing resources will receive the APR Price.\textsuperscript{12} Within the context of the July APR, I will consider the effect on equilibrium FCM outcomes of two Benchmark Rules: the “Going-Forward Cost Benchmark Rule,” in which each OOM resource’s Benchmark is set equal to its going-forward cost; and the “ISO-NE Benchmark,” in which each OOM resource’s Benchmark is set equal to its levelized 40-month cost of new entry.

Incentives in the FCA: Regardless of the Benchmark Rule, each potential new resource in the FCA has an incentive—more precisely, a “weakly-dominant strategy”—to submit an equilibrium bid reflecting the costs of new entry that it has not yet incurred or committed to incur. Similarly, each existing resource has an incentive to submit an equilibrium bid reflecting the costs of continued operation that it has not yet incurred or committed to incur. For this reason, it is straightforward to analyze how bidders will behave in the FCA, given their decisions in the Contracting Stage. The real “action” occurs before the FCA, in the Contracting Stage.

Q WHAT DO YOU MEAN BY “EQUILIBRIUM IN THE FCM”?  
A In my analysis, I will assume that the players in the FCM Game—every potential new resource, every existing resource, and load—will adopt strategies that constitute an “equilibrium” of that game. In a single-stage game, players’ strategies constitute a “Nash equilibrium” when every player’s strategy is a best response (i.e., maximizes that player’s expected profit) given the strategies chosen by others. In a multi-stage game such as the

\textsuperscript{12} In fact, ISO-NE has proposed that resources revert back to receiving the FCA Clearing Price after 20 years in the FCM. My analysis can be easily adapted to accommodate this detail, which I ignore here for the sake of simplicity.
FCM Game, the standard equilibrium concept is that of “subgame-perfect equilibrium.”

In a subgame-perfect equilibrium, every player’s strategy in every stage of the game is a best response given the strategies chosen by others.\footnote{For more discussion and a formal definition of subgame-perfect equilibrium, see Andreu Mas-Colell, Michael Whinston & Jerry Green, Microeconomic Theory ch. 9.B (1995).}

Q WHAT IS THE “COMPETITIVE FCA PRICE”?  
A The “Competitive FCA Price” is the equilibrium FCA price that would obtain in a hypothetical scenario without OOM contracts, in which all resources decide, on a merchant basis, (i) when to incur or commit to incur the costs of new entry (if new) or of continued operation (if existing) and (ii) what to bid in the FCA. Throughout the analysis, the Competitive Price will be denoted by $P^*$. The Competitive FCA Price will serve as my measure of whether a Benchmark Rule fully corrects (but does not over-correct) for the price-suppressing effect of OOM entry.

Q WHAT IS AN “OUT-OF-MERIT LONG-LEAD-TIME RESOURCE”?  
A An “out-of-merit long-lead-time resource” is any resource whose (i) total cost of new entry is greater than $P^*$ but whose (ii) 40-month cost of new entry is less than $P^*$. Absent OOM subsidies, an out-of-merit long-lead-time resource would not competitively enter the FCM. However, should it be induced to sink all pre-FCA investments that are necessary to enter the FCM, such a resource will then have an incentive to enter the FCM at a loss.

Q WHAT IS THE “PRICE-SUPPRESSING EFFECT OF OOM ENTRY”?  
A Absent OOM entry, competitive resources decide whether to enter the FCA on the basis of the presumption that other resources will only enter if entry is profitable. In particular, anticipating the Competitive FCA Price $P^*$, all resources with total cost less than $P^*$ will...
(in equilibrium) make the pre-FCA investments necessary to enter the FCM, and then bid in the FCA so as to clear at $P^*$. On the other hand, if competitive resources anticipate that some OOM resources will be subsidized to enter the FCM unprofitably, their subsequent competitive decisions (in equilibrium) will anticipate and generate an FCA Clearing Price $P^{\text{FCA}} < P^*$ paid to new resources and an APR Price $P^{\text{APR}}$ paid to existing resources. The equilibrium APR Price $P^{\text{APR}}$ depends on the Benchmark Rule that is in place and on the set of OOM resources. I will say that a Benchmark “fully corrects (but does not over-correct) for the price-suppressing effect of OOM entry” if $P^{\text{APR}} = P^*$ regardless of which resources are induced to enter as OOM. This is essential, since subsidizing some particular type of resource could result in an APR Price $P^{\text{APR}} < P^*$, then load would have a perverse incentive to induce such resources to enter the FCM, in order to suppress the APR Price.

**SECTION 3: COMPETITION ABSENT OOM CONTRACTS**

**Q** WHAT IS THE PURPOSE OF THIS PART OF YOUR TESTIMONY?

**A** In later analysis, I will judge the performance of each proposed Benchmark Rule on the basis of whether it fully corrects for the price-suppressing effect of OOM entry, resulting in an APR Price equal to the “Competitive FCA Price” of $P^*$. In this section, I will discuss the “competitive behavior” that determines $P^*$ within the context of my model. First, it is helpful to provide some more general background discussion of competitive forward markets.

**Q** WHAT IS A “COMPETITIVE FORWARD MARKET”?  

**A** The activity surrounding any forward market can be viewed as unfolding in three phases: (i) pre-market, (ii) market, and (iii) post-market. A “competitive forward market” is one
In which all investments in the pre-market and all transactions in the market are competitive.

In the pre-market, each seller decides whether to make “investments” in preparation for the forward market; at the time of the market, such investments are sunk and hence at-risk if the forward market price is not high enough. A pre-market investment is only “competitive” if it is profitable, i.e., if the forward market price $P$ is anticipated to be high enough to cover the sunk cost of investment.

In the market, each seller decides whether to trade at the forward market price $P$. A seller’s decision to trade is only “competitive” if it is profitable on a going-forward basis, i.e., if $P$ is high enough to cover that seller’s remaining un-incurred costs of meeting the terms of trade at the forward transaction date.\(^{14}\)

In the post-market, any seller that chose to trade in the market will incur its remaining un-incurred costs.

