Internal Market Monitoring Unit Review of the Forward Capacity Market Auction Results and Design Elements

Market Monitoring Unit

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This report was prepared by

ISO New England Inc.
Dave LaPlante and Hung-po Chao

and

The Brattle Group
Sam Newell, Metin Celebi, and Attila Hajos

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Executive Summary

The Forward Capacity Market (FCM) is a locational capacity market intended to attract and retain the resources required to ensure resource adequacy. Forward Capacity Auctions (FCAs) procure installed capacity to meet the region's resource adequacy requirements, known as the Installed Capacity Requirement (ICR), for one-year capacity commitment periods.[1] FCAs also procure the capacity required for each capacity zone that has a locational capacity need identified before the auction.[2] The ISO has conducted two FCAs to date, for the commitment periods of 2010/2011 and 2011/2012.

This report provides the ISO Internal Market Monitoring Unit's (INTMMU's) initial assessment of the Forward Capacity Market, as required by *Market Rule 1*, Section 13.8.4.[3] The INTMMU assessed the performance of the FCM by analyzing the results of the first two FCAs in light of the market's main objective of ensuring that New England has sufficient resources to meet its electricity needs reliably and at a reasonable cost. In the opinion of the INTMMU, prices in the FCA should be set competitively and at a level that enables the region to procure sufficient capacity to meet its needs, or as close as practicable to that level, so consumers do not pay more than necessary for capacity.

The FCM has met its objective of attracting and retaining the capacity needed to meet the region's ICR for the first two commitment periods. The INTMMU performed a detailed review of the amount and types of resources purchased in the first two FCAs and the resultant prices and found sufficient competition and robust supply. An additional assessment of the FCM should be made after the completion of at least one full FCM cycle comprising an FCA, reconfiguration auctions for the same capacity commitment period, and the fulfillment of capacity obligations during a delivery year.

Based on the analysis in this report and discussions with regional stakeholders, the INTMMU has developed several recommendations for possible improvements to the FCM, which are described in this report and summarized in this section. These recommendations are intended to ensure that the FCM provides sufficient resources at reasonable cost. They address the rules that affect the creation of capacity zones, the price-setting rules when out-of-market (OOM) capacity dominates the need for new capacity and new entry, the comparability of demand resources, and the determination of the auction starting price.[4] These recommendations address issues that are or will be the subject of ongoing stakeholder discussions. This report is not intended to preempt these discussions but to contribute to them and improve the FCM.

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[1] The Installed Capacity Requirement is set at a level expected to avoid the loss of load more than one time in 10 years as a result of insufficient resources. A *capacity commitment period* is the one-year period from June 1 through May 31 of the following year.

[2] These locational needs are *local sourcing requirements* (LSRs) or *maximum capacity limits* (MCLs). An LSR is the minimum amount of capacity that must be located in an import-constrained area (which has insufficient capacity). An MCL is the maximum amount of capacity that can be located in an export-constrained area (which has a surplus of capacity). Capacity zones can comprise a single or several load zones (i.e., aggregations of load pricing nodes within a specific area).

[3] *Market Rule 1*, *Standard Market Design*, Section III (3.13.1) of the Federal Energy Regulatory Commission (FERC) Electric Tariff No. 3; available online at http://www.iso-ne.com/regulatory/tariff/sect_3/index.html.

[4] Out-of-market resources are those that participate in the FCM at prices below their cost no matter how low the auction price drops; they may be contracted by states or be self supplied by load-serving entities. These resources typically are built by a party with a contract that ensures full payment for the resource regardless of the level of FCM prices.

1.1 Results of the First Two Forward Capacity Auctions

The first FCA (FCA #1) was conducted in February 2008 for the capacity commitment period of June 1, 2010, through May 31, 2011. The second FCA (FCA #2) was conducted in December 2008 for the capacity commitment period of June 1, 2011, through May 31, 2012. Table 1-1 shows that both auctions cleared at the floor price with surplus capacity above the Net Installed Capacity Requirement (NICR).[5] The first FCA closed at the floor price of $4.50/kilowatt (kW)-month and secured 1,772 megawatts (MW) above the 2010/2011 NICR of 32,305 MW. The second FCA closed at the floor price of $3.60/kW-month and cleared 4,755 MW of excess capacity above the 2011/2012 NICR of 32,528 MW. The amounts of demand resources that cleared the two auctions (2,279 MW and 2,778 MW, respectively) exceeded most stakeholders' expectations.[6] Both auctions would have cleared at the floor price with excess capacity without any participation by OOM capacity.

Table 1-1
Results of the First Two Forward Capacity Auctions

Cleared Resources	FCA #1	FCA #2
Generation (MW)	30,865	32,207
Demand resources (MW)	2,279	2,778
Imports (MW)	934	2,298
Total cleared (MW)	**34,077**	**37,283**
NICR (MW)	32,305	32,528
Excess cleared (MW)	**1,772**	**4,755**
Out of Market (MW)	**40**	**1,270**
Price ($/kW-month)	**4.50**	**3.60**

Figure 1-1 shows that both auctions qualified many more new and existing capacity resources than needed to meet the reliability requirement.[7] The qualified new capacity exceeded the cleared new capacity by 400% in FCA #1 and 130% in FCA #2, and the total of existing and new qualified capacity exceeded the NICR by 21% in FCA #1 and by 32% in FCA #2. Figure 1-1 also shows that total capacity in the amount of 15% of the cleared capacity qualified but did not clear in both auctions. This supports the conclusion that the FCM is attracting sufficient interest from new resources to both meet the objectives of procuring sufficient resources and to do so at a reasonable price.

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[5] (1) The floor prices for the auctions (i.e., the capacity clearing price collar or minimum-allowable auction prices) are available online at http://www.iso-ne.com/markets/othrmkts_data/fcm/doc/fcm_pricing_thresholds.pdf. (2) The auction clearing prices are posted at http://www.iso-ne.com/markets/othrmkts_data/fcm/cal_results. (3) Net ICR values are the ICRs for the region, minus the interconnection benefits associated with the interface ISO New England has with Hydro-Québec Phase I/II Interface (HQICC).

[6] For example, the FCM rule developed in 2006 anticipated an "all or nothing" dispatch of active demand resources by load zone, an approach that was acceptable for a relatively small quantity of active demand resources that was anticipated in 2006. With over 2,000 MW of active demand resources, ISO's operational assessment concluded that this approach needed to be refined to ensure system reliability. The ISO has since worked with the stakeholders to modify the market rules and the implementation of the modified market rule will be in place by June 1, 2010.

[7] For the purpose of discussing auction results, the distinction between *new* and *existing* resources is based on the treatment of resources in the auctions (except that some resources are treated as existing although they were treated as new in the auction). A new resource that cleared in FCA #1 is treated as an existing resource in FCA #2.

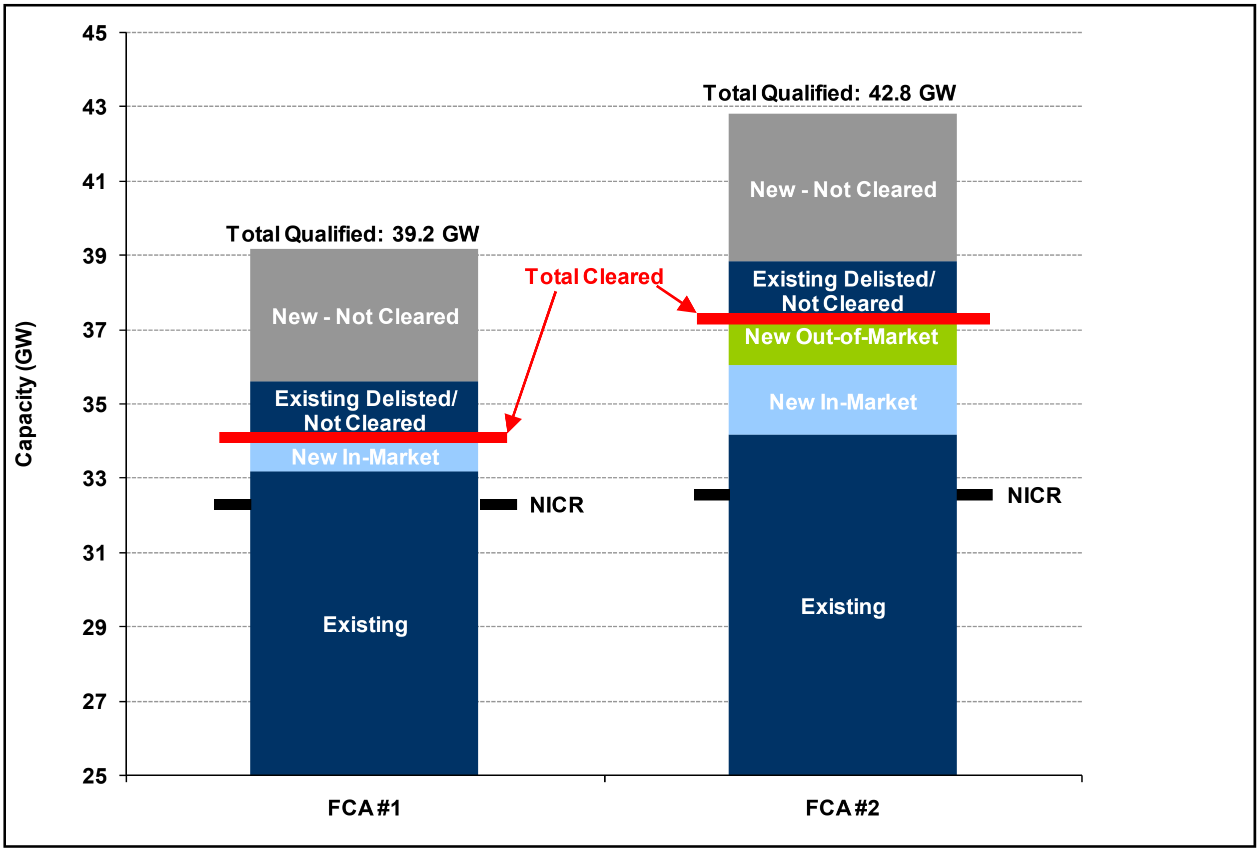

Figure 1-1: Total qualified and cleared resources for the first two Forward Capacity Auctions.

Note*:* *In-market* resource behavior in the FCA is based on their costs and expectations of future revenues. *Out-of-market* resources choose to remain in the auctions no matter how low the price drops.

Several conclusions about the competitiveness of the FCM can be drawn from the results of the first two FCAs. First, clearing at the floor price in both auctions is consistent with the large amounts of surplus capacity that cleared in each auction (1,772 MW in FCA #1 and 4,755 MW in FCA #2). Additionally, because of the large amount of new, in-market resources (primarily new demand resources) that remained in the auction until the floor price was reached, both FCA #1 and FCA #2 would have cleared at the floor price even if no out-of-market resources had participated in the auctions. This indicates that the FCAs successfully attracted sufficient new resources for the auctions to be considered competitive. Another important conclusion is that, to date, the FCAs have successfully retained existing resources, including those that have Reliability Agreements.[8] Of the 3,200 MW with Reliability Agreements as of January 1, 2007, the only resources that sought to leave the market and had to be retained for reliability reasons were the two Norwalk Harbor units that participated in FCA #1 for a total of 330 MW.

The results of the first two FCAs indicate that the market for new resources is competitive, an important assumption underlying the FCM. In addition to the 900 MW of new resources that cleared the market in FCA #1 and the 3,134 MW of new resources that cleared in FCA #2, approximately 3,600 MW of

[8] One way the ISO maintains long-term reliability is to administer FERC-approved agreements, called Reliability Cost-of-Service Agreements (Reliability Agreements), which compensate eligible resources with monthly fixed-cost payments for maintaining capacity that provides reliability services and for ensuring that these resources will continue to be available. These resources, which are needed for reliability but cannot recover their costs through the electric energy and ancillary services markets (i.e., for regulation service and reserves), require this out-of-market compensation.

additional capacity qualified for FCA #1, and an additional 4,000 MW qualified for FCA #2 and did not clear. This indicates that the supply of new resources was robust. As described in Section 4, the qualified resources had various technologies and locations with a broad range of costs reflected in offer prices.

One of the most interesting results of the first two FCAs (as discussed in Section 4) was the large amount of demand-resource capacity that cleared in each auction. Capacity from these resources represents about 7% of NICR for FCA #1 and 9% of NICR for FCA #2, respectively. Demand resources improve the efficiency with which the region uses capacity. The region's low load factor (i.e., the ratio of the average hourly load during a year to peak hourly load, such that a significant amount of capacity is needed in only a very few hours), means that a significant opportunity exists to improve the efficiency with which the region uses capacity. The analysis shows that the large amount of demand resources that cleared the first two FCAs is consistent with the region's load factor and load shape.

1.2 Capacity Zones

The FCM was designed to procure sufficient resources to meet resource adequacy needs both New England-wide and for capacity zones within New England. The FCA enables import-constrained zones, which have insufficient capacity, to have higher prices when necessary to attract new resources. Capacity zones are identified before each auction and are included in the auction only if the local sourcing requirement (LSR) is greater than the amount of existing capacity located within the zone. As part of the FCA process, the ISO reviews *delist bids* submitted by existing resources that want to opt out of the auction and do not want the capacity obligation below a certain price. The ISO reviews delist bids that would clear the auction to determine whether the system will be reliable without the resource. If the resource is needed for reliability reasons, the delist bid is rejected, and the resource is paid an out-of-market payment.

The INTMMU has identified two potential improvements related to capacity zones. The first addresses the alignment of the resource adequacy and reliability criteria used in defining zones in the FCA and those used in the ISO's reliability review of delist bids. The second relates to how and when capacity zones are defined and used in the FCA.

1.2.1 Resource Adequacy and Reliability Review Criteria

For the FCM's locational signals to work correctly, the INTMMU recommends that the reliability criterion used in determining the FCM zones be the same as the zonal reliability criteria the ISO uses to review delist bids in the auction.[9] If these criteria are not the same (for example, in FCA #1, the ISO reliability review criterion used to review delist bids was more stringent than the criterion used to determine whether Connecticut should be a zone in the auction), resources will likely be paid out of market to maintain reliability. This undermines one of FCM's objectives of minimizing out-of-market payments and relying on market prices to ensure adequate resources.

1.2.2 Zone Definition

Currently, capacity zones are defined before the auction. Ideally, in the absence of market power, all zones would be included in the auction. To meet the zonal and regional resource requirements, the auction would identify the most efficient solution in which the lowest-cost resources would clear and the higher-

[9] These reliability reviews of delist bids primarily at the zonal level generally are based on the Transmission Security Analysis (TSA) studies conducted by the ISO Resource Adequacy Department. The INTMMU also recognizes that very local, small areas within a zone may need voltage or stability support to meet reliability needs. The FCM was not intended to address these needs, and attempting to modify the FCM design to address these micro-zonal issues is inappropriate.

cost resources would not, whether or not they were new or existing resources. Existing resources interested in delisting could leave during the auction, cause zonal price separation, or do both.

However, the potential efficiencies of this ideal approach are outweighed by market power concerns, particularly in concentrated, constrained zones. If zones were defined during the auction rather than before, all delist bids could set the price and cause price separation. This would provide large suppliers an incentive, particularly in constrained zones, to withhold capacity by submitting "static" and "dynamic" delist bids to create a zone and increase the price received by their other resources within the zone.[10] This is a relatively low-risk strategy because static and dynamic delist bids remove resources from the market for only one year. In the opinion of the INTMMU, the risk of the exercise of market power outweighs the potential efficiency improvement of permitting a static or dynamic delist bid to set the price and create a zone. "Permanent" delist bids, once cleared, prevent a resource from participating in any future FCA.[11] This imposes a significant cost on those entities that might submit permanent delist bids to exercise market power. For this reason, the INTMMU recommends allowing permanent delist bids to affect the creation and pricing of zones in the FCA to improve zonal price formation. However, the design and implementation of this approach is likely to be complex and should be thoroughly investigated.

1.3 Alternative Price Rule

One of the FCM design goals is to ensure that the FCA clearing price reflects the cost of new entry (CONE) when new entry is needed.[12] The Alternative Price Rule (APR) was included in the market design to help prevent OOM resources from setting artificially low prices. OOM entry includes self-supplied resources and other resources that remain in the auction no matter how low the price, typically because they have a contractual commitment that covers some or all of their costs. The APR provides for price adjustments when new entry is needed but is prevented from setting the price in the FCA because out-of-market entry is sufficient to meet the need. If the quantity of OOM capacity offered is greater than the quantity of new capacity required, prices are likely to be much lower than the market-based competitive cost of new entry. In the longer term, this could result in too few resources, as existing resources may leave the market and new resources will not enter. This is important because the amount of new capacity needed is relatively small each year and can be exceeded by OOM capacity fairly easily.

1.3.1 Description of the APR

Currently, the APR is triggered and the price is adjusted to a more competitive level only when three conditions are met: (1) new capacity is needed, (2) the supply of available resources is adequate to meet the capacity requirement (the NICR) and (3) cleared OOM capacity exceeds the new capacity requirement (NCR), such that no in-market capacity has the opportunity to clear and set prices.[13] Meeting all these conditions means that prices should have been based on in-market new entry but were not. When these conditions are met, the APR is triggered as a post-auction price adjustment. The APR raises the capacity clearing price to the lesser of the CONE or the price at which the last new capacity resource withdrew

[10] *Static delist bids* are submitted for a resource before the auction and cannot be changed during the auction. They may reflect either the cost of the resource or a reduction in ratings as a result of ambient air conditions. *Dynamic delist bids* are submitted by participants during an auction. (See Section 3.2.1 for additional information.)

[11] As of the date of the permanent delisting, permanently delisted resources are prohibited from assuming any capacity obligation.

[12] The *cost of new entry* is a threshold price used to calculate the starting price for each FCA. These prices are based on the estimated fixed costs for developing capacity resources in the region and the clearing price of previous FCAs (see Section 5.4).

[13] According to the market rule (Section III.13.2.8), an import-constrained capacity zone is considered to have inadequate supply if the maximum amount of capacity offered within the capacity zone during an FCA is less than the amount of new capacity required in that capacity zone. The region will be considered to have an inadequate supply systemwide if the maximum total amount of capacity offered in an FCA is less than the ICR (net of HQICCs).

from the auction minus $0.01. The tension between the OOM capacity and the need to have the FCA price set by market-based new capacity is one of the FCM's greatest challenges.

While some OOM capacity participated in the first auction, OOM capacity exceeded 1,000 MW in FCA #2. This large amount of OOM entry has raised concerns about the effectiveness of the APR, since it was not triggered in either auction. However, since more than enough new resources remained in the auction, not triggering the APR was appropriate.

1.3.2 INTMMU Recommendations for the APR

The INTMMU has reviewed the APR and recommends several changes to help ensure that the FCM meets its goal of having the price set by new entry when the region needs new entry. First, the triggering conditions should be modified to properly account for multiyear effects of OOM resources that clear in a single year and eliminate the need for new entry in subsequent years. Second, the adjusted price should apply only to existing capacity, not to OOM new capacity.[14] Allowing the OOM entrants to receive the APR-adjusted price encourages OOM entry and distorts auction results. Limiting payment to OOM resources to the auction clearing price would discourage potential self-supply and encourage bilateral contract-based entrants to offer closer to their true costs, with entry contingent on clearing in the auction. This would not eliminate the exercise of buyer market power, but it would discourage it.

Third, the APR price adjustment no longer needs to be capped by the CONE, since competitive offers by new entrants should provide a competitive cap. Fourth, because the APR cannot adjust the price to a perfectly competitive level, it is appropriate to monitor the effectiveness of the APR over time and to identify ways to improve monitoring, mitigation, and incentive mechanisms.

1.3.3 The Price Collar and the APR

The price collar was included in the FCM Settlement Agreement to protect against extremely high or extremely low clearing prices during the initial auctions.[15] As a result of the decline in the need for capacity and a large amount of demand resources clearing in the auction, the floor price was reached in both FCAs. The price collar will expire after the third auction, and the INTMMU supports the expiration of the collar as planned. In fact, the large amount of surplus argues that removing the collar is essential for determining the equilibrium price for capacity. Extending the collar may raise the short-term price of capacity unnecessarily. It also may discourage resources from permanently delisting or retiring, thereby hindering the development of new, more-efficient investment because a floor price increases prices from what they would be otherwise. This may be enough to keep older, existing resources in operation rather than retiring. If these resources do not retire, new, more efficient resources would not be needed.

Instead of a price collar that is in effect for all auctions, the INTMMU supports additional changes to the APR to offer some price certainty to existing resources when the price is artificially depressed by the OOM resources. Applying a price floor only when the APR is triggered is superior to a price collar that affects all auctions because it achieves the same objective of protecting existing capacity against extremely low prices while allowing new capacity to competitively set the price below the price floor.

The APR and the INTMMU's recommendations are discussed in more detail in Section 3.2.2.3 and Section 5.2, respectively.

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[14] There is no in-market new capacity because the APR is triggered only when OOM new capacity and past excess are sufficient to exclude all new in-market capacity.

[15] (1) *Price collars* are the maximum- and minimum-allowable capacity clearing prices. (2) ISO New England Inc., *FCM Settlement Filing*, Docket Nos. ER03-563-000, et al. (March 6, 2006).

1.4 INTMMU Recommendations for Demand Resources

Given the large amount of capacity from demand resources that cleared the market, the INTMMU examined the comparability of the treatment of demand and generation resources under the FCM. If the payment, incentive, and penalty structures are not comparable, one or the other resource type might be able to provide capacity at artificially low prices and might have insufficient performance incentives. If the differences are significant, they could result in inefficient capacity prices and reliability problems.

In general, the INTMMU found that demand and generation resources have comparable performance requirements and penalty structures but that generation has stronger performance incentives. Generation resources that do not respond during shortage conditions face losses of both capacity and energy revenues. Moreover, these resources are subject to a *peak energy rent* (PER) deduction whereby their capacity payments are reduced by the difference between the locational marginal price (LMP) and the PER threshold (i.e., strike) price for all hours when the LMP exceeds the threshold price. Thus, generators that are not available when the LMP exceeds the PER threshold price lose both capacity revenues and energy revenues.

Demand resources that fail to reduce load during shortage conditions also face the loss of capacity revenues similar to the losses generation resources face. However, demand resources do not currently participate in the electric energy markets, and the capacity payments to demand resources are not reduced by the PER deduction. Thus, demand resources are not subject to the same financial incentives as generation and have weaker incentive to perform. This difference could diminish market efficiency.

To improve the efficiency of the market more generally, the INTMMU recommends adopting the PER deduction for all demand resources and enabling these resources to participate in the electric energy market. This recommendation should be included in the region's discussion and development of price-responsive demand programs for the period after June 2010 when the first capacity commitment period begins. Under this recommendation, demand resources would be permitted to offer into the electric energy market, and they would be paid for the energy they reduce at a price that would result in efficient energy market outcomes—generally the LMP minus the resource's retail rate. This approach has multiple efficiency benefits:

- It makes the capacity market compensation more comparable for demand and generation resources.
- It increases the incentives for demand resources to be available.
- It improves efficiency in both the energy and capacity markets.

Enabling demand resources to participate in the energy market helps improve efficiency by reducing or eliminating the need for relying on administrative rules to dispatch demand resources. By having demand resources bid into the energy market, those that bid their energy at lower values will be dispatched more often, and those that bid the energy at higher values will be dispatched less frequently.

1.5 INTMMU Recommendations for the Cost of New Entry

In principle, the FCM design is intended to let new entry determine the capacity clearing price. In the FCA rules, FCA clearing prices determine the CONE for the next auction, which is used to set auction starting prices as well as the price collars, the floor price in the Alternative Price Rule, offer thresholds for market monitoring reviews, the quantity for replacing delisted capacity, and credit requirements.

The initial CONE value used in FCA #1 was based on an estimate of the cost of a new peaking generator. The FCM rules require the CONE to be adjusted annually after each successful FCA to incorporate the new information about the CONE contained in the auction clearing price.

The INTMMU recommends that the use of the CONE to set the auction starting price be separated from the other uses of the CONE. Generally, the starting price for a descending-clock auction should be set high to ensure sufficient competition in the descending-clock auction. The starting price for FCA #1 was set at twice the CONE or $15.00/kW-month. Yet the first two auctions closed at the floor price and included over 2,000 MW of demand resources. The CONE now stands at $4.918/kW-month. This number is significantly below most estimates of the cost of new entry for generating resources. Given that robust participation from new generating resources is necessary to ensure a competitive market, the starting price must be high enough to attract their participation in the auction. Since significant differences are apparent between the prices at which new demand resources and new generation resources stay in the auction, the auction starting price should be decoupled from the CONE and set at a level high enough to ensure that both generation and demand will enter and create a competitive auction.

The INTMMU suggests that the starting price be set at a minimum of $15.00/kW-month. A formula for adjusting the starting price also should be developed; a simple mechanism, such as adjusting the starting price for a construction cost index, could be used, or the mechanism could be more complex.

The INTMMU did not find any evidence in the first two auctions that supports changing the other uses of the CONE (i.e., for determining offer thresholds for market monitoring reviews of delist bids, in the Quantity Rule for deferring the replacement of delisted capacity, and in determining credit requirements) as long as the CONE continues to stay at its current value of $4.918/kW-month.[16] The $4.918 level is still high enough to warrant reviews of delist bids down to 0.8 × the CONE. The INTMMU has not yet had any experience with the Quantity Rule, so it is premature to change the CONE's use for this purpose. The CONE's use in setting credit requirements remains appropriate because these requirements should be based on the amounts resources are being paid. However, if the CONE drops much below its current level, a review of the use of the CONE for these purposes would be appropriate. Finally, as noted above in the discussion on the APR, the INTMMU recommends discontinuing the use of the CONE as a cap in setting the price under the APR.

[16] (1) To limit the potential for market power by existing suppliers under certain conditions, the Quantity Rule shifts some of the capacity purchased from the primary auction to a reconfiguration auction; see Section 3.2.2.1. (2) The value of CONE is projected to stay at $4.918 for several auctions given the current surplus because the CONE only is adjusted if new capacity is needed; see Section 5.4.

Section 2
Introduction

The Forward Capacity Market (FCM) is ISO New England's (ISO's) locational capacity market intended to send competitive price signals to attract new investment in capacity resources and retain existing resources required to ensure resource adequacy. The overall objective of the FCM is to ensure that adequate resources are available to meet customers' needs for reliable electric energy by the most efficient combination of existing resources and new investments in generating capacity and demand resources. The FCM provides a market structure to attract investment in new generating capacity and to price capacity resources.

This report meets the requirement in Section 5 of the FCM Settlement Agreement that the ISO's Internal Market Monitoring Unit (INTMMU) issue a full report analyzing the operations and effectiveness of the FCM 180 days after the second Forward Capacity Auction (FCA):[17]

> "No later than 180 days after the second FCA is conducted, the ISO's Internal Market Monitoring Unit ("Market Monitor") shall file with FERC [Federal Energy Regulatory Commission] and post to the ISO's website a full report analyzing the operations and effectiveness of the Forward Capacity Market. Thereafter, the Market Monitor shall report on the functioning of the Forward Capacity Market in its annual markets report submitted to FERC pursuant to Section 11.3 of Appendix A to Market Rule 1."

This report provides an overview of the FCM design and an initial assessment of the effectiveness of the FCM in achieving its objectives based on the available FCA results and market experience to date. The analysis addresses theoretical and empirical aspects of the market based on the FCA results and incorporating inputs obtained through INTMMU's interviews with the states and stakeholders. The analysis helps identify opportunities for improvement within the FCM framework.

This report is organized as follows: Section 3 presents the background and summary of the Forward Capacity Market design, Section 4 presents an analysis of the results of the first two auctions, and Section 5 presents an analysis of key issues and recommendations. An appendix summarizes stakeholder inputs and concerns. Key terms are italicized and defined within the text and footnotes.

[17] ISO New England Inc., *FCM Settlement Filing*, Docket Nos. ER03-563-000, et al. (March 6, 2006).

Section 3
Overview of the Forward Capacity Market Design

This section provides information on the development of the Forward Capacity Market and summarizes the key design features of the market, including the qualification process, the structure and mechanics of the Forward Capacity Auctions, and reconfiguration auctions. It also discusses features of the capacity product.

3.1 Background

The development and implementation of capacity markets in New England began in 1998 when the ISO began operating a bid-based market for installed capacity (ICAP). In 2002, the Federal Energy Regulatory Commission charged the ISO with developing a capacity market to address reliability issues in New England, emphasizing location as an important consideration in ensuring optimal investment in resources.[18] In an order issued on April 25, 2003, FERC found that the then-existing capacity market in New England may not allow suppliers in constrained areas to earn adequate revenue to recover their costs and determined that the ISO should develop a market-type mechanism to incorporate a location-specific capacity requirement and phase out the "Reliability-Must-Run" agreements (RMR agreements, now referred to as Reliability Agreements).[19] FERC directed the ISO to file by March 1, 2004, for implementation by June 1, 2004, a mechanism that implemented locational capacity requirements or a resource adequacy market so that installed capacity in the region and constrained areas would be appropriately compensated for reliability.[20]

The ISO and the region's stakeholders began an extensive process to implement FERC's order. On March 1, 2004, the ISO made its filing, proposing a locational installed capacity (LICAP) mechanism that would add a locational element to the existing ICAP market, in compliance with FERC's order.[21] This filing, however, was not approved but resulted in a settlement agreement negotiated before a FERC settlement judge involving numerous stakeholders, including state officials, utility companies, generating companies, consumer representatives, regulators, and other market participants.[22] On June 16, 2006, FERC approved the agreement, which provided a framework for drafting the Forward Capacity Market rules.[23] FERC approved the initial FCM rules on April 16, 2007.

The INTMMU's aim for this report is to help stakeholders better understand the FCM and to assist in improving the market.

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[18] SMD Order. FERC Docket Nos. ER02-2330-000 and EL00-62-039 (September 20, 2002). p. 37.

[19] One way the ISO maintains long-term reliability is to administer FERC-approved Reliability Cost-of-Service Agreements (Reliability Agreements). These agreements compensate eligible resources with monthly fixed-cost payments for maintaining capacity that provides reliability services and for ensuring that these resources will continue to be available. Resources, needed for reliability but that cannot recover their costs through the electric energy and ancillary services markets (i.e., for regulation service and reserves), require this out-of-market compensation.

[20] *Devon Power LLC, et al.*, 103 FERC ¶ 61,082 (2003) (April 25 Order).

[21] *ISO New England, Inc.*, Locational Install Capacity (LICAP) Market filing, ER03-563-000 (March 1, 2004).

[22] Settlement Agreement, Docket Nos. ER03-563-000, -030, and -055 (March 6, 2006).

[23] *Devon Power LLC,* 115 FERC ¶ 61,340, *order on reh'g*, 117 FERC 61,133 (2006).

3.2 Summary of the FCM Design

The Forward Capacity Market is a mechanism set up to procure just enough installed capacity to meet the region's reliability criterion, the Installed Capacity Requirement (ICR).[24] In practice, for each one-year capacity commitment period, a Forward Capacity Auction is conducted to procure the Net Installed Capacity Requirement (NICR) of the New England Balancing Authority Area, which is the ICR for the region minus the interconnection benefits associated with the Hydro Québec Phase I/II Interface.[25] The FCM design incorporates several key features:

- Demand and intermittent resources compete equally with traditional generation resources to provide capacity. This limits the potential for market power in the capacity and electric energy markets while enhancing economic efficiency.

- Resource adequacy is addressed at both the regional level and the capacity zone level.[26] In the FCA, import-constrained zones can have higher prices if needed to attract sufficient new resources. Export-constrained zones can have lower prices if they have too much capacity. Locational price signals provide incentives for new resources to be located where and when new capacity is needed. Before the auction, the ISO determines for the first year of the commitment period the local sourcing requirements (LSRs). During the auction, it procures the capacity required for each capacity zone identified before the auction.

- A three-year forward commitment period facilitates the participation of new capacity resources and fosters competition among new capacity proposals.[27] The primary auction for capacity procurement takes place approximately three years (40 months) before the commitment period begins. However, to limit the length of the FCM transition period, the first two auctions were held in February and December 2008 for the 2010/2011 and 2011/2012 commitment periods. Subsequent auctions gradually will reach the 40-month planning period.

- New proposed capacity projects compete in the market, set capacity clearing prices, and have a choice of an extended commitment period ranging from one to five years. That is, new capacity can have an *N*-year commitment, where the supplier chooses an *N* between one and five years at the time of qualification. Both new and existing capacity resources are paid the same market-clearing price in the first year, provided that competition is sufficient and supply is adequate. The price paid to new capacity after the first year is indexed for inflation. (Existing capacity participates in the auction each year and has a one-year commitment.)

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[24] The resource adequacy requirement is set at a level that can be expected to avoid the loss of load more than one time in 10 years resulting from insufficient resources.

[25] The *capacity commitment period* is the one-year period from June 1 through May 31 of the following year, starting with the period 2010/2011. According to the North American Electric Reliability Corporation (NERC), a *balancing authority area* is a group of generation, transmission, and loads within the metered boundaries of the entity (*balancing authority*) that maintains the load-resource balance within the area. Balancing authority areas were formerly referred to as *control areas*. (See the NERC glossary at http://www.nerc.com/docs/standards/rs/Glossary_12Feb08.pdf (accessed April 21, 2009).

[26] A *capacity zone* is an area that has a locational capacity need determined as a result of FCA models. This need could be either a *local sourcing requirement* (LSR), which is the minimum amount of capacity that must be located in an import-constrained load zone (that has an insufficient capacity) or a *maximum capacity limit* (MCL), which is the maximum amount of capacity that can be located in an export-constrained area (that has a surplus of capacity).

[27] The planning period is the time between when the auction is held and when the supply commitment begins. During the transition period, the first auction (held in February 2008) was about 28 months before the capacity commitment year that begins in June 2010.

- A simultaneous descending-clock auction is used to determine the capacity clearing prices and the capacity suppliers for each zone. A starting price for the auction is specified before the auction begins. The starting price is 2 × the cost of new entry (CONE), where CONE = \$7.50/kW-month in the initial auction. The auction clearing price is used to update the CONE in subsequent auctions.[28]

The four major components of the FCM design are resource qualification, Forward Capacity Auctions, reconfiguration auctions, and the capacity product.

3.2.1 Qualification

The purpose of qualification is to ensure that auction participants and the potential projects, including existing and new capacity resources, will be able to credibly provide capacity. Only capacity resources that have complied with the qualification and financial assurance requirements of the FCM are eligible to enter into a Forward Capacity Auction.

Each resource type, including intermittent generation, has a resource-specific set of rules for qualification that permits it to participate in the FCM. Qualification occurs between 13 and five months before the auction. New resources are qualified based on a package of qualification materials the potential bidders submit 13 months before the auction. Existing resources' qualifying capacity is based on historical performance. Before each auction, the ISO informs resource owners of their qualified capacity. The qualification criteria include satisfying credit and other terms. In addition, each qualifying participant must provide the ISO with a financial assurance deposit. Financial assurance is necessary to ensure that new capacity offers will deliver the capacity commitments. The requirement of financial assurances deters a capacity commitment default.