**Q** HOW DOES THE FORWARD PERIOD AFFECT COMPETITIVE OUTCOMES?

**A** Consider the extreme case of a spot market, in which the forward period has zero length. To the extent that meeting the terms of trade requires sellers to make costly investments prior to the forward transaction date, any seller will enter the spot market with substantial “at-risk” sunk costs. In a competitive spot market, each seller’s decision to incur such costs would have been made competitively, on the basis of that seller’s expectations about what the spot-market price would be. However, if the spot-market price turns out to be lower than expected, the seller will not be able to recover its sunk investment costs. Because of this risk, sellers may only be willing to invest when the spot-market price is

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\(^{14}\) Such “remaining costs” account for the possibility that the seller may be able to “re-trade” and pay someone else to meet the terms of trade on its behalf.
expected to cover those sunk costs \textit{and} offer a large enough premium to compensate for
spot-market price risk.

By participating in a forward market rather than a spot market, resources can
decide whether to trade at the forward transaction date \textit{before} sinking all of their
investment costs. Furthermore, for resources that must decide whether to invest even
prior to the forward market, forward markets can serve to reduce the risk—relative to
spot markets—that the cost of such investments will not be recovered. This can reduce
the internal rate of return necessary to justify such investments.

In the FCM, the 40-month forward period provides ample time for at least some
resources (\textit{e.g.}, “peakers” and demand-side resources) to incur essentially all of their
costs of new entry after the FCA. The flexible availability of such peakers in turn
reduces the risk faced by other, longer lead-time units (\textit{e.g.}, a combined-cycle unit) when
deciding prior to the FCA whether to invest. In particular, the availability of peakers to
enter or exit the FCM dampens the effect of unexpected events on the FCA Price,
allowing longer lead-time units to more confidently assess the profitability of their pre-
\textit{FCA} decision to enter the FCM. This can reduce the risk premium demanded by longer
lead-time units, reducing the total cost of meeting the Net ICR.

As discussed in Section 5-C, the analysis here abstracts from the possibility of
“unexpected events” between the FCA and a resource’s (prior) decision to sink
investment costs. However, it is important to bear in mind that longer lead-time
resources can face substantial uncertainty about whether they will be able to recover their
full cost in the auction. The risk premia associated with such uncertainty are part of such
resources’ “total cost of new entry.”
Q  PLEASE ELABORATE. WHAT DO YOU MEAN BY “COMPETITIVE”?  

A  My usage of the word “competitive” here is subtly different than its most common usage in this proceeding. Typically, the phrase “competitive bidding” is used to describe bids submitted during the FCA that are consistent with price-taking behavior. Perhaps the most important point of my testimony is that the presence of “competitive bidding” does not imply that the FCA is competitive! In fact, “competitive bidding” can be consistent with a pattern of anti-competitive conduct perpetrated before the FCA.  

In my usage, the FCA is “competitive” only when bidders’ decisions before and during the FCA are consistent with individual profit-maximization. In particular, in the (hypothetical) scenario that I shall refer to as the “Competitive FCA,” (i) every resource views itself as a price-taker in the FCA, when deciding both what to bid during the auction and what costs to incur prior to the auction, and (ii) there are no out-of-market subsidies.  

Q  WHAT PRE-INVESTMENTS WILL RESOURCES CHOOSE TO MAKE PRIOR TO THE AUCTION, IN THE “COMPETITIVE FCA”?  

A  In the Competitive FCA, absent OOM entry, all clearing resources expect to be paid the “Competitive FCA Price” of P*. Thus, any resource with total cost greater than P* will choose not to make any costly investments prior to the FCA, since such investment expenses would be unrecoverable. On the other hand, resources with total cost less than P* expect to be able to recover all of their costs, whether these costs are incurred prior to or after the FCA. In particular, (i) resources with total cost less than P* will incur all costs that must be incurred prior to the FCA in order to provide reserve capacity during

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15 See infra Section 4-A for a more in-depth discussion.
the obligation period and (ii) such resources may incur some (or all) costs that could be
defered until after the FCA.

Q HOW WILL RESOURCES BID IN THE FCA, ABSENT OOM CONTRACTS?

A At the FCA, each resource will evaluate whether to commit to enter the FCM on the basis
of its un-incurred costs; any investment expenses are sunk and will be treated as such.
Thus, each resource in a Competitive FCM absent OOM contracts will bid according to
its “competitive going-forward cost.”

Q WHAT DO YOU MEAN BY “COMPETITIVE GOING-FORWARD COST”?

A A resource’s going-forward cost in the FCA depends on the investment decisions that it
made prior to the FCA. A resource’s “competitive going-forward cost” is the going-
forward cost that it would have if it had chosen to make the same pre-FCA investments
that it would have made in a competitive market absent OOM entry. As I discussed
above, the only resources that will competitively invest to enter the FCM are those that
expect to be profitable at the Competitive FCA Price of P*. Such resources will have
competitive going-forward cost less than their total cost but—since both their competitive
going-forward cost and their total cost are less than P*—the price would remain P* if all
such resources bid their total cost instead of their going-forward cost.

SECTION 4: BENCHMARK ANALYSIS

Q WHAT IS THE PURPOSE OF THIS PART OF YOUR TESTIMONY?

A In this section, I will analyze the Going-Forward Cost Benchmark advocated by
Mr. Wilson, the ISO-NE Benchmark proposed by ISO-NE, and the Total Cost
Benchmark.
SECTION 4-A: GOING-FORWARD COST BENCHMARK

Q PLEASE SUMMARIZE THE FINDINGS OF THIS SECTION.

A I demonstrate and discuss the failure of the “Going-Forward Cost Benchmark” to fully correct for the price-suppressing effect of OOM entry.

Q DOES THE GOING-FORWARD COST BENCHMARK ADVOCATED BY MR. WILSON FULLY CORRECT FOR THE PRICE-SUPPRESSING EFFECT OF OOM ENTRY?

A No, it does not. Indeed, for reasons that I will explain, the Going-Forward Cost Benchmark egregiously fails to correct for the price-suppressing effect of OOM entry.

Q WHAT DO YOU MEAN WHEN YOU SAY THAT THE GOING-FORWARD COST BENCHMARK “EGREGIOUSLY FAILS”?