All existing resources are automatically entered into the capacity auction and assume a capacity supply obligation for the relevant commitment period at the lower of their summer- or winter-qualified capacity, unless they submit a "delist bid" that subsequently clears in the auction. A *delist bid* indicates that a resource does not want to assume a capacity supply obligation below the price of the bid. There are five types of delist bids—permanent, static, dynamic, export, and administrative export:

- *Permanent delist bids* are intended for resources that either wish to retire or no longer wish to assume a capacity supply obligation. They are submitted before the auction and cannot be changed during the auction. If a resource's permanent delist bid clears the auction, the resource is prohibited from participating in any future auctions or assuming the capacity supply obligation of another resource in a reconfiguration auction. To help ensure that permanent delist bids are not an exercise of market power, the market monitor reviews permanent delist bids above 1.25 × the CONE to ensure they are consistent with the resources going forward costs.
- *Static delist bids* are intended for resources that wish to leave the capacity market for one year and preserve the option to return to the auction in the future. Like permanent delist bids, static delist bids are submitted before the auction and cannot be changed during the auction. They may reflect either the going-forward cost of a resource or a reduction in ratings as a result of ambient air conditions.[29] To help ensure that static delist bids are not an exercise of market power and that

[28] The FCM Settlement Agreement indicated that the FCM must be designed to allow new capacity to set the clearing price and thus provide a market-based measure of the cost of new entry. (FCM Settlement Filing, p. 3)

[29] *Ambient air delist bids* are those made to reflect that a thermal generator's summer capability is less than its winter capability because high ambient air temperatures can reduce the generator's capacity ratings.

the bids are consistent with a resource's going-forward costs, the market monitor reviews static delist bids that are above 0.8 × CONE.

- *Dynamic delist bids* are, like static delist bids, are intended for use by participants that wish to leave the auction for one year. They need not be submitted before the auction but must be equal to or lower than 0.8 × the CONE. The INTMMU does not review these bids.
- *Export delist bids* are intended for resource that wish to export capacity. These bids have the same rules as static delist bids but explicitly provide for the opportunity cost of selling capacity to another market.
- *Administrative export delist bids* are intended to allow for the multiyear sale of capacity from New England to adjacent regions. In the first year of the sale, the bid is reviewed as an export offer, and the multiyear contract is reviewed. In the second and subsequent years of the contract, an administrative export is submitted, which does not need to be reviewed and is assumed to be priced at the auction starting price to ensure that the bid clears the auction.

The ISO reviews all delist bids for reliability reasons.[30] The ISO also conducts additional reliability reviews during the auction to ensure that all reliability criteria are met.

The rules also provide for resources that wish to retire independent of the auction clearing price. *Nonprice retirement bids* are requests to retire the entire capacity of a generating capacity resource regardless of the price of the FCA. Resources submitting these bids must retire before the commitment period for which the bid was submitted. These requests are subject to review for reliability impacts. If a resource submitting a nonprice retirement bid is needed for reliability reasons, it has the choice of receiving full cost of service or of retiring. However, generating capacity resources that have had a nonprice retirement bid denied for reliability reasons must still retire as soon as practicable after the ISO has determined that the resource is no longer needed for reliability reasons.

3.2.2 Forward Capacity Auction

The FCM addresses resource adequacy at both the regional and local levels. Local sourcing requirements for import-constrained areas are determined before the start of each auction using the GE-MARS simulation model.[31] MARS considers import limitations and treats load and generation probabilistically across many simulations to identify the amount of local supply needed to avoid having inadequate supply for serving load more than one time in 10 years. An LSR is calculated for each load zone.[32] The resulting LSRs are used before the auction to identify import-constrained capacity zones and during the auction for identified capacity zones.[33] If the capacity is greater than the local sourcing requirement, the zone will not

[30] In the reliability review, the ISO also performs a Transmission Security Analysis (TSA). Similar to the preauction LSR determination, the TSA compares load with resources in zones but under different transmission security-based criteria. The TSA defines need using a deterministic "90/10" load forecast plus operating reserves, and it defines supply as the import capability plus outage-derated existing generation and demand-side resources located in the subarea. System operations currently conducts the TSA each day to assess the amount of capacity to be committed day ahead to allow the system to withstand the loss of the largest unit or the loss of the second-most critical transmission element after accounting for the occurrence of the first-most critical contingency. Peak loads with a 10% chance of being exceeded, expected to occur at a weighted New England-wide temperature of 94.2ºF, are considered the 90/10 peak loads.

[31] See RSP08, Section 4, *Resource Adequacy Requirements*; http://www.iso-ne.com/trans/rsp/2008/index.html.

[32] A *load zone* is an aggregation of load pricing nodes within a specific area. New England is divided into the following eight load zones: Maine (ME), New Hampshire (NH), Vermont (VT), Rhode Island (RI), Connecticut (CT), Western/Central Massachusetts (WCMA), Northeast Massachusetts and Boston (NEMA), and Southeast Massachusetts (SEMA).

[33] The LSR is determined in probabilistic terms (not derated for outages), while the TSA is performed in deterministic terms (i.e., with capacity derated for outages). *Probabilistic analyses* reflect the use of statistical estimates of an event taking place. These

be modeled as a separate import-constrained zone in the auction. Export-constrained zones are modeled in the auction. Dynamic descending-clock auctions are used to determine the market clearing prices and the capacity supply obligations for each capacity zone.

The FCAs are conducted in two stages. The first stage involves the simultaneous descending-clock auctions for each zone, an iterative procedure conducted in multiple rounds over the Internet by an auction manager, an external vendor, using vendor-designed software. The resources remain in the auction as the auction price decreases in predetermined rounds until the price is lower than what they require to participate in the market. The starting price in each auction is set at 2 × the CONE, and a series of steps defined with an ending price of 0.6 × the CONE (or the floor price).[34] During these auctions, the auction manager announces prices, one for each of the zonal products being procured. The bidders then indicate the quantities of each product they wish to supply at the current prices. Prices for products with excess supply then decrease, and the bidders again express equal or lower quantities at the new prices; during the auction, bidders are not permitted to increase their supply offers for existing or new capacity resources as prices decrease. This process is repeated until supply equals demand for each capacity product. As a result of this process, FCAs typically begin with excess supply at the start-of-round price for Round 1, and excess supply decreases as the auction progresses and prices decline. The auction closes when excess supply becomes zero, or negative, in all capacity zones and their associated external interfaces or when the price reaches the floor prices.

The auction manager provides a written certification attesting to the accuracy of the FCA results. An auction administrator reviews the certification for completeness. A database management tool, called the Forward Capacity Tracking System (FCTS), automatically uploads the FCA input data file containing the qualification results and downloads the output data file from the first stage of the FCA. The tracking system starts the second stage only after the auction administrator approves the results.

The second stage is auction clearing, which is managed by and under the direction of an ISO auction administrator. During this stage, ISO staff members execute the Market Clearing Engine (MCE) software that determines the minimal capacity payment and calculates the final capacity zone clearing prices. They also execute the post-processing software that determines the final payment rate for each resource and its capacity supply obligations for the capacity commitment period.

Upon successful completion and notification by the post-processing software that the final capacity supply obligations and payment rates have been calculated for each cleared resource, the auction administrator is ready to prepare, verify, and distribute the auction results to the auction participants.

3.2.2.1 Quantity Rule

To limit the potential for market power by existing suppliers under certain conditions, the Quantity Rule shifts some of the capacity purchased from the primary auction to a reconfiguration auction. The amount procured in the primary auction depends on price ranges as shown in the Table 3-1 below.

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analyses explicitly recognize that the inputs are uncertain; thus, the outcome of a probabilistic analysis is a measure of the likelihood of an event taking place. *Deterministic analyses* are snapshots of assumed specific conditions that do not attempt to quantify the likelihood that these conditions actually will materialize. The results are based on analyzing a set of conditions representing a specific scenario.

[34] The floor price is the minimum-allowable auction price and the lower bound of the price collars set by the FCM Settlement Agreement.

Table 3-1
Quantity Rule

Price Range in Capacity Zone	Procured Quantity
Between Start Price and 1.5 × CONE	The full NICR quantity, assuming permanent, static, and dynamic delist bids do not clear the auction.
Between 1.5 × CONE and 1.25 × CONE	The full NICR quantity plus a quantity of capacity to replace permanent delist bids in the primary auction that increases linearly from zero at 1.5 × CONE to the full quantity of permanent delist bids accepted in the primary auction at 1.25 × CONE.
Between 1.2 × CONE and 0.8 × CONE	The full NICR quantity and the full quantity of permanent delist bids plus a quantity of capacity to replace static delist bids in the primary auction that increases linearly from zero at 1.2 × CONE to the full quantity of static delist bids accepted in the primary auction at 0.8 × CONE.
Below 0.8 × CONE	The full NICR quantity and all accepted permanent, static, and dynamic delist bids.

3.2.2.2 Inadequate Supply or Insufficient Competition Conditions

While the two FCAs to date were competitive and had adequate supply, it is possible for an FCA to be characterized as having “inadequate supply” or “insufficient competition.”

Inadequate Supply. Inadequate supply arises when new capacity in a capacity zone at the FCA’s starting price is less than the new capacity requirement (NCR) for that zone. In such events, existing capacity in this zone is paid 1.1 × the CONE, new capacity in this zone is paid the starting price, and the capacity deficiency will be made up in subsequent reconfiguration auctions. A resource that requested to delist but had its bid denied in this zone is paid its bid price or 1.1 × the CONE, whichever is higher. Inadequate supply in one or more capacity zones does not affect the FCAs for capacity zones containing adequate supply.

If the systemwide NICR cannot be satisfied at the starting price, existing capacity is paid 1.1 × the CONE, new capacity is paid the starting price, and the capacity deficiency is made up in subsequent reconfiguration auctions. A resource that requested to delist but had its bid denied is paid its bid price or 1.1 × the CONE, whichever is higher. Systemwide inadequate supply does not affect the FCAs for capacity zones having adequate supply, except that in capacity zones with adequate supply, new capacity is paid the capacity clearing price and existing capacity is paid the lower of the capacity clearing price or 1.1 × the CONE.

Insufficient Competition. An FCA is considered to have insufficient competition systemwide or within any capacity zone when the amount of existing capacity is less than the NICR (or the LSR, as applicable for a particular zone), and one of the following conditions exists at the starting price:

- Less than 300 MW of new capacity is offered (to be reconsidered in the case of the creation of import-constrained zones having a total requirement of less than 5,000 MW).
- The amount of new capacity offered is more than the new capacity required but less than twice the new capacity required.

- The new capacity of at least one market participant is pivotal, excluding OOM capacity.[35] A market participant is considered pivotal if, at the starting price, any of that participant's potential new capacity is required to satisfy the NICR (or the LSR, as applicable).

If the FCA has insufficient competition, new capacity will be paid the capacity clearing price, and existing capacity will be paid the lower of the capacity clearing price or 1.1 × the CONE.

3.2.2.3 Alternative Price Rule

One of the FCM design goals is to ensure that the FCA clearing price reflects the cost of new entry when new entry is needed. The Alternative Price Rule (APR) was included as a mechanism to adjust the capacity clearing price when new entry is prevented from setting it. The capacity clearing price can be adjusted only when all of the following conditions (triggers) are satisfied:

- New capacity is needed in the relevant capacity commitment period (i.e., when the new capacity required > 0). The new capacity requirement is the difference between the amount of capacity needed to meet reliability criteria (i.e., an LSR or the ICR) and the total amount of existing capacity in the capacity market, excluding resources that are permanently delisted.
- The supply of resources is sufficient; the FCA does not have inadequate supply or insufficient competition.
- The total amount of out-of-market capacity that cleared at the capacity clearing price exceeds the amount of new capacity needed (i.e., OOM > NCR).

These three conditions combined are designed to indicate when OOM capacity has prevented in-market new entry from setting the capacity clearing price when it otherwise would have. Thus, if all conditions are satisfied, the price is adjusted upward after the auction. The price is adjusted to the lesser of the CONE or the price at which the last in-market new capacity resource withdrew from the auction minus $0.01.

3.2.3 Reconfiguration Auctions

Reconfiguration auctions enhance market liquidity. Reconfiguration auctions provide secondary markets for adjusting the commitments made in the forward auction to respond to changing market circumstances as a capacity commitment period approaches. For each capacity commitment period, the ISO conducts two types of reconfiguration auctions:

- Annual reconfiguration auctions (for trading year-long commitments) before the relevant commitment period.
- Monthly reconfiguration auctions held before each commitment month.

Reconfiguration auctions allow deficient suppliers to procure replacement capacity and allow the ISO to buy additional capacity, if the load forecast increases, or sell back capacity, if the forecast decreases. They also allow the ISO to procure replacement capacity for delist bids that were cleared but deferred from the

[35] Out-of-market resources are those that participate in the FCM at prices below their cost no matter how low the auction price drops; they may be contracted by states or be self supplied by load-serving entities. OOM capacity equals the sum of (a) capacity procured through ISO-issued RFPs; (b) new capacity offers below 0.75 × the CONE that the INTMMU found to be lower than the resource's long-run average costs, net of revenues from other electricity markets; (c) new self-supplied generating and import capacity, and (d) in import-constrained zones, carried-forward excess capacity from the previous FCA. Carried-forward capacity refers to the portion of a resource that cleared in an import-constrained region in a previous auction in excess of the LSR.

FCA because the clearing prices were high in the FCA. These reconfiguration auctions use a static double auction while preserving the locational elements of the primary auction.

3.2.4 Capacity Products

In the Forward Capacity Market, the capacity products include systemwide and zonal generation, demand resources, and imports. Each type of capacity product is associated with a specific capacity supply obligation that involves performance measurement, incentives, and penalties.

3.2.4.1 Capacity Zone Definition

The assessments of the local sourcing requirements and maximum capacity limits that are conducted before each FCA are based on network models using transmission lines that will be in service no later than the first day of the relevant capacity commitment period. The LSRs and MCLs are compared with the projected total amount of capacity in each load zone for the capacity commitment period to determine whether separate zones must be modeled in the FCA. Once determined, capacity zones can comprise a single or several load zones but not *subzones* (i.e., aggregations of load pricing nodes within a specific area).

3.2.4.2 Demand Resources

Demand resources are measures that reduce consumer demand for electricity from the bulk power system, such as using energy-efficient appliances and lighting, advanced cooling and heating technologies, electronic devices to cycle air conditioners on and off, and equipment to shift load to off-peak hours of demand. They also include facilities that can temporarily curtail load when directed to by the ISO, and the use of electricity generated on site (i.e., *distributed generation*).

To allow demand resources to compete with generation resources, the FCM accommodates the participation of both active and passive demand resources. An *active* demand resource is a resource designed to reduce load in response to real-time system conditions or ISO instructions. A *passive* demand resource, such as an energy-efficiency program or a distributed generation project, reduces load, for the most part, continually, but not in response to real-time conditions or instructions. Active demand resources include the Real-Time Demand-Response Program and real-time emergency generation (RTEG).[36]

[36] (1) *Demand response* in wholesale electricity markets occurs when market participants reduce their consumption of electric energy from the network in exchange for compensation based on wholesale market prices. (2) For the Real-Time Demand-Response Program, active demand resources receive dispatch instructions from the ISO to reduce electricity consumption. (3) RTEG is distributed generation that the ISO calls on to operate during certain voltage-reduction or more severe actions but must limit its operation to comply with the generation's federal, state, or local air quality permit(s), or combination of permits. Real-time emergency generators are required to begin operating within 30 minutes, which results in increasing supply on the New England grid, and also to continue that operation until receiving a dispatch instruction allowing them to shut down. Because real-time emergency generators are allowed to run only during voltage-reduction or more severe actions, the market rules limit their total obligation to 600 MW.

3.2.4.3 Capacity Supply Obligation

In the FCM design, a capacity supply obligation is a commitment to be available to supply electric energy during shortage events, and capacity payments are based on each resource's performance during such events.[37] A capacity product is defined by several factors:

- Availability metrics based on performance during shortage events
- Financial obligations to provide electric energy during shortage periods and penalties for nonperformance
- A must-offer obligation in the Day-Ahead and Real-Time Energy Markets.[38]

The capacity product incorporates performance incentives and measurement and penalties for nonperformance. An availability score measures capacity performance during shortage conditions and is adjusted for capacity resources that are not fully available during a shortage event. This applies uniformly to most resources, including generation and imports.[39] Monthly capacity variance (MCV) is monitored to provide incentives to demand resources exceeding their obligation and to assess penalties on demand resources.

Capacity market payments for all generating resources are reduced by the peak energy rent (PER) deduction. *Peak energy rents* are the difference between the LMPs and a threshold (i.e., strike) price, which is an estimate of the cost of the most expensive resource on the system. *Peak energy rents* are accumulated in all hours when prices in the electric energy markets (i.e., the LMPs) go above the PER threshold price. The PER deduction is the sum of all PERs in a year,[40] Because PERs typically occur only when electricity demand is high, the PER deduction discourages physical and economic withholding in the electric energy market; if the owner of a resource withholds to raise price, it loses the energy revenues on that resource, and the high price will not benefit its other resources in the capacity market.