A The Going-Forward Cost Benchmark has no hope of fully correcting the price-suppressing effect of OOM entry. Indeed, the Going-Forward Cost Benchmark seems designed (i) to minimize the APR’s correction of the price-suppressing effect of OOM and (ii) to provide multiple avenues by which load can suppress the APR Price without violating the tariff.

Q WHY DO YOU SAY THAT THE GOING-FORWARD COST BENCHMARK HAS “NO HOPE” OF FULLY CORRECTING THE APR PRICE?

A OOM entry can have a long-lasting price-suppressing effect. Indeed, an OOM resource that has entered the FCM uncompetitively will suppress the FCA Clearing Price paid to new resources until such time as it would have competitively entered the FCM. If this price-suppressing effect is not corrected for this full length of time, such OOM resources will also suppress the APR Price paid to existing resources. However, by design, the Going-Forward Cost Benchmark only attempts to correct the price-suppressing effect of
an OOM resource until such time as it would have competitively continued to operate in the FCM. Once a carried-forward OOM resource’s going-forward cost of continued operation (commonly called “to-go cost”) falls below the FCA Clearing Price, it is no longer designated as OOM. This essentially guarantees that the price-suppressing effect of OOM entry will not be fully corrected!

Q WHY DO YOU SAY THAT THE GOING-FORWARD COST BENCHMARK “PROVIDES MULTIPLE AVENUES BY WHICH LOAD CAN SUPPRESS THE APR PRICE WITHOUT VIOLATING THE TARIFF”?

A First, under the Going-Forward Cost Benchmark, OOM entry will have a price-suppressing effect on the APR Price. The reason for this was explained in the last Q&A: the price-suppressing effect of OOM is only corrected for a portion of the period in which prices are suppressed. This is the most obvious avenue by which the Going-Forward Cost Benchmark allows load to suppress the APR Price without violating the tariff. Second, load has a perverse incentive to induce resources to undertake inefficient investments that will shrink the window of time in which the APR is triggered. In particular, load stands to gain by signing OOM contracts that induce resources to incur costs earlier than is most efficient. For example, if load induces a potential new resource to break ground on its facility prior to the FCA, then any costs that become sunk by virtue of this early activity will not be included in its Going-Forward Cost Benchmark. If enough such deferrable costs are incurred prior to the FCA, an out-of-merit resource sponsored by load can thereby escape detection as OOM and evade all correction of its price-suppressing effect.
Q ON WHAT BASIS DID LOAD EXPERT MR. WILSON ADVOCATE THE GOING-FORWARD COST BENCHMARK?

A While Mr. Wilson did not advance any specific proposal regarding how to compute benchmark prices, his comments can be interpreted as endorsing the Going-Forward Cost Benchmark:

[E]ven merchant capacity resources that receive no subsidies and have no bilateral contracts may nevertheless be offered into the FCA at low prices. For instance, a resource that is already under construction at the time of the FCA may rationally, competitively, and legitimately stay in the descending clock auction at prices down to the level of its net going-forward or opportunity cost.16

Q IS MR. WILSON’S REASONING HERE CORRECT?

A The reasoning here is incomplete and Mr. Wilson’s basic conclusions fail to hold up under closer inspection. Before proceeding, I should make it clear that Mr. Wilson’s goal with this quote was to argue against the ISO-NE Benchmark, which is based on the (levelized) 40-month cost of new entry. After all, since he claims that a bidder who—for some mysterious, unspecified reason—had chosen to incur before the FCA some costs that might have been deferred until afterwards might then “rationally, competitive, and legitimately” bid lower than the ISO-NE Benchmark in the FCA, he contends that the ISO-NE Benchmark must be uncompetitively high. In fact, upon closer inspection, the example advanced in this quote strengthens the case in favor of using Benchmarks based on the levelized 40-month cost of new entry. The easiest way to make this point is with a simple numerical example.

**Simple Example:** Consider a potential new resource having 40-month cost equal to $12\textsuperscript{17} that needs to bid less than $P$ to clear. Suppose that, prior to the FCA, this resource decides to start construction and sinks $6$. In the FCA itself, this resource’s competitive bid will be $12 - 6 = 6$. There are three possibilities for what could happen next, depending on the clearing price $P$:

- **Unprofitable, not in FCM.** If $P$ is less than $6$, the resource will fail to clear and lose its sunk cost of $6$.

- **Unprofitable, in FCM, designated as OOM.** If $P$ is between $6$ and $12$, the resource will clear and be designated as OOM but wish that it had not started construction early. (It loses $12 - P$ whereas, if it had not started construction early, it would have bid $12$, not cleared, and lost nothing.)

- **Profitable, in FCM, not designated as OOM.** If $P$ is greater than $12$, the resource will clear at its bid of $6$ but also would have cleared with a bid equal to its 40-month cost of $12$. The resource earns profits of $P - 12$ and is not designated as OOM. Note that, in this case, the resource’s Benchmark is irrelevant.

In this example, Benchmarks equal to the 40-month cost of new entry (i) have no effect when this resource’s decision to start construction early is rational but (ii) perfectly correct for the price-suppressing effect of this decision when it is irrational—and potentially anti-competitive—to begin construction ahead of the FCA.

Put differently, this example illustrates the essential point that so-called “competitive bids” can be part of an anti-competitive pattern of conduct. True, it is

\textsuperscript{17} For purposes of exposition here, I use small, unqualified dollar values. The actual figures for capital expenditures are of course many orders of magnitude larger and must be converted to per-kW-month figures for purposes of bidding. This shorthand has no effect on the generality of the results that I derive.
rational and competitive *in the FCA* to ignore costs already sunk at the time when formulating one’s bid. However, it is not rational and competitive *in the FCM as a whole* to sink costs when doing so will induce one to enter at a loss. For this reason, Mr. Wilson’s attempted assault on 40-month cost not only misses the mark—it boomerangs back to undermine his own central premise that it is rational to bid less than 40-month cost. Indeed, the only time that it is rational to incur *deferrable* costs prior to the FCA, that induce one to bid less than one’s 40-month cost of new entry, is when a bid equal to that 40-month cost would also have cleared!