Table 3-2 compares the performance penalties faced by generators with those faced by demand resources. Penalties are collected from unavailable resources into a performance-incentive pool, from which incentives are distributed monthly as credits to overperforming FCA resources. The performance penalties plus the peak energy rent deductions for a listed capacity resource cannot exceed the total payment based on the capacity clearing price in the primary auction.[41] Thus, the capacity performance penalties are capped at the annual capacity payment for the resource owner that assumed the capacity supply obligation during the FCA. The total of a resource's unavailability penalties during each month is capped at 2.5 × the monthly FCA payment, and the total of a resource's annual penalties cannot exceed its total FCA payment minus the PER adjustment for that year. However, underperforming resources are derated for future delivery years and future auctions.

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[37] A shortage event is any period, 30 minutes or more, when the system is considered to be short of operating reserves and the systemwide reserve-constraint penalty factor (RCPF) has been activated. RCPFs help determine the highest level of redispatch costs the system is willing to endure to maintain reserves, A shortage event also can occur when a local operating condition in an import-constrained region must be addressed through an ISO operating procedure (e.g., various actions of ISO Operating Procedure 4 [OP 4], *Action during a Capacity Deficiency*, and OP 7, *Action in an Emergency*). OP 4 and OP 7 are available online at http://www.iso-ne.com/rules_proceds/operating/isone/index.html.

[38] Intermittent resources (e.g. wind power) and demand resources are exempt from must-offer requirements.

[39] Intermittent resources and demand resources are exempt from the unavailability penalties and availability credits.

[40] The PER is applied as a 12-month rolling average. The calculation of the PER adjustment is explained in *Market Rule 1,* Section III.13.7.2.7.1.1.2.

[41] For obligations assumed through bilateral agreements or reconfigurations at less cost than the primary auction price, the penalty can exceed the purchase price.

Table 3-2
Comparison of Penalties[(a)]

Penalty	Generators	Demand Resources
Penalty formula	Penalty per event = annual capacity payment ($) × PF × (1 - Shortage Event Availability Score), *where* Penalty Factor (PF) = 0.05 if shortage event ≤ 5 hours; increased by 0.01 for each additional hour; Shortage Event Availability Score = capacity factor during each shortage event (relative to capacity obligation).	Monthly penalty = Monthly Capacity Variance (kW-month) × FCA capacity clearing price ($/kW-month), *where* Monthly Capacity Variance = capacity supply obligation − monthly Demand-Reduction Value grossed up for losses and reserves; Demand-Reduction Value is the average load reduction (or output) over all performance hours in the month.
Minimum penalty per shortage event	5% of annual capacity payment[(b)]	None
Daily penalty cap	10% of annual capacity payment	None
Maximum monthly penalty	250% of monthly capacity payment	Monthly capacity payment plus an additional penalty of up to 167% for underperformance in each summer month, depending on how many fall and spring months' penalties depend on summer performance.[(c)] Thus, the maximum total monthly penalty is 267%. (Penalties for underperformance in nonsummer months are capped at 1 × monthly capacity payment.)
Maximum annual penalty	Net annual revenues (i.e., annual capacity payment − peak energy rent)	Annual capacity payment
Capacity value derated for future delivery years	Yes, based on past underperformance	Yes, based on past underperformance
Other penalties	A resource may be excluded from the FCA for three years if in a four-year period, it receives three annual availability scores of ≤40% and it is unavailable during 10 or more shortage events. FERC referral for failing to offer capacity into the energy market	None

(a) The table is based on *Market Rule 1*, Section III of the ISO's FERC Electric Tariff No. 3; http://www.iso-ne.com/regulatory/tariff/sect_3/index.html.

(b) Monthly capacity payment = a resource's capacity value (kW) × the capacity clearing price ($/kW-month).

(c) The range above the minimum depends on how many future months use summer performance as a proxy measure. Summer performance determines penalties for fall and spring months with no activations.

3.3 A Theoretical Review of the FCM Design

This section provides a discussion of the economic theory underlying two key elements of the FCM design—price formation and the performance incentives of the peak energy rent deduction. It also reviews the benefits of allowing demand resources to participate in the FCM in a manner similar to supply resources, including increasing the amount of price-responsive demand.

3.3.1 Demand Response and Scarcity Pricing

To provide sufficient operating capacity to meet the region's resource adequacy requirement, suppliers must be confident that market revenues will be sufficient to recover the costs of investing in new assets. Theoretically, if electricity demand is responsive to real-time prices, an "energy-only" market that allows prices to increase unabated when demand is high and resource availability is low would accurately reflect the scarcity value of demand and provide adequate revenue to suppliers.

However, given the barriers to demand response and pure scarcity pricing, FERC has approved price caps that prevent the market from clearing at prices above a certain level. These price caps were instituted primarily to protect against the exercise of market power in the energy market given the relative absence of price-responsive demand in New England. As a result, the current energy and reserve markets alone do not send price signals that are adequate to attract new investment or efficiently compensate existing resources to meet the resource adequacy requirement.

The difference between revenues generated by the current markets and revenues that are expected in an efficient energy-only market with scarcity pricing has been termed the "missing money problem." A capacity market is intended to solve this problem and stimulate ongoing investment in the resources needed to meet long-term electric energy demands. As such, New England's capacity market design under the FCM strives to mimic the revenue outcomes that would occur in an efficient energy-only market.

Aligning the FCM design, which includes demand resources, to produce the outcomes that would otherwise be expected from an efficient energy-only market also helps to restore incentives for greater demand-response participation. The FCM incorporates demand response by including the participation of demand resources on a similar footing to supply resources. This improves competition in the FCM and brings the market closer to what would happen in an energy-only market. It provides a way in which demand can reduce consumption when the value of that consumption is less than the wholesale cost of energy. This happens because the market attracts and retains those customers that are willing to reduce electricity use during shortage conditions and compete with generators in the capacity market. This should lower load during times of system peak and near system peak in much the same way as would an energy-only market. Until technological advances in metering infrastructure and regulatory reform in retail markets offer the potential to significantly improve price-responsive demand and scarcity pricing, the FCM provides an interim mechanism that helps restore the economic incentives for demand to respond and sends price signals that recognize both the demand and supply sides of the market.

3.3.2 Auction Mechanism and Price Formation

At the core of the FCM is the FCA, an auction mechanism that procures annual capacity commitments to meet the resource adequacy requirement (the NICR) and produces competitive price signals to attract new investments. Before each New England auction, reliability assessments external to the market determine the NICR. This resource requirement is announced before the auction's start to ensure that the appropriate amount of resources is procured during the auction.

Because the FCM design relies on competition among unmitigated offers from new entry to determine the market price for new capacity, the participation of a large amount of qualified new capacity that can compete to fulfill the NICR is essential to each auction's success. This type of procurement approach also has been adopted for capacity markets in other RTOs, including PJM and the New York Independent System Operator (NYISO).[42]

[42] PJM Interconnection LLC is the RTO for all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, and the District of Columbia.

Since new entry sets the market clearing price in the FCM, new capacity and existing capacity are compensated at the same level when the market is presumed to be competitive. Linking the prices of new and existing capacity recognizes that all substitute products, independent of vintage or cost differences, command the same price in a competitive market.

This approach is based on the economic model of competitive investment under uncertainty.[43] In principle, the cost of new entry is determined by the net cost of new investment that incorporates the expected net revenues from the energy and ancillary services markets during the commitment period and future commitment periods, including a risk premium. This cost determines the efficient price for all capacity for the commitment period. As a central feature of the FCM, the estimated value of the CONE is adjusted annually to reflect the capacity clearing price of previous successful auctions. In this way, each auction's CONE will reflect prevailing technology choices, market expectations of future returns and risks, and other factors. Market clearing prices from successful auctions over time will then provide a reliable indicator of the CONE, which serves as an indicator for the long-run cost of new investment.

The FCA's reliance on a small amount of new capacity to set a competitive price makes the market vulnerable to large owners of existing capacity and large load-serving entities to move the market clearing price. Therefore, a key emphasis of the FCM design is to ensure that competitive forces, rather than the exercise of market power, determine the capacity price. In conjunction with a competitive energy market, the FCM has been designed to facilitate efficient price formation for the wholesale electricity market to form a strong foundation for competitive transactions in the long term.

If market conditions are not competitive, decoupling the price of existing capacity and the price of new capacity may be appropriate. The FCM design recognizes three conditions when the FCA is not likely to be competitive: (1) inadequate supply, (2) insufficient competition, and (3) situations in which competitive new entry is prevented from setting price in the FCA. These conditions and their remedies in the FCM rule are described in Section 3.2.2.1 and reviewed in Section 5.

Last, the FCM allows existing capacity to delist or leave the market temporarily for one year or permanently. This generally reduces the risk to resource owners and could improve efficiency, allowing for economic decisions on retirement, repowering, upgrades, and exports to be factored into efficient pricing decisions. However, since the capacity of existing resources far exceeds the need for new capacity, delist bids are reviewed to prevent the exercise of market power. The current design addresses physical and economic withholding (at the systemwide level or within any defined capacity zones) through the following measures:

- Competition with potential new capacity by lowering barriers to entry for various types of resources, with the three-year forward period, limited penalties, and the option to lock in first-year revenues for up to five years
- INTMMU review of all static and permanent delist bids above 0.8 × the CONE
- Prohibition of dynamic delist bids above 0.8 × the CONE

[43] A key element is that investment is irreversible. That is, once a piece of equipment has been manufactured or a structure has been built, the asset becomes fixed and costly to change for as long as it is in use. The investment expenditures in power plants, such as siting, permitting, manufacturing, and construction, once incurred, are irreversible and become "sunk" costs. Long-lived power plants, which usually require significant capital investment and long lead times, are particularly exposed to the risks associated with recovering sunk costs. However, once incurred, sunk costs should not influence economic decisions, and doing so could only distort economic efficiency. This explains why existing assets are willing to assume capacity supply obligations at a low price.

The application of the Quantity Rule delays some procurement to the reconfiguration auctions when delist bids contribute to prices being very high in the FCA. Delist bids also are reviewed to avoid the creation of reliability problems.

3.3.3 The Peak Energy Rent Deduction

The peak energy rent deduction is an important element of the FCM design that is intended to discourage the exercise of market power in the energy market. With PER, capacity payments will be reduced for all generation resources when prices in the energy market go above a certain threshold level (i.e., strike price), which usually occurs when electricity demand is high. The PER deduction encourages a resource to produce electricity during periods of high demand or emergency conditions because the deduction applies unilaterally to all generating resources whether or not they are producing during these time periods.

In addition, the capacity markets with PER deductions reduce a supplier's risk of participating in the FCM compared with a market design that does not explicitly treat peak energy rents. To illustrate, consider a supplier that needs to recover its fixed cost (FC) from the sum of its capacity payment (CP), PER, and inframarginal rent (IMR).[44] That is, FC = CP + PER + IMR. Since both PER and IMR are uncertain, without the PER deduction, the supplier must estimate both PER and IMR to determine its price in the capacity market. In general, PER is more volatile than IMR because the system peak conditions are weather sensitive. The PER tends to be low in most months but high during the occasional peak periods.[45] Moreover, IMR is near zero for peaking units, so IMR should not be a significant source of risk for these units. Baseload plants are more dependent on IMR but can absorb the daily price fluctuations when the annual average IMR is fairly predictable. With the PER deduction, the supplier would internalize the effects of the deduction and evaluate PER at exactly zero when deciding on its bid. As a result, the capacity payment would reflect the expected PER, or CP = FC – IMR, in market equilibrium. This reduces the uncertainty, in particular, for the peaking units; because their IMR is zero, estimating the PER is not needed and their offers need only reflect the fixed cost. In effect, this works like a forward contract that reduces the risks for all suppliers.

The PER deduction also eliminates the financial motivations for exercising market power in the electric energy market, especially during peak periods. This is because a supplier that has sold its power when the energy price is above the threshold price cannot profit from raising real-time prices higher above it, reducing the likelihood that capacity resources exercise market power in the energy market.

Demand resources do not participate in the electric energy markets. Their capacity payments are not reduced by the PER deduction. Moreover, while generation that does not respond during shortage conditions faces penalties (loss of capacity revenues) and forgoes the opportunity to earn net energy revenues, demand resources are not subject to the same consequences. As a result, demand resources do not have in place the same financial incentives for performance as generation. This raises concerns about the comparability of demand and supply resources in the FCM that are discussed more fully in the section that follows.

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[44] *Inframarginal rent* is the net revenue, which equals the LMP minus the marginal cost of a unit, minus the PER (when the LMP exceeds the PER strike price); thus, net revenue = PER + IMR.

[45] For example, the PER for the historic peak month of August 2006 in New England was calculated at $4.80/kW-month and was mostly zero for off-peak months.

3.3.4 Participation by Demand Resources

The FCM incorporates demand response by including the participation of demand resources on a similar footing to supply resources. In this way, the capacity market attracts and retains those customers willing to reduce electricity use during shortage conditions and compete with traditional generators, bringing the market closer to what would happen in an energy-only market. This improves the economic efficiency of wholesale electricity markets by discouraging low-value energy consumption when wholesale energy prices are very high. This should lower load during times of system peak and near system peak in much the same way as would an energy-only market.

Treating demand- and supply-side resources comparably has many challenges. To achieve market efficiency, the FCM rules must ensure that demand has the same performance requirements, penalties, and incentives as the supply side. In other words, demand resources in the FCM must have as close to the same incentives as possible that price-responsive demand would have in an energy-only market. In the FCM, this would be the total of their capacity payment and the difference between their retail rate and the value they place on the electricity.

To illustrate this point, suppose that a load-serving entity or a demand-resource provider made an offer on behalf of a customer in the electric energy market based on the customer's expected value of service (VOS). During shortage hours, demand resources would be dispatched in merit order based on the offers. When the resource is dispatched, the customer would lose the value of service but would save the retail rate (RR), and thus the consumer's net loss equals VOS – RR. Therefore, if the LMP were greater than the offer price of the consumer's VOS, the demand resource would be dispatched. Under the INTMMU's recommendation, the demand reduction would be compensated at an amount equal to the LMP – RR, which will be equal to or greater than VOS – RR. Alternatively, if the LMP were less than the offer price, the demand resource would not be dispatched, and the customer would keep its consumer surplus of VOS – RR. Therefore, a demand resource would be dispatched, or a demand reduction requested, during the shortage hours only if the energy payment (LMP – RR) were large enough to compensate for the losses in consumer surplus (VOS – RR).

In this way, every customer would have an incentive to make an offer that reflected the true value of service. As a result, demand resources would be dispatched efficiently, and the LMP would send efficient price signals that reflected the scarcity value of resources during the shortage hours. In essence, this approach could provide a positive incentive for demand resources to mimic the behavior of price-responsive demand in an energy-only market for an efficient outcome.

Section 5.3 discusses a recommendation to modify the PER deduction to make the performance incentives for demand-side resources comparable to supply-side resources.

Section 4
Analysis of the Forward Capacity Auction Results

This section presents an analysis of the results of the first two Forward Capacity Auctions. It describes the results at a high level, assesses the capacity that qualified to participate in the auctions, and analyzes the qualified capacity that cleared the auctions, by type and location. The resources that delisted from the auctions also are described. Additionally, the section reviews price formation in the auctions and compares the clearing prices to capacity prices in other RTOs. Additional observations pertaining to the effectiveness of the FCM in attracting new resources and retaining existing resources also are presented.

4.1 Overview of Auction Results

Each of the two FCAs has procured the capacity needed to meet the region's resource adequacy requirement. The first FCA (FCA #1) was conducted in February 2008 for the capacity commitment period June 1, 2010, through May 31, 2011, and the second FCA (FCA #2) was conducted in December 2008 for the capacity commitment period June 1, 2011, through May 31, 2012. Table 4-1 summarizes the results and shows that both auctions reached the floor price. These results are consistent with the outcome of a competitive market with excess supply.

Table 4-1
Results of the First Two Forward Capacity Auctions

	FCA #1	FCA #2
Total qualified (MW)	39,165	42,777
Total cleared (MW)[(a)]	34,077	37,283
NICR (MW)	32,305	32,528
Excess cleared (MW)[(a)]	1,772	4,755
Price ($/kW-month)	4.50	3.60

(a) Excludes real-time emergency generation (RTEG) resources in excess of 600 MW.

A key requirement of a successful FCA is having sufficient qualified capacity. Table 4-1 and Figure 4-1 show that both auctions qualified many more new and existing capacity resources than needed to meet the resource adequacy requirement. These resources are broadly distributed among 34 and 54 lead participants, respectively, in FCA #1 and FCA #2, supporting the conclusion that the FCAs were competitive.[46] A large amount of capacity from new resources qualified despite compressed planning schedules for the first two auctions. The qualified new capacity exceeded the cleared new capacity by 400% in FCA #1 and 130% in FCA #2. The number of different lead participants that represent the qualified new resources increased from 34 in FCA #1 to 54 in FCA #2. Figure 4-1 and Table 4-1shows that the total of existing and new qualified capacity exceeded the NICR by 21% in FCA #1 and by 32% in FCA #2. Figure 4-1 also shows that total capacity amounting to about 15% of the total cleared capacity

[46] For the purpose of discussing auction results in this section, the distinction between new and existing resources is based on the treatment of resources in the auctions (except that some resources are treated as existing resources although they were treated as new in the auction). A new resource that cleared in FCA #1 is treated as an existing resource in FCA #2. See Section III.13.1.1.1 of the ISO's tariff and the ISO's postings (e.g., http://www.iso-ne.com/support/faq/fwd_cap_mkt/gen/index.html#faq3)

qualified for and participated in both auctions but did not clear. The large amount of capacity with a diverse ownership that participated in the auction indicates that the FCM is competitive.

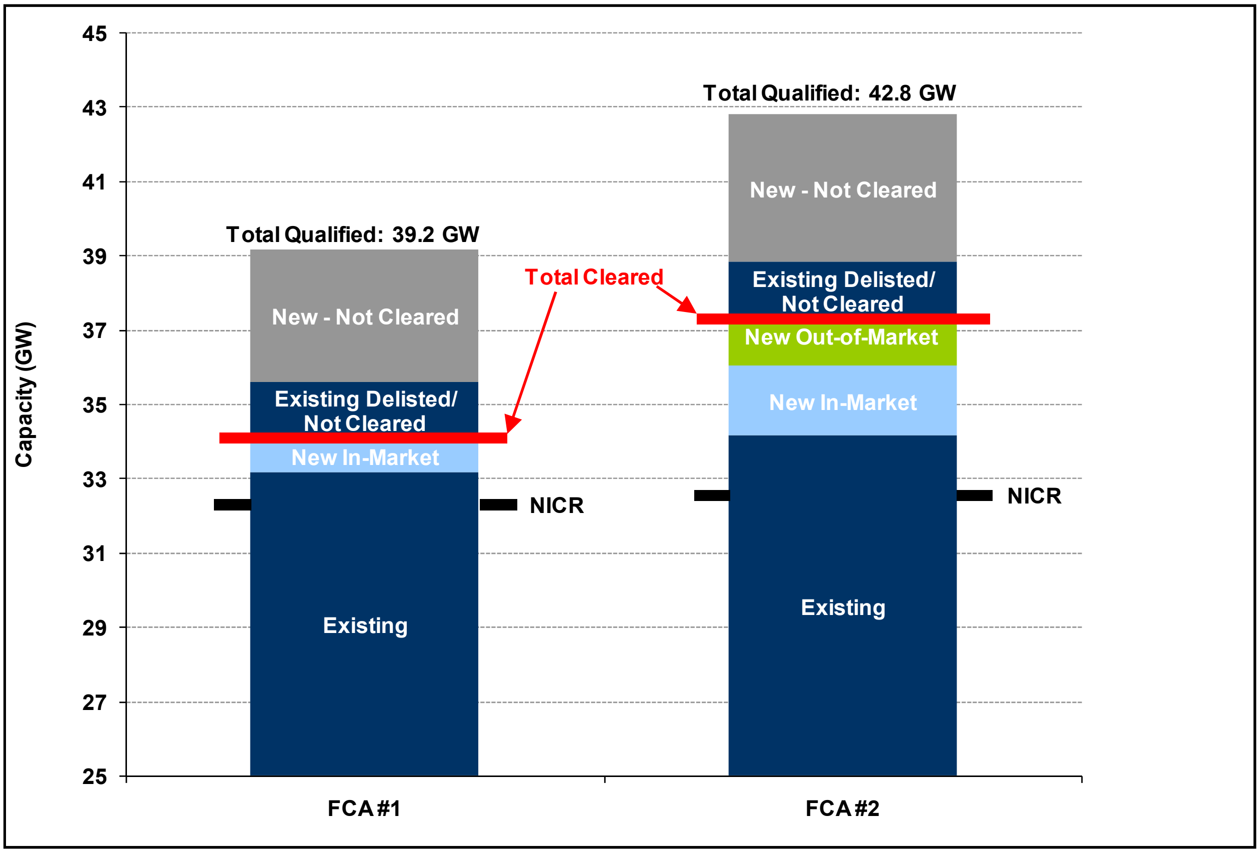

Figure 4-1: Total qualified and cleared resources for the first two Forward Capacity Auctions.

Note*:* *In-market* resources are driven in the FCA by their costs and expectations of future revenues. *Out-of-market* resources choose to remain in the auctions no matter how low the price drops.

In both auctions, the amounts of cleared capacity substantially exceeded the NICR.[47] However, the procurement of excess capacity does not increase the total capacity payment for the FCM because the total payment is kept constant through prorating, which lowers either the effective price or the payment rate.

Figure 4-1 also shows that the amount of cleared OOM new resources increased from 40 MW in FCA #1 to 1,270 MW in FCA #2, contributing to the large excess capacity in FCA #2. However, OOM capacity did not affect prices in FCA #1 or FCA #2, as the auctions would have cleared at the floor price with excess capacity even if none of the out-of-market resources had participated. Section 4.3.4 contains more details on OOM resources, and Section 5.2 discusses improvements to the APR and the treatment of OOM in the FCM.

[47] The excess cleared capacity shown in Table 4-1 and Figure 4-1is based on the total resources that cleared without any adjustment for potential prorating by resource owners to bring the total capacity cleared in the Maine (ME) capacity zone below its maximum capacity limit (see Section 3.2). However, the cleared capacity from RTEG resources was adjusted to cap it at the 600 MW limit. RTEG resources receive a payment rate that is further prorated by the ratio of total cleared RTEG resources to the 600 MW RTEG cap. The 2010/2011 and 2011/2012 auction resulted in committing resources beyond the RTEG cap (for a total of 875 MW in FCA #1 and 759 MW in FCA #2) and beyond the MCL in the ME zone.

4.2 Capacity Qualification Results

Table 4-2 shows the new generation, demand, and import resources that requested capacity qualification for FCA #1 and FCA #2. The new resources that qualified were added to the existing qualified resources to create the total qualified capacity to participate in the auctions. The table shows that the total qualified capacity from new resources increased 59% from the first to the second FCA.

Table 4-2
Requested and Qualified Resources (MW)

		FCA #1[(a)]			FCA #2[(b)]		
		New	**Existing**	**Total**	**New**	**Existing**	**Total**
Requested new resources	Generation	6,904		6,904	5,901		5,901
	Demand resources	2,507		2,507	1,438		1,438
	Import	3,610		3,610	4,649		4,649
	Total	**13,021**		**13,021**	**11,988**		**11,988**
Qualified resources	Generation	2,353	31,447	33,801	3,299	31,401	34,700
	Demand resources	1,449	1,990	3,438	1,176	2,978	4,153
	Import	658	1,269	1,926	2,613	1,311	3,924
	Total	**4,460**	**34,705**	**39,165**	**7,088**	**35,689**	**42,776**

(a) Information on requests from the ISO's November 6, 2007, informational filing to FERC. Requested demand-resource qualification requests are multiplied by the 1.223 adjustment ratio for losses and reserves. See http://www.iso-ne.com/regulatory/ferc/filings/2007/nov/er08-190-000_11-06-07_informational_filing.pdf.

(b) Information on requests for qualification from the ISO's September 9, 2008, informational filing to FERC. Requested demand-resource qualification requests are multiplied by the 1.254 adjustment ratio for losses and reserves. See http://www.iso-ne.com/regulatory/ferc/filings/2008/sep/er08-1513-000_09-09-08_fca_info_filing.pdf.

In FCA #1, a total of about 13,000 MW of capacity from new resources requested qualification, about 34% (4,460 MW) of which qualified and participated in the first auction. The primary reasons for the failure of generation resources to qualify were withdrawn applications, insufficient documentation to support the resource's ability to commit capacity for the commitment period, or that the necessary transmission system upgrades could not be completed by June 2010. About 58% of demand resources that requested qualification were qualified and participated in the auction. The primary reasons for the failure of demand resources to quality were withdrawn applications and insufficient documentation.

In FCA #2, a slightly smaller amount of new capacity (about 12,000 MW) requested qualification than in FCA #1, but a greater proportion and amount of capacity, mostly generation and imports (about 56% of each), qualified. About 82% of the capacity from demand resources that requested qualification was qualified, but the amount of qualified new capacity from demand resources in FCA #2 was less than in FCA #1.[48]

[48] The ISO FERC filing on September 9, 2008, Informational Filing for Qualification in the Forward Capacity Market, p. 5 and 22–24.

4.3 Cleared Capacity Resources

This section reviews the new and existing capacity resources that cleared in the two auctions by type (i.e., generation, demand resources, and imports) and by location, with emphasis on demand resources and out-of-market new resources.

4.3.1 Resources by Type

Figure 4-2 shows the combination of new and existing generation, demand resources, and imports that cleared in each auction. Some of the new capacity did not clear, and some existing capacity delisted. Both auctions cleared more capacity than needed. In FCA #1, a total of 34,077 MW of capacity cleared, exceeding the NICR by 1,772 MW. A greater amount of capacity cleared in FCA #2 (37,283 MW), exceeding the NICR by 4,755 MW. Thus, from FCA #1 to FCA #2, the amount of cleared capacity increased by more than 3,000 MW despite only a slight change in the NICR. However, in both auctions, a substantial amount of qualified resources left before the clearing price was reached; 5,088 MW of participating resources left in FCA #1 and 5,493 MW left in FCA #2. Figure 4-2 also shows the total cleared and uncleared capacity by resource type in each auction relative to the NICR.

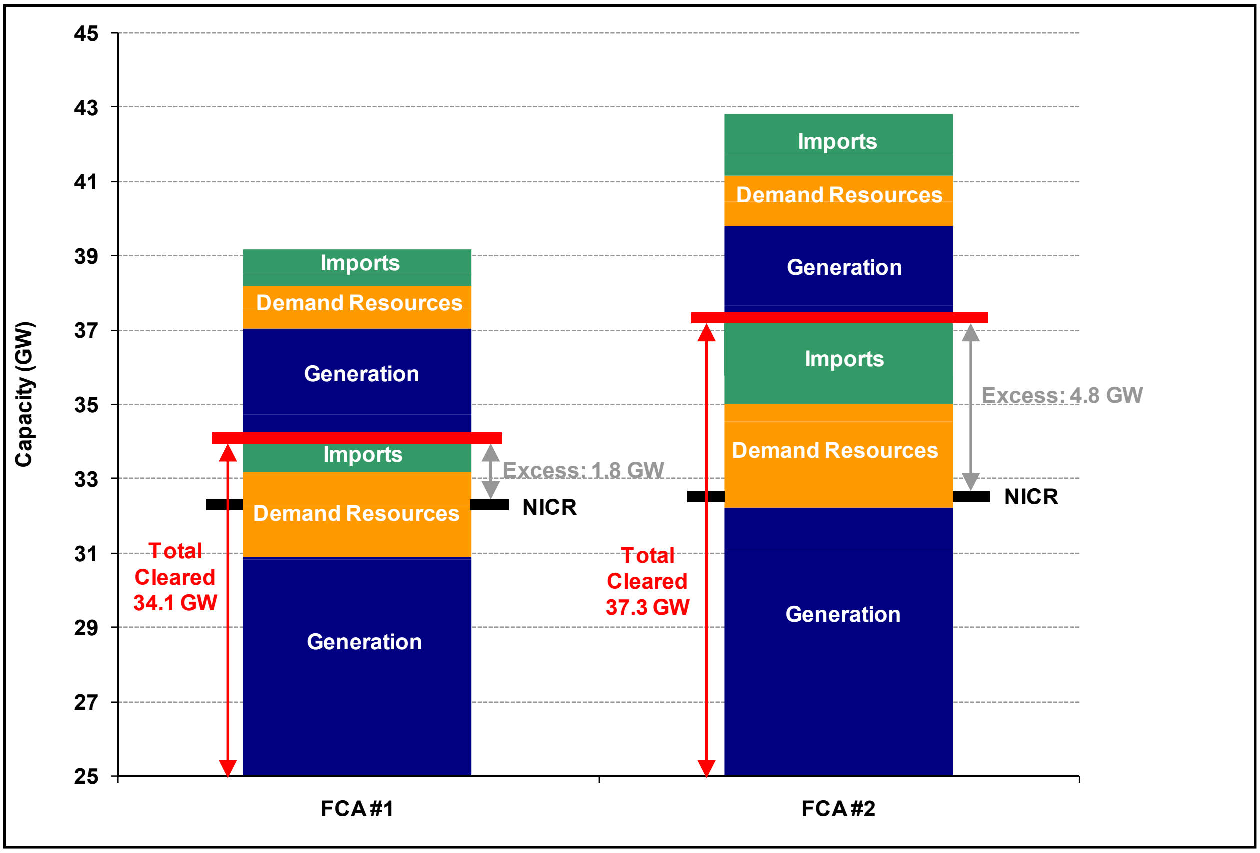

Figure 4-2: Qualified and cleared resources in FCA #1 and FCA #2.

Table 4-3 details the new capacity that cleared in each FCA. It shows that in FCA #1, demand resources accounted for 96% of new capacity, whereas in FCA #2, new generation and imports provided most of the new capacity. Capacity that had been "new" in FCA #1 became "existing" in FCA #2. In FCA #1, 900 MW of capacity from new resources cleared, accounting for 2.6% of total procurement cleared. In

FCA #2, 3,134 MW of capacity from new resources cleared, accounting for 8.4% of the total procurement and roughly three times more than in FCA #1.

Table 4-3
Cleared Resources (MW)

	FCA #1			FCA #2		
	New	Existing	Total	New	Existing	Total
Generation	40	30,825	30,865 (90.6%)	1,157	31,050	32,208 (86%)
Demand resources	860	1,419[(a)]	2,279 (6.7%)	448	2,330[(a)]	2,778 (8%)
Import	-	934	934 (2.7%)	1,529	769	2,298 (6%)
Total cleared	**900**	**33,177**	**34,077**	**3,134**	**34,149**	**37,283**

(a) Capped by the RTEG limit of 600 MW.

4.3.2 Resources Cleared by Location and Imports

Neither of the two auctions modeled any import-constrained zones because preauction screens showed that no potential import-constrained zones needed additional capacity to meet reliability requirements.[49] Both auctions cleared more capacity in the CT and NEMA load zones than needed to meet their local sourcing requirements. In the CT zone, 1,193 MW above the LSR cleared in FCA #1, and 2,286 MW cleared above the LSR in FCA #2. For the NEMA zone, 1,725 and 1,831 MW cleared above the LSR in FCA #1 and FCA #2, respectively.

The Maine export constraint was modeled but experienced no price separation when the auction cleared at the floor price, even though cleared capacity in FCA #2 exceeded Maine's maximum capacity limit. Price separation did not occur because the excess capacity in Maine remained at the floor price, so continuing the auction and reducing the excess capacity was not possible.

Figure 4-3 shows the zonal distribution of total cleared and new cleared resources. In FCA #1, most capacity in all zones was from demand resources. This changed in FCA #2 when generation became the largest source of new capacity in Connecticut, Maine, New Hampshire, and Rhode Island. The single largest source of generation was the request for proposals (RFP) issued by the state of Connecticut.

[49] However, existing capacity in Connecticut would have been insufficient to meet the more stringent Transmission Security Analysis criteria if Norwalk Harbor had been allowed to delist as requested. See Sections 3.2.1 and 5.1.

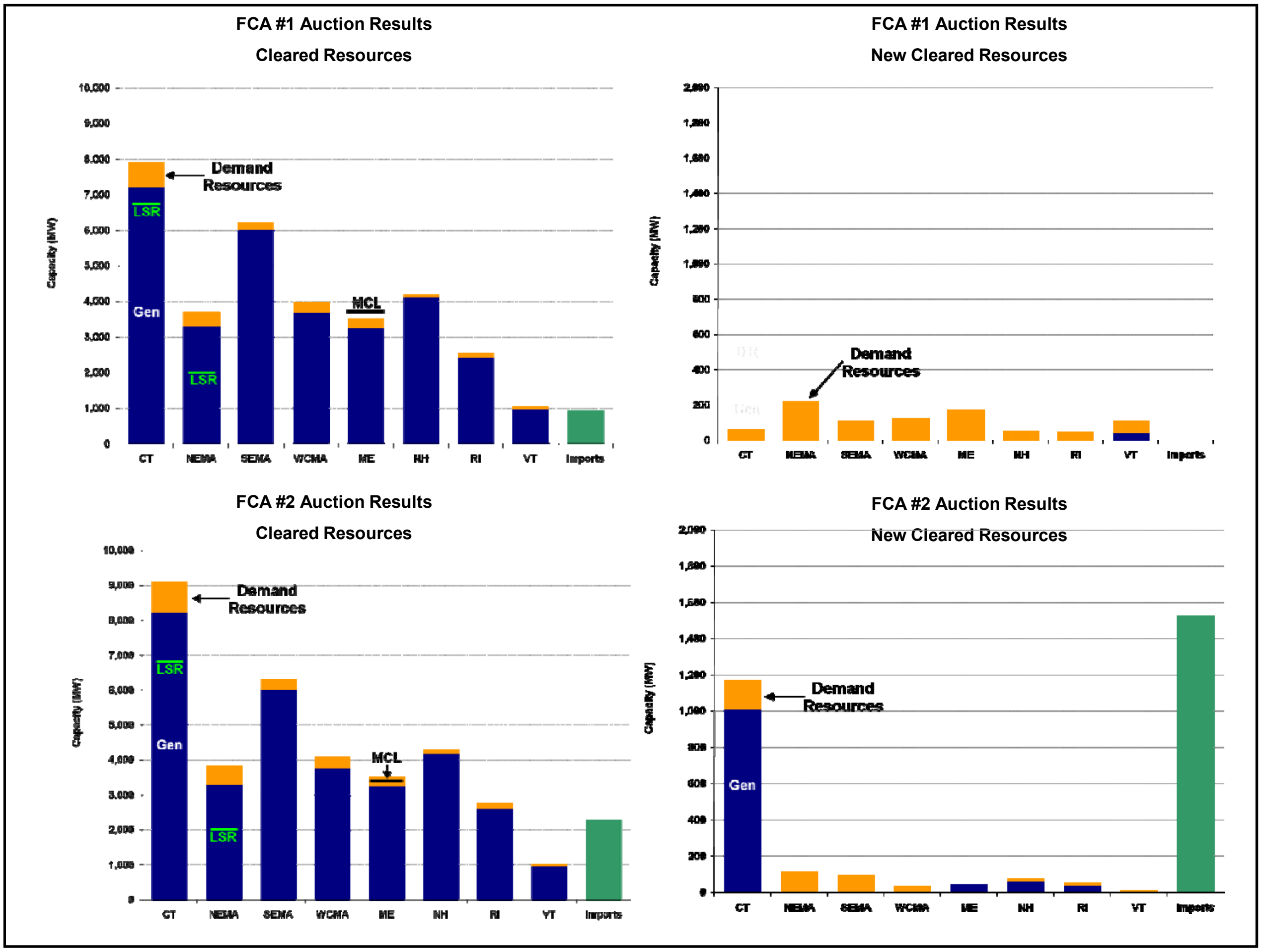

Figure 4-3: FCA #1 and FCA #2 auction results for total cleared resources and new cleared resources.