Q PLEASE ELABORATE. HOW CAN SO-CALLED “COMPETITIVE BIDS” BE CONSISTENT WITH A PATTERN OF ANTI-COMPETITIVE CONDUCT?

A The FCA is a bidding game, and resources’ *equilibrium* bids in that game are “competitive” in a certain sense. However, the FCA is just one element of the FCM, and competitive bids in the FCA can arise from anti-competitive conduct *outside* of the auction. For example, consider a resource that has signed a bilateral OOM contract with load that effectively commits it to enter the FCM. Such a resource’s equilibrium bid—what load interests might describe as “rational” and “competitive”—is zero! Indeed, since this resource is committed to incur all its 40-month costs, some might even argue that this zero bid reflects the “reasonably considered incremental”\(^\text{18}\) costs that the IMM has been proposed to use as benchmark price.\(^\text{19}\)

Of course, this line of reasoning is absurd and I do not suggest that Mr. LaPlante meant to interpret his proposed “reasonable incremental costs” standard in this obviously

\(^\text{18}\) LaPlante Brief at 21.

\(^\text{19}\) “[The IMM proposes] to use an incremental project cost standard instead of a total project cost standard in those circumstances in which a participant submitting a below-the-benchmark offer believes such an offer is appropriate.” LaPlante Brief at 22.
perverse manner. However, if one accepts the wrong and deeply flawed notion that competitive bidding alone equals competitive conduct, there is no reason to stop short of this absurdity. A new resource’s competitive bid in the FCA will be based on something less than its total cost whenever it has *already incurred or committed to incur* some of its 40-month costs. If one wrongly equates competitive bidding with competitive conduct, then it is equally appropriate to lower a nuclear power plant’s Benchmark to reflect its already-sunk construction costs at the time of the FCA, as it is to lower the Benchmark of an OOM resource because its OOM contract commits it to enter the FCM!

A fundamental error of Mr. Wilson’s reasoning in support of the Going-Forward Cost Benchmark is to assume that all costs borne prior to the *actual* FCA would have been borne prior to a Competitive FCA. In other words, Mr. Wilson’s argument only makes sense under the assumption that load will not induce any resources to enter the FCM that would not have entered anyway in a competitive market. Given load’s active and clearly-stated interest in sponsoring and continuing to sponsor new resources that would not have otherwise cleared in the FCA,\(^\text{20}\) this assumption is demonstrably counterfactual.

\(^{20}\) The states have argued that they have a vital public-policy interest to induce certain new resources to enter the FCM that would not be able to clear in the FCA. While the states have advanced this public-policy argument as if it supports their “right” to insist that the FERC not correct the price-suppressing effects of state-sponsored OOM, this argument actually underscores the urgent necessity of APR reform—and of getting benchmark prices right. (See Professor Milgrom’s testimony for a particularly clear discussion of this essential point. NEPGA Second Brief, NEPGA Ex. 5, Testimony of Professor Paul R. Milgrom, Ph. D. on Behalf of New England Power Generators Association at 9.)
SECTION 4-B: TOTAL COST BENCHMARK

Q PLEASE SUMMARIZE THE FINDINGS OF THIS SECTION.

A I will prove and discuss why a Total Cost Benchmark fully corrects (but does not over-correct) for the price-suppressing effect of OOM entry, a result that I will formulate as the “Total Cost Benchmark Theorem.”

**Total Cost Benchmark Theorem:** Under the Total Cost Benchmark, the equilibrium APR Price equals the Competitive FCA Price, i.e., $P_{APR} = P^*$.

Q HAVE YOU PROVIDED A PROOF OF THIS RESULT?

A Yes. The proof is included in NEPGA Exhibit 10-A.

Q CAN YOU PLEASE PROVIDE AN INTUITIVE SKETCH OF THE PROOF?

A Yes. The Theorem can be broken down into two parts. Under the Total Cost Benchmark, the APR Price is (i) not “too high” (i.e., the equilibrium APR Price is not inflated above the Competitive FCA Price) and (ii) not “too low” (i.e., the equilibrium APR Price is not suppressed below the Competitive FCA Price).

First, consider whether the Total Cost Benchmark could lead to an APR Price that exceeds the Competitive FCA Price. Such price-inflation could happen under the Total Cost Benchmark only if (i) some resource would have bid less than $P^*$ in the Competitive FCA but (ii) that resource has a Total Cost Benchmark greater than $P^*$. Entry into the FCM is only profitable—and hence only competitive—if the entering resource expects to be paid enough in the FCA to cover its total cost of new entry. Thus, any resource that would have bid less than $P^*$ in the Competitive FCA must have total cost less than $P^*$. If one were to replace such a resource’s competitive bid (less than $P^*$) with its total cost of new entry (also less than $P^*$), doing so will therefore not artificially inflate the market-clearing price. Since this reasoning applies to all in-merit resources that would have
cleared in the Competitive FCA, we conclude that the Total Cost Benchmark will not artificially inflate the equilibrium FCA Price.

Second, consider whether the Total Cost Benchmark could lead to an APR Price that is less than the Competitive FCA Price. Such price-suppression could happen under the Total Cost Benchmark only if (i) some resource would have bid more than $P^*$ in the Competitive FCA but decides to bid less than $P^*$ in the actual FCA (because of an OOM contract) and (ii) that resource has a Total Cost Benchmark less than $P^*$ so that its price-suppressing effect is not corrected. Consider any resource that would have bid more than $P^*$ in the Competitive FCA. Such failure to enter the FCM is only competitive if that resource’s total cost of new entry is greater than $P^*$. In particular, such a resource must have Total Cost Benchmark greater than $P^*$. Thus, if it were to enter the FCM on the basis of out-of-market subsidies, then the price-suppressing effect of its OOM entry would be corrected by under the Total Cost Benchmark.

All together, we conclude that the Total Cost Benchmark fully corrects (but does not over-correct) for the price-suppressing effect of OOM entry.

Q DO ANY OTHER BENCHMARK RULES FULLY CORRECT (BUT NOT OVER-CORRECT) FOR THE PRICE-SUPPRESSING EFFECT OF OOM ENTRY?