Imports to the ISO may come from the Hydro-Québec, NYISO, and New Brunswick systems. As shown in Table 4-4, most of the qualified capacity from import resources (61%) was from the Hydro-Québec system in FCA #1, although only 200 MW of these resources cleared in the auction. In contrast, all the qualified import resources from the NYISO system (38% of qualified imports) cleared in FCA #1. In FCA #2, import capacity from NYISO was the highest, both among qualified imports (72%) and among cleared imports (59%). The cleared import capacity from both Hydro-Québec and NYISO in FCA #2 was higher than in FCA #1.

Table 4-4
Sources of Qualified and Cleared Imports (MW)

System	FCA #1		FCA #2	
	Qualified	Cleared	Qualified	Cleared
Hydro-Québec	1,167	200	727	662
NYISO	734	734	2,842	1,352
New Brunswick	26	0	355	284
Total	**1,926**	**934**	**3,924**	**2,298**

Of the 2,298 MW of import resources that cleared in FCA #2, 1,529 MW were new resources. A slight majority of the new import capacity was from the NYISO system, and the remaining was from Hydro-Québec. In FCA #1, no new import resources cleared.

In FCA #1, imports represented 2.7% of the cleared capacity, all from existing imports. Cleared capacity from imports, which amounted to 6.2% of total cleared in FCA #2, also was higher relative to FCA #1.[50]

4.3.3 Demand Resources

One of the most notable features of the first two auctions is the large amount of capacity from demand resources that qualified and cleared. As shown in Table 4-3, demand resources accounted for 7% of the cleared capacity in FCA #1. In both auctions, most of the demand resources were existing resources. In FCA #2, total cleared capacity from demand resources increased by about 500 MW and accounted for 8% of the total cleared capacity.

The total qualified capacity from demand resources amounted to 12% and 14% of the projected ISO peak load for the 2010/2011and 2011/2012 capacity commitment periods, respectively.[51] The cleared demand resources amounted to 8% and 9% of the peak load for the auctions' respective commitment periods, a higher percentage than in any other RTO. However, a substantial amount of qualified capacity from new demand resources did not clear (41% in FCA #1 and 62% in FCA #2). The resources left the auction at a range of price levels, from the starting price down to just above the price floor.

As shown in Figure 4-4, in both auctions, approximately two-thirds of the capacity from cleared demand resources was from active demand resources (real-time demand response or real-time emergency generation), and the rest was from passive demand resources (on-peak and seasonal demand resources). Most of the passive demand resources came from state-sponsored utility energy-efficiency programs, and most of the active demand resources came from third-party providers.

[50] See the ISO's informational FERC filings at for FCA #1 and FCA #2 (November 6, 2007 and September 9, 2008).

[51] The 29,035 MW peak load forecast for 2010/2011 and the 29,405 MW peak load forecast for 2011/2012 were used. Filing of Installed Capacity Requirement, Hydro Quebec Interconnection Capability Credits and Related Values for the 2010/2011 Capability Year, (October 11, 2007) (FERC Docket ER-08-41-000), p. 11. Filing of Installed Capacity Requirement, Hydro-Quebec Interconnection Capability Credits and Related Values for the 2011/2012 Capability Year.(September 9, 2008) (FERC Docket ER-08-1512-000), p.11.

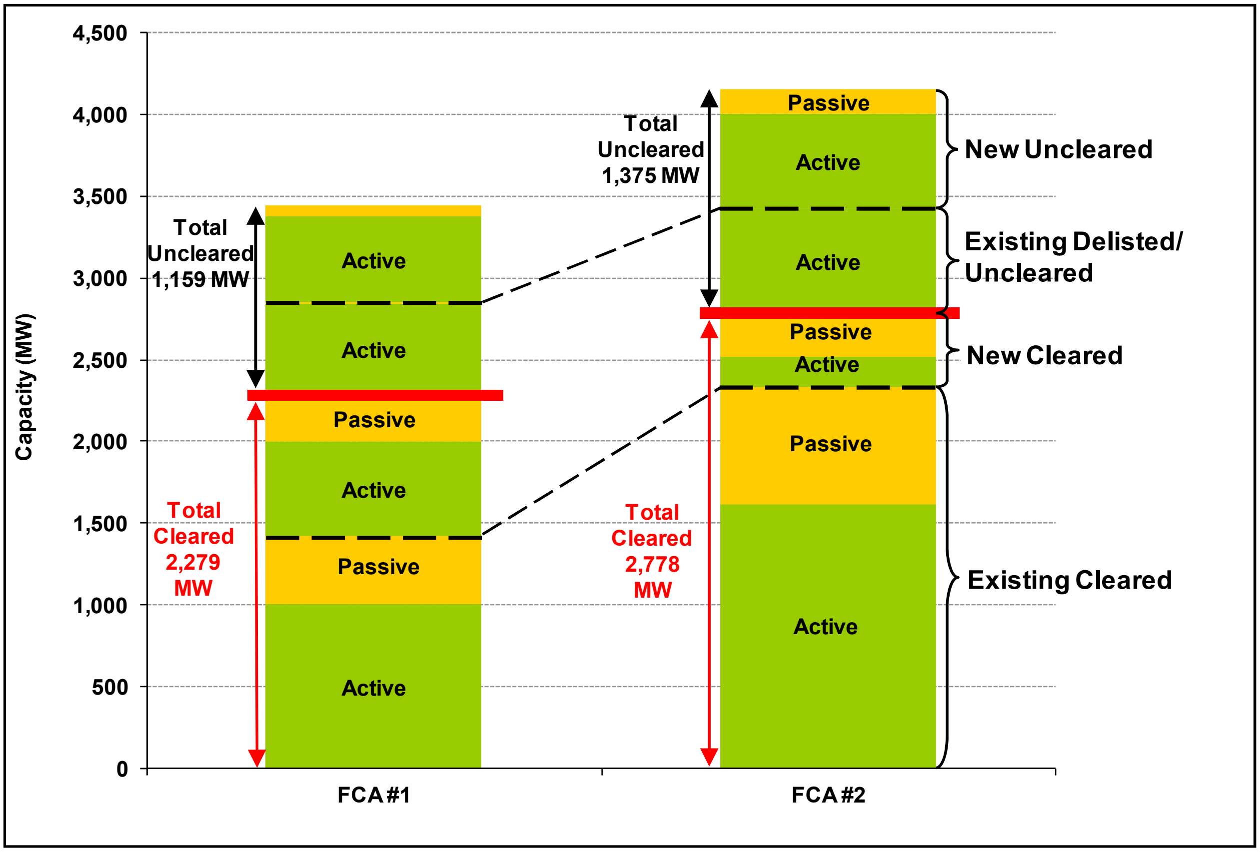

Figure 4-4: Auction results for qualified demand resources.

The participation of merchant demand resources (i.e., nonutility and not under contract with utilities) in the FCAs may be attributable to the FCM since these resources had very limited capacity revenue opportunities before the FCA transition period. In addition, the FCM encouraged new utility and state demand resources to participate through additional capacity revenues. Almost all of the demand resources that participated in the FCM were in-market resources. This means that the program's benefits exceeded their costs. Many demand resources are funded through utility system benefit charges or other regulatory mandates. Questions have been raised as to whether such funding sources make these programs out-of market. In the opinion of the INTMMU, the appropriate way to determine whether a resource is in market or out of market is to determine whether it is cost effective, not how it is funded. Therefore, demand resources should be treated as in market when they are cost effective, even when funded by state

Demand resources improve the efficiency of using capacity in the region. Many opportunities exist for making such improvements because of the region's low load factor (i.e., the ratio of the average hourly load during a year to peak hourly load). Figure 4-5 shows the load duration curve for 2006, 2007, and 2008. High load levels occurred in only very few hours. For example, Figure 4-5 shows that demand resources that can operate for up to 100 hours (shown by the dotted vertical line) would have reduced the peak load by between 3,500 MW and 5,000 MW in 2006 to 2008. Based on this observation, the 2,300 to 2,800 MW of demand resources that cleared in the FCAs (see Table 4-3) seems reasonable because demand resources could provide capacity by interrupting consumption in a small number of hours, presumably with minimal effect on their core activities. Section 5.3 discusses demand resources in greater detail.

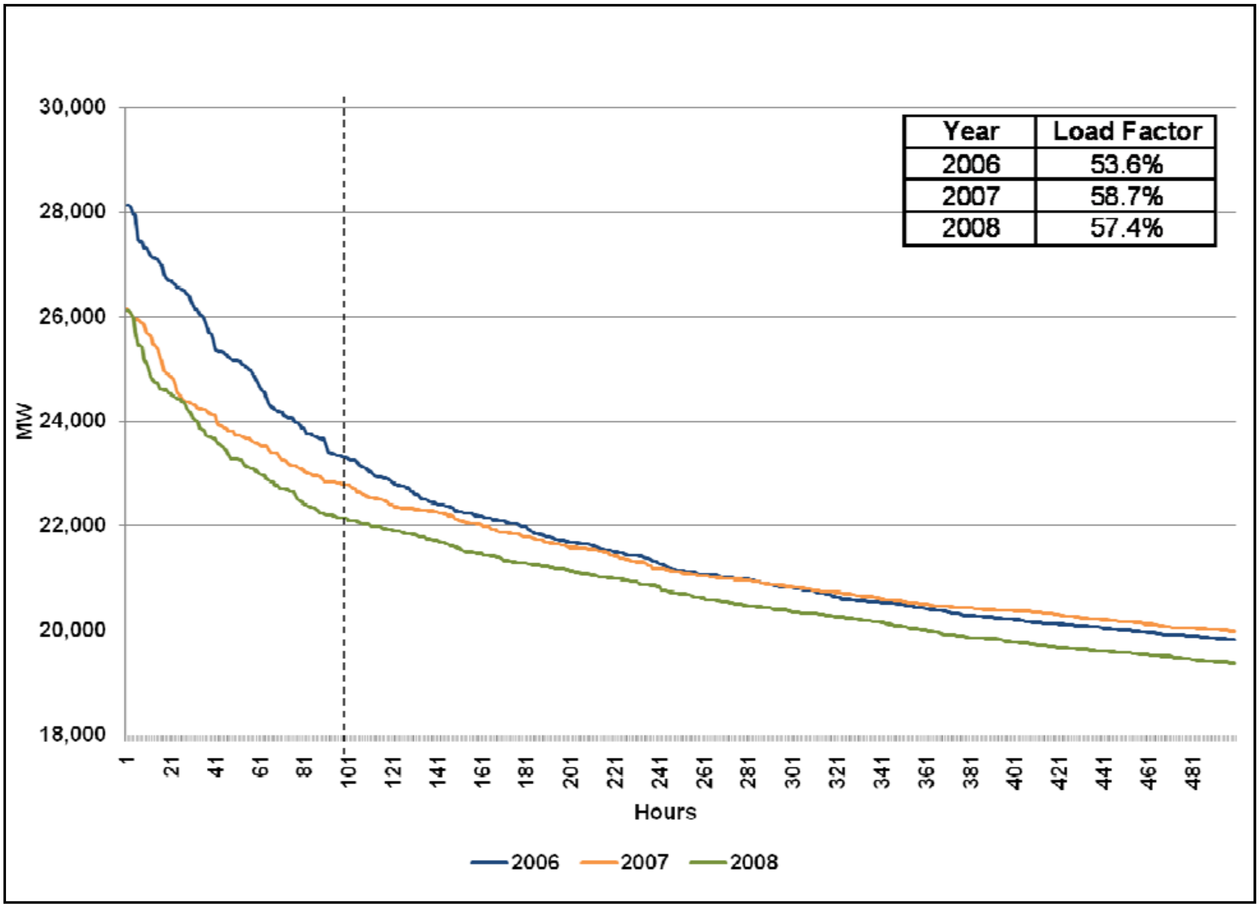

Figure 4-5: Load-duration curve for the 500 highest load hours in New England, 2006, 2007, and 2008.

4.3.4 Out-of-Market New Resources and In-Market New Resources

Out-of-market resources, which participate in the FCM at prices below their costs, include certain new resources with offer prices less than 0.75 × the CONE, new self-supplied resources, capacity carried-forward from previous auctions, and capacity under ISO-issued RFPs.[52] Table 4-5 shows the new in-market and OOM capacity that cleared in the first two FCAs.

[52] Section III.13.2.7.8.1 of the ISO's tariff.

Table 4-5
Cleared, New, In-Market and Out-Of-Market Capacity, FCA #1 and FCA #2

Auction	Type of Resource	Generation	Demand Resources	Import	Total
FCA #1	**New cleared**	**40**	**860**	**0**	**900**
	In-market	0	860	0	860
	Out-of-market	**40**	**0**	**0**	**40**
FCA #2	**New cleared**	**1,157**	**448**	**1,529**	**3,134**
	In-market	37	298	1,529	1,864
	Out-of-market	**1,120**	**150**	**0**	**1,270**

In FCA #1, only 40 MW (4% of the cleared new capacity) were from OOM generation with offer prices less than 0.75 × the CONE, and no other categories of OOM resources participated. In FCA #2, the amount of OOM new entry increased to 1,270 MW (41% of cleared new capacity), primarily from 994 MW of resources with low offers under state contracts in Connecticut. This contributed to the significant excess capacity in FCA #2 in which the existing capacity already was greater than the NICR.

In both auctions, the cleared OOM capacity was well below the excess capacity that cleared, such that the auctions most likely would have cleared with excess capacity at the floor price even if none of the OOM capacity had cleared. Nevertheless, future OOM entry could potentially diminish competition and deter new entry. The long-term impacts of OOM resources on FCM performance warrant continuous monitoring and assessment.

The APR (see Section 3.2.2.3), which corrects for distortions when OOM entry in an FCA prevents in-market new capacity from setting the clearing price and prices fall below competitive or efficient levels, was not triggered in FCA #1. This was because the 40 MW of new OOM capacity was less than the new capacity requirement of 441 MW. The APR was not triggered in FCA #2 because the existing qualified capacity (35,639 MW) exceeded the NICR of 32,528 MW, so no new capacity was required.

4.4 Delisted Capacity Resources

In each auction, nearly 1,000 MW of capacity from existing resources was delisted. In FCA #1, most were generation resources, and in FCA #2, most were demand resources (see Table 4-6). In both auctions, most of the delist requests from demand resources were from nonutility aggregators.

Table 4-6
Delisted Existing Resources by Type (MW)

Resource Type	FCA #1	FCA #2
Generation	**622** (64%)	**350** (39%)
Demand resources	**296** (31%)	**489** (55%)
Import	**51** (5%)	**51** (6%)
Total delisted	**970**	**890**

Among the existing generation resources, roughly one-third of the capacity that requested to be delisted in FCA #1 came from nine generation units (454 MW total) that requested to delist their entire capacity. In FCA #2, 13 generation units made these full delist requests, corresponding to 183 MW. In both auctions, more than one-third of the delisted capacity was located in Massachusetts, corresponding to about 400 MW of installed capacity. All these delisted resources helped reduce the excess capacity but did not cause the price to rise above the floor price.

As shown in Figure 4-6, most of the delist requests in both auctions were dynamic bids, followed by the static bids and delists for export or administrative reasons. Permanent delist requests were minimal.[53]

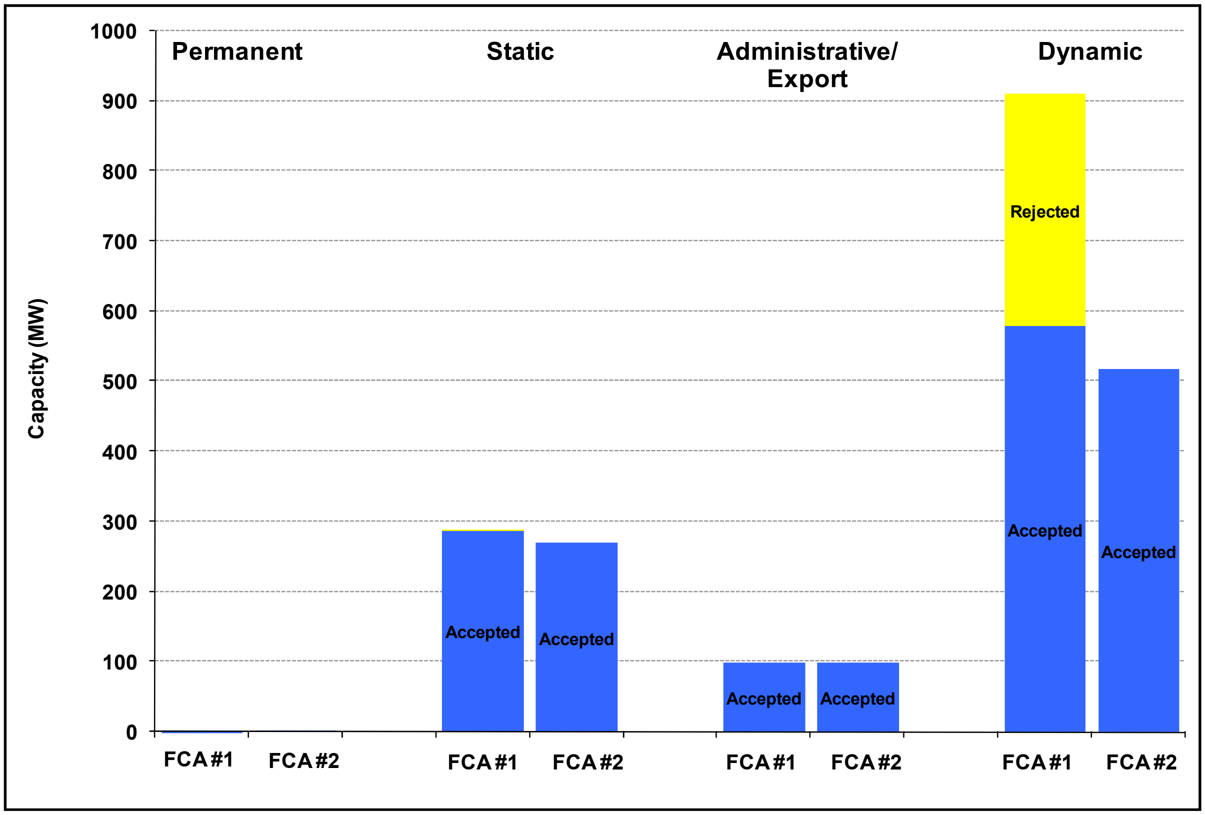

Figure 4-6: Requests for various types of capacity delistings, FCA #1 and FCA #2.

Figure 4-6 also shows delist requests that were rejected. For reliability reasons, the ISO rejected 330 MW of delist bids from existing generation resources (representing two units in Connecticut) in FCA #1, but it did not reject any of the delist bids in FCA #2. Since the total amount of the rejected delist bids in FCA #1 was significantly less than the excess cleared capacity, this rejection had no impact on the auction clearing price (i.e., FCA #1 would have cleared at the floor price even if these 330 MW of delist requests had not been rejected).The analysis of capacity zones in Section 5.1 discusses the rejection of delist bids in greater detail.

[53] The permanent delist bids in FCA #1 do not include the capacity of the retired New Boston generation plant, which was retired on November 2, 2007. See the ISO's FERC Filing on November 6, 2007, *Informational Filing for Qualification in the Forward Capacity Market.*

4.5 Capacity Clearing Prices

Given the constraints of the price collar, the two FCAs performed successfully in determining capacity clearing prices that reflect robust supply and sufficient competition.[54] Consistent with the excess supply outcome, both auctions cleared at the floor prices specified for each auction: $4.50/kW-month in FCA #1 and $3.60/kW-month in FCA #2. Cleared resources have the option either to prorate their obligation quantities and receive the full payment per megawatt, or to prorate their payments and retain the obligation for the full quantity of accepted megawatts. While the former reduces the quantities the ISO procures, the latter reduces the effective prices paid for the resources. In both cases, the total capacity payment remains the same. Resources in CT are prohibited from prorating their megawatts because all megawatts in Connecticut are needed for reliability reasons. If all resources opted to retain their full obligations, the capacity payment to resources would be prorated to $4.25/kW-month and $3.12/kW-month in FCA #1 and FCA #2, respectively. Because of price proration, the total cost to procure capacity did not increase as a result of buying more capacity than the NICR.[55]

4.5.1 Clearing Prices and Price Thresholds

As shown in Table 4-7, both the starting price and the floor price in FCA #2 were lower than those in FCA #1, since the CONE was lower in FCA #2.[56] For FCA #3 (the 2012/2013 commitment period), the CONE will be even lower, and the auction will have a floor price of $2.95/kW-month.

Table 4-7
FCM Pricing Thresholds ($/kW-month)

Threshold	FCA #1	FCA #2	FCA #3
CONE	$7.50	$6.00	$4.918
Starting price	$15.00	$12.00	$9.836
Floor price	$4.50	$3.60	$2.951
Clearing price	$4.50	$3.60	
Prorated price	$4.254	$3.119	

The price collars will expire after three successful FCAs. The first two FCAs have provided no new evidence that the price collars will advance the FCM goal of competitive price formation in future FCAs.

4.5.2 Supply Curves

Figure 4-7 shows the supply curves from the two auctions. These curves reflect the offer prices from new resources and delist bid prices from existing resources that were revealed as resources dropped out of the auction as the descending-clock progressed.[57] The lower portions of the supply curves appear as flat

[54] The "inadequate supply" and "insufficient competition" conditions (see Section 3.2.2.1) worked as designed and were appropriately not triggered.

[55] This result is consistent with the effect of a demand curve with an elasticity of 1.0 in a competitive market.

[56] For FCA #2, the CONE was reduced from $7.50/kW-month to $6.00/kW-month based on the required formula included in the ISO tariff for determining the clearing price for the FCA that took place after the first successful auction: half the first successful auction's clearing price plus $3.75/kW-month.

[57] These supply curves do not reflect the caps on import resources due to the external interface limits and the 600 MW cap on RTEG resources.

dotted lines because that is where the clock stopped, revealing no information about how much lower a price the remaining units would have accepted. However, the remaining capacity included both new and existing resources. The fact that these resources remained in the auction indicates that the cost of new entry for some new resources and the going-forward costs for many existing resources were at or below the floor price.

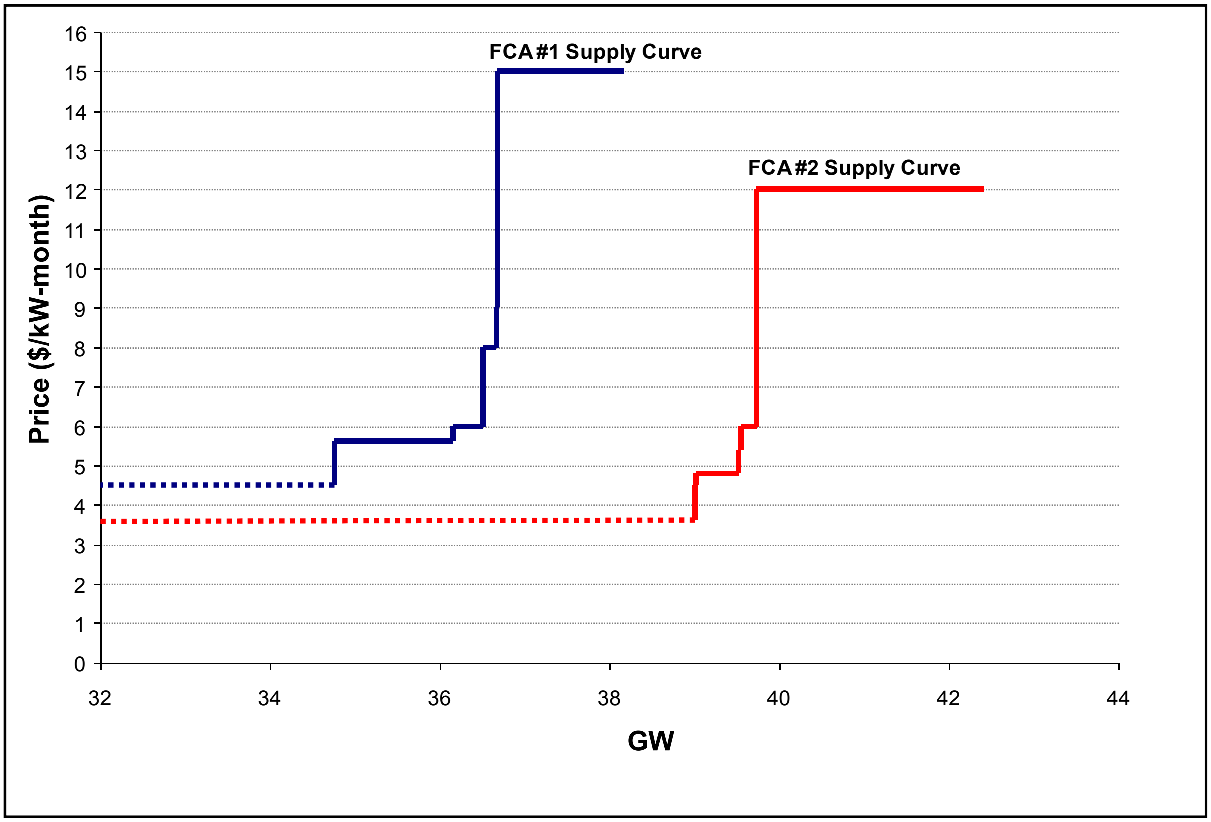

Figure 4-7: Supply curves in the auctions.

Note: The quantities shown in these supply curves do not reflect the caps on import resources and RTEG resources.

The supply curves reveal a continuous range of capacity prices at which a variety of new and existing resources are willing to assume the capacity supply obligation. New and existing capacity that did not clear had been offered at a large range of prices above the auction clearing price. Between the clearing prices and $6.00/kW-month, a total of about 1,750 MW were in FCA #1, and about 730 MW were in FCA #2. Above $6.00/kW-month, about 1,650 MW were in FCA #1, and about 2,700 MW were in FCA #2, although most of these offers were at the auction starting prices of $15.00/kW-month and $12.00/kW-month, respectively.

4.5.3 Capacity Prices under ICAP and the FCM

Figure 4-8 compares the clearing prices in FCA #1 and FCA #2 with historical ISO Installed Capacity (ICAP) Market prices.[58] The clearing prices under both FCA #1 and FCA #2 were significantly higher than the ICAP supply auction prices (which were mostly under $0.5/kW-month) and ICAP deficiency auction prices (which reached as high as $2.75/kW-month in summer 2006). In reviewing this chart, it is

[58] Under the ICAP Market, capacity was procured monthly for each month ahead (compared with annual procurements under the FCM for three years ahead), and performance and availability incentives were different compared with the FCM.

important to remember that the definition of capacity products and the underlying market fundamentals for the historical and forward-commitment periods are different.

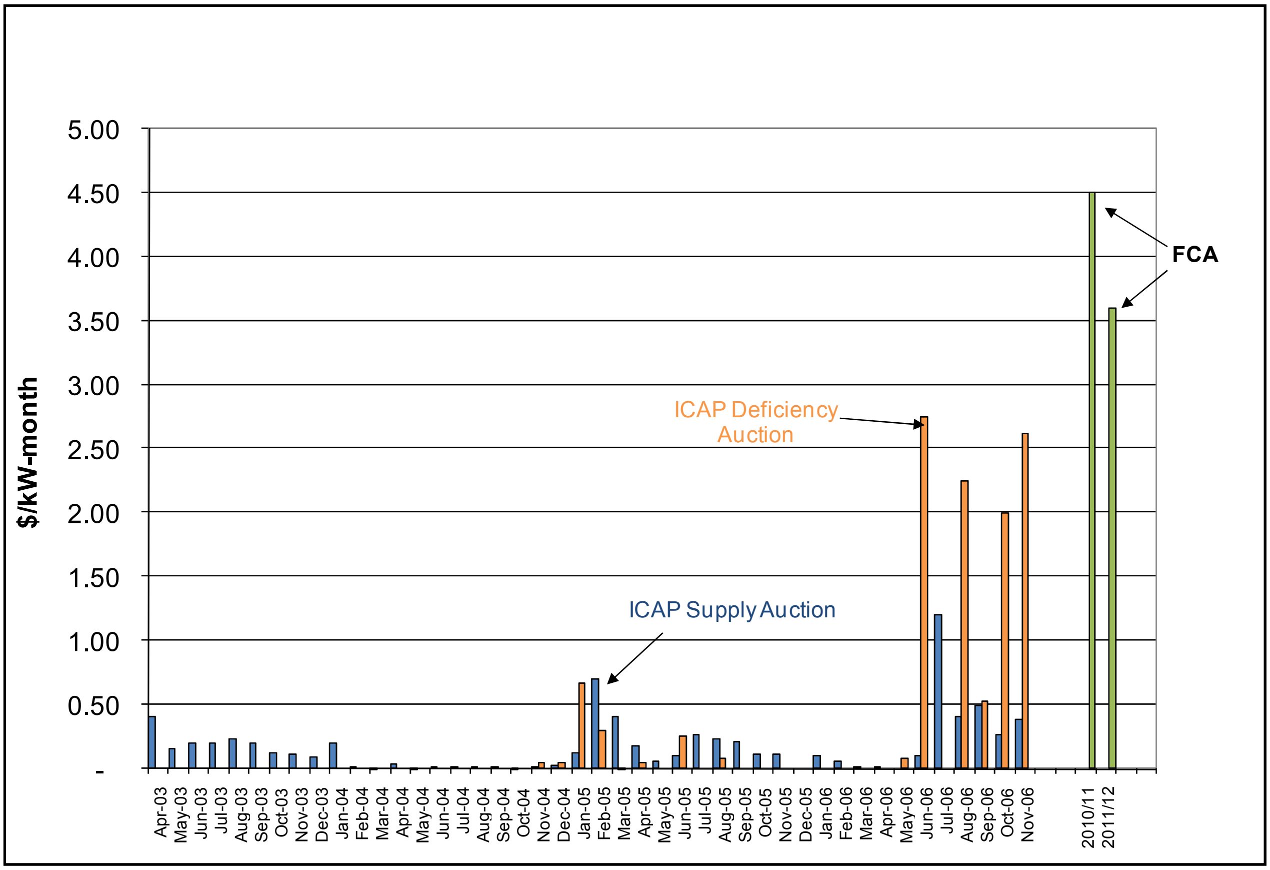

Figure 4-8: Capacity prices under the ICAP Market and the FCM.

Note: The definition of capacity products and the underlying market fundamentals for the historical and forward-commitment periods are different.

4.5.4 Capacity Prices at PJM and NYISO

The FCA clearing prices are similar to PJM's Reliability Pricing Model (RPM) prices for the same commitment periods and exceeded the NYISO ICAP prices for the 2008 capability period.[59] As shown in Table 4-8, the FCA #1 clearing price was $0.73/kW-month lower than PJM's RPM price for the same period, while the FCA #2 and RPM clearing prices were about the same for the 2011/2012 period. In NYISO, the monthly ICAP spot prices in 2008 for the New York Balancing Authority Area were in the range of $1.77 to $2.67/kW-month (the prices for New York City locality were in the range of $2.79 to $6.50/kW-month).

[59] The NYISO prices are available at http://www.nyiso.com/public/webdocs/products/icap/general_info/Installed_Capacity_Auction_Activity_1999-2008.pdf. The PJM prices are available at http://www.pjm.com/markets-and-operations/rpm/rpm-auction-user-info.aspx.

Table 4-8
Capacity Prices in ISO New England, PJM, and NYISO ($/kW-month)

	Commitment/Capability Period		
	2008	**2010/2011**	**2011/2012**
ISO New England FCA	n/a	4.50	3.60
PJM Base Residual Auction	n/a	5.23	3.30
NYISO System ICAP	1.77–2.67	n/a	n/a

4.6 Additional Observations

This section provides some additional observations on how well the FCM has performed in attracting new resources and retaining existing resources.

4.6.1 Addition of New Resources

A comparison of the amount of new resources that cleared under the two FCAs with the average historical new resources could shed light on whether the implementation of the FCM resulted in new resources coming on line or existing resources retiring. Although the historical market conditions previous to the FCM differ from the expected market conditions for the 2010/2011 and 2011/2012 commitment periods, the historical data at least provide reasonable, though imperfect, benchmarks for the performance during the implementation of the FCM.

Figure 4-8 shows the annual new generation and demand resources coming on line from 2002 to 2007, compared with the incremental new resources that cleared in FCA #1 and FCA #2 for the 2010/2011 and 2011/2012 commitment periods. From 2002 to 2007, on average, about 1,400 MW of such resources came on line annually, 1,100 MW of generation resources and 300 MW of demand resources. Figure 4-8 also shows that 900 MW of new generation and demand resources cleared in FCA #1, and 1,605 MW cleared in FCA #2 (excluding the new resources that also cleared in FCA #1). Therefore, comparable amounts of new generation and demand resources cleared during the two auctions compared with the historical average from 2002 to 2007.