A Surprisingly, no. Any other Benchmark Rule will sometimes induce an equilibrium APR Price that is either higher or lower than the Competitive FCA Price. Suppose first that the Benchmark for a resources is greater than its Total Cost. If the Competitive FCA Price $P^*$ lies between the Benchmark and Total Cost, then entry is competitive for this resource, since $P^*$ is greater than Total Cost. However, because the Benchmark is greater than $P^*$, this resource would be incorrectly categorized as OOM and the resulting APR
Price would be artificially inflated above $P^*$. Suppose next that the Benchmark is less than Total Cost. If the Competitive FCA Price $P^*$ lies between the Benchmark and Total Cost, then entry is uncompetitive for this resource since $P^*$ is less than Total Cost. However, because the Benchmark is less than $P^*$, any uncompetitive entry by this resource would evade categorization as OOM. Thus, load has an incentive to provide out-of-market subsidies to this resource that induce it to enter the FCM at a loss, since doing so will suppress the APR Price below $P^*$.

SECTION 4-C: ISO-NE BENCHMARK

PLEASE SUMMARIZE THE FINDINGS OF THIS SECTION.

I will prove and discuss why the ISO-NE Benchmark can, under certain conditions, fully correct (but not over-correct) for the price-suppressing effect of OOM entry. I will formulate this result as the “ISO-NE Benchmark Theorem.”

**ISO-NE Benchmark Theorem:** Suppose that there are no out-of-merit long-lead-time potential resources\(^{21}\) in the FCM. Then, under the ISO-NE Benchmark, the equilibrium APR Price equals the Competitive FCA Price.

HAVE YOU PROVIDED A PROOF OF THIS RESULT?

Yes. The proof is included in NEPGA Exhibit 10-B.

PLEASE PROVIDE INTUITION FOR THE ISO-NE BENCHMARK THEOREM.

There are two important steps to the reasoning behind this result.

1. The ISO-NE Benchmark, based on each resource’s *levelized* 40-month cost of new entry, induces the same equilibrium APR Price as a 40-Month Cost Benchmark based on *un-levelized* 40-month costs of new entry.

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\(^{21}\) *See supra* at 6 (definition of an “out-of-merit long-lead-time resource.”)
2. The 40-Month Cost Benchmark induces the same equilibrium APR Price as the Total Cost Benchmark.

In light of the Total Cost Benchmark Theorem (discussed earlier), these steps together establish that, if there are no out-of-merit long-lead-time resources, the ISO-NE Benchmark fully corrects (but does not over-correct) for the price-suppressing effect of OOM entry. I will focus here on providing intuition for the second step. (The first step, relating levelized and un-levelized costs, is more technical.) So, for the rest of the discussion here, suppose that each resource’s Benchmark is equal to its (un-levelized) 40-month cost of new entry.

First, if there are out-of-merit long-lead-time resources, such a 40-Month Cost Benchmark may not fully correct for the price-suppressing effect of OOM entry. By definition, an out-of-merit long-lead-time resource is one whose (i) total cost of new entry exceeds P*, so that it would not competitively enter the FCM, but whose (ii) 40-month cost of new entry is less than P*, so that it would have an incentive to bid less than P* and enter the FCM after incurring the sunk cost of the pre-FCA investments that are necessary to enter the FCM. Load can induce out-of-merit long-lead-time resources to enter the FCM by providing OOM subsidies that cover the cost of their pre-FCA investments. Further, if load were to do so, the 40-Month Cost Benchmark would fail to categorize these resources as OOM, thereby providing no correction whatsoever of their price-suppressing effect. This is why the ISO-NE Benchmark Theorem only holds under the extra assumption that there are no out-of-merit long-lead-time resources in the FCM.

Second, suppose now that there are no out-of-merit long-lead-time resources. In this case, any resource that is unprofitable on the basis of total costs will also be
unprofitable on the basis only of 40-month costs. Consequently, subsidizing a resource’s pre-FCA investments is not enough to induce it to enter the FCM. Furthermore, since every out-of-merit resource that would not have entered in the Competitive FCA has 40-month-cost greater than P*, any out-of-merit resource that is induced to enter the FCM on the basis of out-of-market subsidies will be correctly categorized as OOM, and its price-suppressing effect on the APR Price will be fully corrected.

SECTION 5: OTHER COMMENTS

SECTION 5-A: ON IMM DISCRETION

Q WHAT DO YOU MEAN BY “IMM DISCRETION”?

A The IMM “lacks discretion” if its method to compute a resource’s benchmark price depends on objective, context-independent characteristics of that resource. In its comments, the IMM proposes to give itself substantial discretion when determining benchmark prices.

[The IMM proposes] to use an incremental project cost standard instead of a total project cost standard in those circumstances in which a participant submitting a below-the-benchmark offer believes such an offer is appropriate.\(^22\)

In other words, the IMM proposes to invite bidders to make a case that it is “appropriate” for benchmark prices to reflect only those remaining costs that those resources have not already incurred—or committed to incur—prior to the FCA. Under such a discretionary rule, market outcomes could depend dramatically on the quality of the IMM’s judgment.

For instance, an (admittedly absurd but ultimately economic) case could be made that it is “appropriate” for OOM resources to have benchmark prices equal to zero, since

\(^22\) LaPlante Brief at 22 (emphasis added).
such resources have committed to enter the FCM and hence have “competitive bids”
equal to zero. Even if the IMM is wise enough to reject such arguments, it may be very
difficult to divine which (say) decisions to start construction early were driven by
legitimate considerations of cost savings, and which were driven by a desire to lower
auction payments by lowering benchmark prices.

In this testimony, I have established that the exercise of such discretion is
unnecessary. In fact, one of the most attractive features of the ISO-NE Benchmark—or,
even more so, the Total Cost Benchmark—is that it limits the need for the IMM to
exercise discretion. Under the Going-Forward Cost Benchmark, the IMM must
determine what costs are “reasonably incremental,” a standard that requires inspection of
the circumstances of each individual resource. Under the ISO-NE Benchmark, by
contrast, the IMM needs only to determine what costs are “deferrable” in principle—even
if such costs are not always deferred in practice.

SECTION 5-B: ON OTHER COMMENTS BY MR. WILSON

Q WHAT ADDITIONAL COMMENTS DO YOU HAVE ON MR. WILSON’S
TESTIMONY?

A In his supplemental testimony, Mr. Wilson offered several attempted criticisms of my
First Testimony. There is little need to respond on a point-by-point basis, but some
general comments may be helpful to readers trying to sort through Mr. Wilson’s attacks.

First, Mr. Wilson argues that I did not consider certain perverse incentives that
might arise under the July APR. Indeed, in my First Testimony, I was clear to state that
my focus was on (hypothetical) scenarios in which all bidders lack market power. Thus,
it is somewhat disingenuous for Mr. Wilson to criticize my testimony on the basis that I
did not consider market-power issues. Many sorts of conceivable inefficient behaviors
can arise as a result of the exercise of market power, especially in complex markets such as the FCM. Thus, Mr. Wilson’s list of strange behaviors that might conceivably arise—such as generators seeking to suppress the FCA Clearing Price—should not surprise or especially concern the Commission. As far as I am aware, none of Mr. Wilson’s hypothetical scenarios has any demonstrable connection to the real world. Should such behaviors someday arise as a practical concern, then market-mitigation measures can and should be developed to address them. In the present context of this proceeding, therefore, I view such examples as unhelpful distractions that seek to create concerns on the basis of hypothetical scenarios with no basis in observed practice. (By contrast, the issue of OOM entry and its price-suppressing effect is demonstrably real.)

Second, Mr. Wilson argues that, in my First Testimony, I did not adequately support the contention that the July APR is “sound and sensible.” For example, Mr. Wilson critiques my July discussion of OOM subsidies by noting that Prof. McAdams “does not recognize that these incentives and payments may be serving a legitimate economic function, and one that should be reflected in the auctions.” This is a valid point. In my First Testimony, my focus was on the bidding incentives of resources in the FCA, not on the incentives of the third-parties (such as load) that might seek to influence those bidding incentives. However, please note that my Supplementary Testimony—submitted on September 1, 2010, before I became aware of Mr. Wilson’s criticisms—is almost entirely devoted to this issue. That Supplementary Testimony (i) builds on the foundation laid by my First Testimony, (ii) fully recognizes the potential

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value of public policies that promote certain types of resources, and (iii) supports the contention that the February APR creates inefficient, unbalanced incentives when it comes to sponsoring OOM. By contrast, the July APR creates efficient incentives for load to sponsor OOM when doing so provides great enough un-priced benefits to be efficient.

Finally, Mr. Wilson argues that the ISO-NE Benchmark is incorrect. This Second Supplementary Testimony directly confronts this contention, and proves it to be without merit. All together, then, my Supplementary Testimony and this Second Supplementary Testimony strengthen—and provide more detailed support for—the conclusion of my First Testimony that the July APR is “sound and sensible.”

SECTION 5-C: DISCUSSION OF THE MODEL USED IN THIS TESTIMONY

Q WHAT IS THE PURPOSE OF THIS PART OF YOUR TESTIMONY?
A The model of the FCA that I have employed in this testimony serves as an objective vehicle by which to evaluate each of the Benchmark Rule proposals. However, like any model, this model is not a complete representation of reality. To complete my testimony, I would like to discuss some of the most important abstractions inherent in the model, related to (i) market power, (ii) uncertainty, and (iii) long-term trends.

Q HOW DOES THE MODEL ABSTRACT FROM “MARKET POWER”?
A The model abstracts from seller-side market power, since every resource is assumed to have no unilateral effect on the auction price. My rationale for focusing on this baseline scenario is that, if an auction design does not function well when all bidders lack market power, then there is something seriously wrong with that design. Conversely, if an auction design does function well when bidders lack market power, then there is at least
hope that the auction design will function well when paired with well-conceived market-power mitigation measures.

Obviously, some bidders may possess market power in practice. As discussed in Section 5-B, many sorts of conceivable inefficient behaviors can arise as a result of the exercise of market power by bidders, especially in complex markets such as the FCM. It is therefore important to pair a well-conceived APR Rule—including a well-conceived Benchmark Rule—with other well-conceived measures to mitigate the exercise of seller market power.

Q HOW DOES THE MODEL ABSTRACT FROM “UNCERTAINTY”?

A In the model, each resource can correctly anticipate the FCA Clearing Price $P^{FCA}$ and the APR Price $P^{APR}$ that will ultimately prevail in the FCA, when deciding in Stage 1 whether to sign an OOM contract and/or to make investments that will enable it to enter the FCM. Of course, “unexpected events” can be important in practice and can create substantial risk for longer lead-time resources that must decide whether to sink substantial investments prior to the FCA. Indeed, in practice, such resources will typically only incur such investments if they will generate a sufficiently large expected profit to compensate for this risk. This “risk premium” is an important element of the “total cost of new entry” of longer lead-time resources. However, the analysis and the main qualitative findings developed in this testimony still apply, once each resource’s “costs” are appropriately modified to account for uncertainty.\(^{25}\)

\(^{25}\) Resources’ 40-month cost and going-forward cost will also typically incorporate a risk premium, as well as an adjustment based on the option value associated with retaining the option to enter and/or to exit the FCM.
HOW DOES THE MODEL ABSTRACT FROM “LONG-TERM TRENDS”?

In the model, the Competitive FCA Price $P^*$ is assumed not to change over time. In practice, one may expect the Competitive FCA Price to fall over time because of technological development or other factors. Since resources entering the FCM today expect to receive lower future payments under such a long-term downward trend, the presence of such a trend will tend to increase the minimal auction payment that they demand today to enter the FCM. In other words, a downward price trend increases each resource’s going-forward cost (and its 40-month cost of new entry and its total cost of new entry) by the expected present value of future decreases in the Competitive FCA Price. However, most of the analysis and the qualitative findings developed in this testimony still apply, once each resource’s “costs” are appropriately modified to account for lower future auction payments.

DOES THIS CONCLUDE YOUR TESTIMONY?

Yes.

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26 If there is a long-term downward trend in auction prices, then the levelized 40-month costs that ISO-NE proposes to use as benchmark offers will tend to be too low, leading to incomplete correction of the price-suppressing effect of OOM entry. (See proof of the ISO-NE Benchmark Theorem, NEPGA Exhibit 10-B, for further discussion.)
APPENDIX A: PROOF OF THE TOTAL COST BENCHMARK THEOREM

I will establish the Total Benchmark Theorem by what one might a “Goldilocks proof:”
the Total Cost Benchmark is neither “too high,” nor “too low,” but “just right.”

Under the Total Cost Benchmark, each OOM resource’s Benchmark is equal to its total
cost of new entry. If these Benchmarks are “too high” for some resources, then the resulting
APR Price could be higher than P* even if all resources bid as if in a Competitive FCA. On the
other hand, if the Benchmarks are “too low” for some resources, then load could profitably
suppress the APR Price by signing OOM contracts that induce those resources to bid less than in
a Competitive FCA.

Part One: Total Cost Benchmark is not “too high.” A resource’s Benchmark is “too
high” if replacing its Competitive FCA bid with its Benchmark will artificially inflate the APR
Price. To be concrete, suppose that some resource has equilibrium bid P’ in the Competitive
FCA, but its Benchmark is P’’ > P’. Replacing its bid of P’ with the Benchmark of P’’ will
artificially inflate the APR Price if and only if (i) P’ < P* so that that resource clears at the
Competitive FCA Price P* and (ii) P’’ > P* so that the APR Price is computed on the faulty
assumption that that resource would not have cleared competitively. So, to establish that the
Total Cost Benchmark is not “too high,” I need to show that the Total Cost Benchmark is less
than P* for every resource that would have bid less than P* in the Competitive FCA.

My proof will focus on a generic “Resource X.”

Suppose that Resource X would have bid less than P* in the Competitive FCA. Bidding
less than P* causes Resource X to clear in the Competitive FCA. For this to be profitable, P*
must be large enough to cover its total cost of new entry. Thus, its Total Cost Benchmark is less
than P*, as desired.
Part Two: Total Cost Benchmark is not “too low.” A resource’s Benchmark is “too low” if load can artificially suppress the APR Price by inducing that resource to bid less than it would have bid in the Competitive FCA. To be concrete, suppose that some resource has equilibrium bid $P'$ in the Competitive FCA, but its Benchmark is $P'' < P'$. If load were to induce this resource to bid less than $P''$, then the APR Price would be computed on the basis of the Benchmark $P''$ rather than the “competitive bid” $P'$. This will artificially suppress the APR Price if and only if (i) $P'' < P^*$ so that that resource would clear in the Competitive FCA with a bid equal to its Benchmark and (ii) $P' > P^*$ so that that resource would not have cleared in the Competitive FCA without the benefit of OOM subsidies. (If the resource would have cleared anyway, any suppression of its *inframarginal* bid will not suppress the market-clearing price.)

So, to establish that the Total Cost Benchmark is not “too low,” I need to show that the Total Cost Benchmark is greater than $P^*$ for every resource that would have bid more than $P^*$ in the Competitive FCA.

Suppose now that Resource X would have bid more than $P^*$ in the Competitive FCA. Bidding more than $P^*$ causes Resource X not to clear in the Competitive FCA. This means that entry into the FCM at price $P^*$ must be unprofitable for Resource X, *i.e.*, its total cost of new entry must be greater than $P^*$. Thus, its Total Cost Benchmark is greater than $P^*$, as desired.

Having shown that the Total Cost Benchmark is neither “too high” nor “too low,” we conclude that, as Goldilocks might say, the Total Cost Benchmark is “*just right*.” By neither artificially inflating the APR Price nor allowing load to artificially suppress the APR Price, the Total Cost Benchmark fully corrects (but does not over-correct) for the price-suppressing effect of OOM entry. Q.E.D.
APPENDIX B: PROOF OF THE ISO-NE BENCHMARK THEOREM

I will establish the ISO-NE Benchmark Theorem by what one might a “Goldilocks proof:” under the maintained assumption that there are no out-of-merit long-lead-time resources, the ISO-NE Benchmark is neither “too high,” nor “too low,” but “just right.”

Under the ISO-NE Benchmark, each OOM resource’s Benchmark is equal to its levelized 40-month cost of new entry. If these Benchmarks are “too high” for some resources, then the resulting APR Price could be higher than \( P^* \) even if all resources bid as if in a Competitive FCA. On the other hand, if the Benchmarks are “too low” for some resources, then load could profitably suppress the APR Price by signing OOM contracts that induce those resources to bid less than in a Competitive FCA.

**Part One: ISO-NE Benchmark is not “too high.”** A resource’s Benchmark is “too high” if replacing its Competitive FCA bid with its Benchmark will artificially inflate the APR Price. To be concrete, suppose that some resource has equilibrium bid \( P' \) in the Competitive FCA, but its Benchmark is \( P'' > P' \). Replacing its bid of \( P' \) with the Benchmark of \( P'' \) will artificially inflate the APR Price if and only if (i) \( P' < P^* \) so that that resource clears at the Competitive FCA Price \( P^* \) and (ii) \( P'' > P^* \) so that the APR Price is computed on the faulty assumption that that resource would not have cleared competitively. So, to establish that the ISO-NE Benchmark is not “too high,” I need to show that the ISO-NE Benchmark is less than \( P^* \) for every resource that would have bid less than \( P^* \) in the Competitive FCA.

My proof will focus on a generic “Resource X.” As shorthand, let “LEVEL” denote Resource X’s levelized 40-month cost of new entry and let “UNLEVEL” denote Resource X’s (un-levelized) 40-month cost of new entry.

Suppose that Resource X would have bid less than \( P^* \) in the Competitive FCA. Bidding less than \( P^* \) causes Resource X to clear in the Competitive FCA. For this to be profitable, \( P^* \)
must be large enough to cover Resource X’s total cost of new entry and hence also its (un-levelized) 40-month costs of new entry. Thus, UNLEVEL is less than P*. By definition, a resource’s (un-levelized) 40-month cost of new entry in the Competitive FCA\(^1\) is the minimal auction payment now that this resource requires to enter the FCM, given that it expects to receive the Competitive FCA Price P* in future years.\(^2\) In other words, the present value of the stream of annual auction payments

\[(\text{UNLEVEL, P*, P*, ...})\]

must be just enough to make Resource X indifferent to committing to enter the FCM. Similarly, a resource’s levelized 40-month cost of new entry is the minimal annuity payment that this resource requires to enter the FCM. In other words, the present value of the stream of annual auction payments

\[(\text{LEVEL, LEVEL, LEVEL, ...})\]

must also be just enough to make Resource X indifferent to committing to enter the FCM. Both of these streams of auction payments must therefore generate the same present value:

\[(\text{UNLEVEL, P*, P*, ...}) = (\text{LEVEL, LEVEL, LEVEL, ...}).\]

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\(^1\) A potential new resource’s (un-levelized) 40-month cost of new entry depends on the expected stream of future auction payments. Within the context of the Competitive FCA, as considered here, “40-month cost of new entry” is defined relative to an expected stream of P* every period. By contrast, a resource’s levelized 40-month cost of new entry is not context-dependent in this way. In particular, conclusions about Resource X’s levelized 40-month cost of new entry derived in the context of the Competitive FCA still apply in the FCM Game should load actively sign resources to OOM contracts.

\(^2\) The argument here can be easily adapted to account for the fact that, under ISO-NE’s proposal, new resources receive the “Year 1 FCA Clearing Price” for multiple years. In particular, a resource’s decision whether to enter the FCM will be based on the present value of the stream (UNLEVEL,...,UNLEVEL,P*,P*,...), where “UNLEVEL” is appropriately re-defined, and the key conclusion still holds that LEVEL lies between UNLEVEL and P*.
Thus, \textit{LEVEL} must lie \textit{strictly between} \textit{P*} and \textit{UNLEVEL}.\textsuperscript{3} Since we have previously shown that \textit{UNLEVEL} is less than \textit{P*}, we conclude that \textit{LEVEL} is less than \textit{P*}.

So far, we have proven that any resource that would have bid less than \textit{P*} in the Competitive FCA must have levelized 40-month cost of new entry (\textit{i.e.}, ISO-NE Benchmark) less than \textit{P*}. That is, we have established that the ISO-NE Benchmark is not “too high.”

\textbf{Part Two: ISO-NE Benchmark is not “too low.”} A resource’s Benchmark is “too low” if load can artificially suppress the APR Price by inducing that resource to bid less than it would have bid in the Competitive FCA. To be concrete, suppose that some resource has equilibrium bid \textit{P’} in the Competitive FCA, but its Benchmark is \textit{P’’} < \textit{P’}. If load were to induce this resource to bid less than \textit{P’’}, then the APR Price would be computed on the basis of the Benchmark \textit{P’’} rather than the “competitive bid” \textit{P’}. This will artificially suppress the APR Price if and only if (i) \textit{P’’} < \textit{P*} so that that resource would clear in the Competitive FCA with a bid equal to its Benchmark and (ii) \textit{P’} > \textit{P*} so that that resource would not have cleared in the Competitive FCA without the benefit of OOM subsidies. (If the resource would have cleared anyway, any suppression of its \textit{inframarginal} bid will not suppress the market-clearing price.)

So, to establish that the ISO-NE Benchmark is not “too low,” I need to show that the ISO-NE Benchmark is greater than \textit{P*} for every resource that would have bid more than \textit{P*} in the Competitive FCA.

\textsuperscript{3} This step of the proof relies on the assumption that the Competitive FCA Price does not change over time. Suppose instead that the Competitive FCA Price \textit{T} years in the future is expected to be \textit{P\textsuperscript{T}}, where these prices are decreasing over time, \textit{i.e.}, \textit{P*} > \textit{P\textsuperscript{1}} > \textit{P\textsuperscript{2}} > ... Now, by definition of levelized and unleveled 40-month cost, both streams of auction payments (UNLEVEL, \textit{P\textsuperscript{1}}, \textit{P\textsuperscript{2}}, ...) and (LEVEL, LEVEL, LEVEL, ...) must provide the same present value. In particular, for the marginal resource that sets the Competitive FCA Price (and has unleveled 40-month cost UNLEVEL = \textit{P*}), both streams (\textit{P*}, \textit{P\textsuperscript{1}}, \textit{P\textsuperscript{2}}, ...) and (LEVEL, LEVEL, LEVEL, ...) must provide the same present value. When \textit{P*} = \textit{P\textsuperscript{1}} = \textit{P\textsuperscript{2}} = ..., we conclude that the marginal resource also has \textit{levelized} 40-month cost LEVEL = \textit{P*}, so that Benchmarks equal to levelized 40-month cost result in APR Price equal to \textit{P*}. However, if \textit{P*} > \textit{P\textsuperscript{1}} > \textit{P\textsuperscript{2}} > ..., then \textit{LEVEL} < \textit{P*} for the marginal resource. In this case, Benchmarks equal to levelized 40-month cost result in an APR Price that is systematically lower than \textit{P*}. 
Suppose now that Resource X would have bid more than $P^*$ in the Competitive FCA. Bidding more than $P^*$ causes Resource X not to clear in the Competitive FCA. This means that entry into the FCM at price $P^*$ must be unprofitable for Resource X, i.e., its total cost of new entry must be greater than $P^*$. By assumption, Resource X is not an out-of-merit long-lead-time resource. Thus, its (un-levelized) 40-month cost of new entry must also be greater than $P^*$. In other words, using the notational shorthand from Part One, UNLEVEL is greater than $P^*$. However, I proved in Part One that LEVEL lies strictly between $P^*$ and UNLEVEL. Thus, LEVEL is greater than $P^*$. So, we have now also proven that any resource that would have bid more than $P^*$ in the Competitive FCA must have levelized 40-month cost of new entry (i.e., ISO-NE Benchmark) greater than $P^*$. That is, we have established that the ISO-NE Benchmark is not “too low.” Under the maintained assumption that there are no out-of-merit long-lead-time resources, we conclude that the ISO-NE Benchmark is “just right.” By neither artificially inflating the APR Price nor allowing load to artificially suppress the APR Price, the ISO-NE Benchmark fully corrects (but does not over-correct) for the price-suppressing effect of OOM entry. Q.E.D.