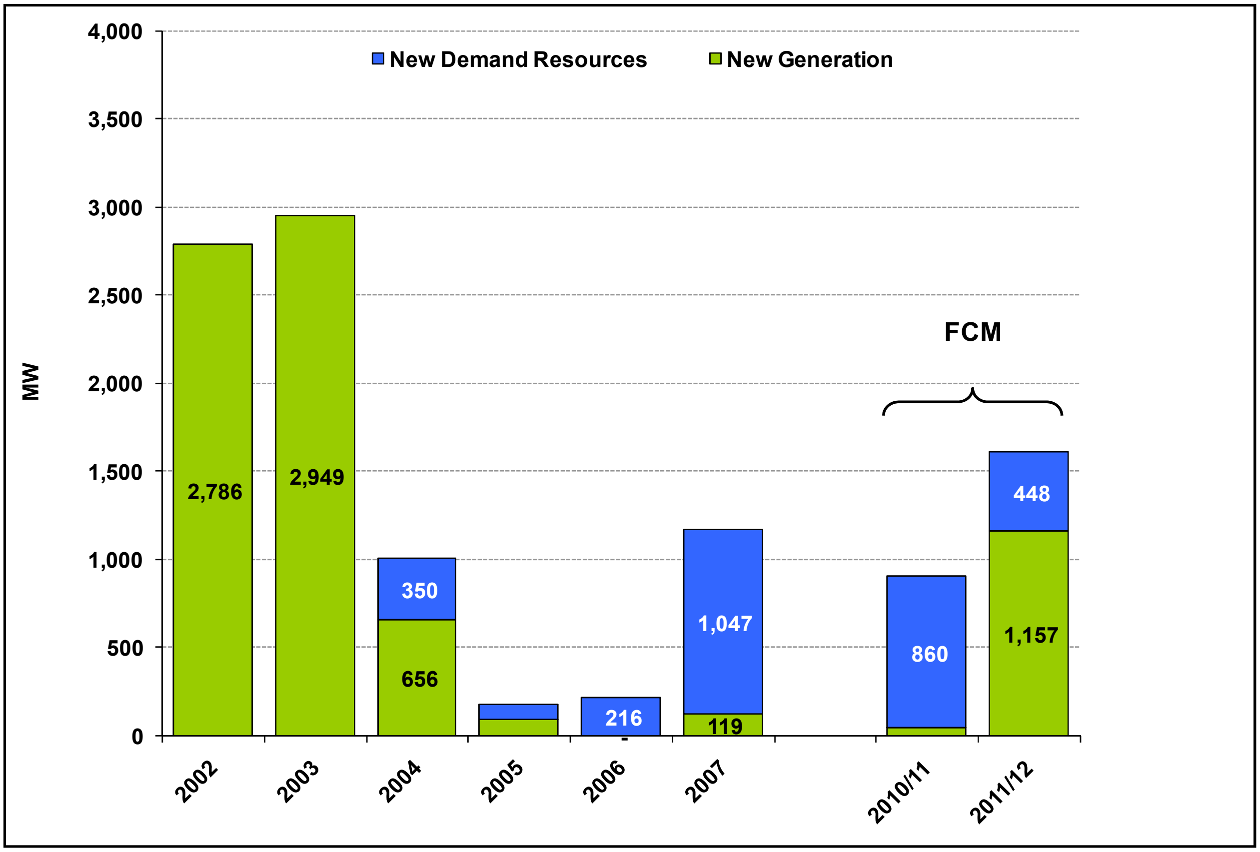

Figure 4-9: New generation and demand resources, 2002 through 2007, 2010/2011 and 2011/2012.

4.6.2 Retention of Existing Generation Capacity

One of the goals of the FCM is to retain existing capacity, including generation units that were formerly under Reliability Agreements, at reasonable costs. With the start of the first commitment period of the FCM on June 1, 2010, existing Reliability Agreements will terminate. In 2008, 19 units had Reliability Agreements, representing 3,200 MW.[60] None of these units submitted static or permanent delist bids in either of the first two FCAs, and all the units cleared in both auctions. Only two of the units with Reliability Agreements (Norwalk Harbor units #1 and #2) submitted dynamic delist bids in FCA #1 for 330 MW; for reliability reasons, the ISO rejected the requests to delist.

As shown in Table 4-9, the annualized fixed revenue requirement of the units with Reliability Agreements in 2008 totaled approximately $290 million, or on average $7.56/kW-month. Individual units had average fixed costs in the range of $4.84/kW-month (for the four Montville units in CT) to $12.36/kW-month (for Milford units #1 and #2).The claimed annualized fixed operations and maintenance (O&M) costs of these units in 2008 were on average $5.22/kW-month (with a range of $4.35/kW-month for West Springfield unit #3 to $7.62/kW-month for the Norwalk Harbor units #1 and #2).

[60] This total includes the Reliability Agreement for Milford units #1 and #2 that terminated on October 1, 2008.

Table 4-9
Fixed Revenue Requirements for Units with Reliability Agreements in 2008

Unit(s) under Reliability Agreement	Location	Capacity	Annualized Fixed Revenue Requirement[(a)]		Annualized Fixed O&M Costs (Claimed)[(b)]	
		(MW)	($)	($/kW-mo)	($)	($/kW-mo)
West Springfield #3	WCMA	94	$7,050,000	$6.23	$4,926,296	$4.35
Berkshire Power	WCMA	229	$26,000,000	$9.45	$12,049,627	$4.38
Pittsfield Gen. "Altresco"	WCMA	141	$13,000,000	$7.68	$8,327,848	$4.92
West Springfield gas turbine #1–#2	WCMA	74	$9,800,000	$10.99	$4,466,880	$5.01
Middletown #2–#4, #10	CT	770	$49,611,273	$5.37	$44,150,736	$4.78
Montville #35–#36, #10–#11	CT	494	$28,696,612	$4.84	$27,387,004	$4.62
Milford #1–#2	CT	489	$72,500,000	$12.36	$29,840,974	$5.09
New Haven Harbor	CT	448	$37,492,000	$6.98	$28,666,690	$5.33
Bridgeport Harbor #2	CT	131	$14,008,000	$8.95	$10,411,323	$6.65
Norwalk Harbor #1–#2	CT	330	$32,000,000	$8.08	$30,184,716	$7.62
Total/Average		**3,200**	**$290,157,885**	$7.56	**$200,412,094**	$5.22

(a): These values were the result of FERC settlement processes in several individual rate cases.

(b): The "Altresco" plant agreement excludes $22,439,278 in lease expenses that were included as fixed O&M costs in the filed cost-of-service (COS) study.

Since none of the units with Reliability Agreements submitted static or permanent delist bids in FCA #1 or FCA #2, the minimum price they are willing to receive to stay in the FCM was less than 0.8 × the CONE (or $6.00/kW-month in FCA #1 and $4.80/kW-month in FCA #2). Hence, on average, the Reliability Agreement units assumed the capacity supply obligations for the 2010/2011 and 2011/2012 commitment periods at prices lower than their total fixed costs accepted in recent settlements and recently estimated claimed fixed O&M costs, which do not reflect any net revenues from the energy or ancillary services markets.

Norwalk Harbor units #1 and #2 will receive payments to cover the difference between the floor price and their dynamic delist bid price. Norwalk Harbor did not submit a dynamic delist bid in the second auction for the 2011/2012 period.

Section 5
Market Design Analysis and Recommendations

This section presents analyses and recommendations addressing several of FCM's key features, including capacity zones, the Alternative Price Rule, demand-resource comparability and performance, and the cost of new entry.

5.1 Analysis of Capacity Zones

The FCM was designed to procure sufficient resources to meet resource adequacy needs both New England-wide and for capacity zones within New England. The FCA enables import-constrained zones, which have insufficient capacity, to separate from the rest of the region in the FCA and have higher prices when necessary to attract new resources. Capacity zones are identified before each auction and are included in the auction only when the local sourcing requirement is greater than the amount of existing capacity in the zone.

To address a range of other reliability concerns, the ISO reviews delist bids that would clear the FCA to determine whether the system will be reliable without the resources. If a resource is needed for reliability reasons, its delist bid is rejected and the resource is paid its delist bid as an out-of-market payment.

In both FCA #1 and FCA #2, sufficient capacity to meet the LSR was projected for all zones, and thus neither auction included any import-constrained capacity zones.[61] However, in FCA #1, the ISO rejected the dynamic delist bids by two Norwalk Harbor generation units (330 MW total) in Connecticut based on the Transmission Security Analysis conducted during the reliability review. These units will be required to remain on line and receive their delist bid rather than the FCA clearing price. Additionally, the reliability review prohibited all resources in Connecticut from prorating their commitments after excess capacity cleared at the floor price in both auctions.

The INTMMU has identified two potential improvements to meet resource adequacy needs for capacity zones. The first relates to the consistency between the resource adequacy criteria the ISO uses to define FCA zones and the reliability criteria used during the reliability reviews of delist bids.[62] The second relates to how and when capacity zones are defined and used in the FCA.

5.1.1 Determination of the Amount of Needed Zonal Capacity

For the FCM's locational signals to work correctly, the INTMMU recommends that the reliability criterion used in determining the FCM zones be the same as the reliability criteria the ISO uses to review delist bids in the auction. If these criteria are not the same (for example, in FCA #1, the ISO reliability review criterion used to review delist bids was more stringent than the criterion used to determine whether Connecticut should be a zone in the auction), resources are more likely be paid out of market to maintain reliability. This undermines the FCM's objectives of minimizing out-of-market payments and relying on market prices to ensure adequate resources.

[61] The auctions include export-constrained zones (i.e., Maine, which had no preauction screening), but, by the final round of FCA #1 and FCA #2 when the price reached the floor price, all zones had the same price.

[62] These reliability reviews primarily are the TSA studies conducted by the ISO Resource Adequacy Department. The INTMMU also recognizes that very local, small areas within a zone may need voltage or stability support to meet reliability needs. The FCM was not intended to address these needs, and attempting to modify the FCM design to address these micro-zonal issues is inappropriate.

Having two different resource-adequacy requirements for the same (or nearly equivalent) capacity zone reduces the transparency and the efficiency of the FCA. It also will result in resources that are in the same zone receiving different payments. This may undermine the FCA by encouraging other resources to leave the auction and seek a higher out-of-market payment. To ensure that the amount of capacity in each load (or capacity) zone will meet reliability needs, to price capacity appropriately, and to minimize the need for out-of market payments, the same reliability requirement should be used in defining capacity zones and load zones and in the reliability reviews. The following approaches can meet this objective:

- Continuing to calculate both the LSR and TSA and using the higher of the two for both purposes
- Using a single measure for defining both the capacity zones for the auction and the reliability reviews
- Adjusting one or both of the calculations to achieve more consistent results. This approach may not alleviate the need use the higher of the two calculations for both purposes.

The criteria used to determine how much capacity is needed within a capacity zone should be harmonized, not the transmission security and voltage reliability criteria. These criteria often result in very local reliability concerns. The FCM is not intended to address micro-zonal transmission security or voltage concerns that are addressed in reliability reviews. These issues should continue to be addressed through transmission planning and nonmarket mechanisms.

5.1.2 Zone Definition

Import-constrained capacity zones are defined before each auction and are allowed to price-separate in the auction only when the total amount of existing capacity within a particular zone is less than its local sourcing requirement. Therefore, such zones are not be modeled in the auction when the capacity in the zone before the auction exceeds the LSR. This means that the FCA has no way to determine a zonal price if resources within the zone wish to delist during the auction. This occurred in FCA #1, and the Norwalk Harbor units will be paid their delist bids, but other Connecticut resources will be paid the auction clearing price. This approach may result in some inefficient outcomes but, as explained below, is necessary because of market power concerns.

Ideally, in the absence of market power, the determination of all zones would be included in the auction. The auction would identify the most efficient solution in which the lowest-cost resources would clear and the higher-cost resources would not, whether or not they were new or existing resources, to meet the zonal and regional resource requirements. Existing resources with high going-forward costs that wished to delist could leave during the auction, cause zonal price separation, or do both. However, the potential efficiencies of this ideal approach are outweighed by the potential for existing resources to gain market power through delist bids, particularly in concentrated, constrained zones.

If zones were defined during rather than before an FCA, all delist bids could set the price and cause price separation. This would provide large suppliers an incentive, particularly in constrained zones, to withhold capacity by submitting static and dynamic delist bids to create a zone, which would increase the price received by their other resources within the zone. This is a relatively low-risk strategy for the existing resources that wanted to delist because static and dynamic delist bids remove resources from the market for only one year.

The risk of the exercise of market power that can occur when resources submit delist bids outweighs the potential efficiency improvement of permitting a static or dynamic delist bid to set the price and create a zone during an FCA.

The present design, which prevents permanent delist bid resources, once cleared, from participating in any future FCA, imposes a significant cost on resource owners who might submit permanent delist bids to exercise market power.[63] For this reason, the INTMMU recommends allowing permanent delist bids to affect the creation and pricing of zones during the FCA to improve zonal price formation. The design and implementation of this approach is likely to be complex and should be thoroughly investigated before making any modifications to the market rules.

5.2 Analysis of the Alternative Price Rule

The Alternative Price Rule (APR) was included in the FCM market design as a post-auction price adjustment mechanism to correct for distortions when the capacity clearing price falls below competitive or efficient levels (refer to Section 3.2.2.3). The APR addresses multiple factors that may cause the FCA to clear at inefficiently low levels, including the exercise of buyer market power, self-supplied capacity, and large indivisible ("lumpy") new investments needed for capacity additions in import-constrained capacity zones. When the conditions to trigger the APR are satisfied and OOM capacity prevents new entry from setting the capacity clearing price, the capacity clearing price adjustment is made. The price adjustment raises the clearing price to the lesser of CONE or the price at which the last in-market new capacity resource withdrew from the auction, minus $0.01.

Because the annual new capacity requirement is small relative to the size of existing generation capacity, buyers may have the ability and incentive to exploit the market's price sensitivity by building or contracting for a large amount of new capacity bilaterally and then offering such capacity into the FCA at a an uncompetitively low price.[64] This could depress the capacity clearing price in the FCAs, depending on the size of the capacity addition. This is a concern because depressed prices, or even the prospect of depressed prices, could prevent the FCM from attracting or retaining competitive, market-based resources.

The APR has not been triggered in either of the two FCAs to date. However, based on the INTMMU's review of the auction results and participation in the auctions, four recommendations are being made. First, the triggering conditions should be modified to account for multiyear effects of large OOM resources that clear in a single year and eliminate the need for new entry in subsequent years. Second, the adjusted price should apply only to existing capacity, not to OOM new capacity. Third, the adjusted price should be raised to the price at which the last new capacity resource withdrew from the auction, minus $0.01 and not be limited by the CONE. Fourth, it is difficult for any price-adjustment mechanism to exactly replicate a competitive outcome; hence it is appropriate to monitor market participants' offer behavior over time and consider other monitoring, mitigation, and incentive mechanisms.

5.2.1 Conditions for Triggering the APR

Currently, after each FCA is cleared, the APR is triggered only if three conditions are met: (1) new capacity is needed, (2) the supply of available resources is adequate to meet the capacity requirement (the NICR) and (3) the cleared OOM capacity exceeds the new capacity requirement (NCR), such that no in-market capacity has the opportunity to clear and set prices. Meeting all these conditions means that prices should have been based on in-market new entry but were not. When these conditions are met, the APR is triggered as a post-auction price adjustment. The APR raises the capacity clearing price to the lesser of the CONE or the price at which the last new capacity resource withdrew from the auction minus $0.01.

[63] As of the date of the permanent delisting, permanently delisted resources are prohibited from assuming any capacity obligation.

[64] Buyers could not actually withhold demand since they are obliged to procure capacity for their full capacity requirements, so underconsumption, an inefficiency typically associated with a *monopsony*, or a large buyer's market power, is of no concern.

The first condition to trigger APR, that new capacity is needed, restricts the APR to situations where new in-market capacity could have set the clearing price in the absence of OOM offers. Combined with the third condition, it allows the APR to be activated in the first year that a large amount of OOM capacity is introduced to meet and exceed a need. However, this condition prevents the APR from being activated in subsequent years when carried-forward capacity from lumpy OOM additions fully satisfies the need for capacity and continues to depress prices.

The hypothetical example presented in Table 5-1 illustrates the need to account for excess capacity from the prior FCA. The Net Installed Capacity Requirement for this import-constrained zone is 10,200 MW in the first year and increases by 200 MW in the second year because of load growth. In the first year, 650 MW of new OOM capacity clears in the FCA. The APR will be triggered because new capacity is needed and the amount of cleared OOM additions exceeds the amount of the new capacity requirement (NCR). However, in the second year, the APR will not be triggered because the NCR is negative—the past excess capacity having eliminated the need for new capacity.

Table 5-1
Example Illustrating the Shortcomings of the
First APR Trigger Condition Requiring New Capacity

Year	NICR	Existing Capacity	New Capcity Required[(a)]	New Cleared OOM	Excess OOM Capacity	Condition 1 Satisfied? (NCR > 0)[(a)]
1	10,200	10,000	200	650	450	Yes
2	10,400	10,650	−250	0	250	No

(a) The need for new capacity = NICR – existing capacity for the region or the LSR – existing capacity for a zone.

An alternative trigger that appropriately recognizes past excess is the following:

For the time period, T,

NCR_T + Excess OOM $Capacity_{T-1} > 0$, *where*

For a region:

Excess OOM $Capacity_T$ = the minimum of A) Excess $Capacity_T$ or
B) Excess OOM $Capacity_{T-1}$ + New Cleared OOM $Capacity_T$ – the maximum of NCR_T or 0,
or, if the minimum of A or B is negative, Excess OOM Capacity = 0; *and*

For a capacity zone:

Excess OOM $Capacity_T$ = the minimum of C) Excess $Capacity_T$, or
D) Excess OOM $Capacity_{T-1}$ + New Cleared OOM $Capacity_T$ – the maximum of
(LSR_T – Existing Capacity) or 0,
or, if the minimum of C or D is negative, Excess OOM Capacity = 0,

where

Excess Capacity = the maximum of (Existing $Capacity_T$ – $NICR_T$) or 0 for the region or the maximum of (Existing $Capacity_T$ – LSR_T) or 0 for a capacity zone.

An additional enhancement can be made to this condition to recognize whether any permanent delists cleared and contributed to the need for new capacity. Since the APR is triggered after the auction has concluded, the amount of cleared permanent delists is known and can be incorporated into the APR trigger as follows:

$$NCR_T + \text{Excess OOM Capacity}_{T-1} + \text{Cleared Permanent Delist Bids}_T > 0.$$

The example in Table 5-2 illustrates this alternative condition, which uses the same assumptions as the previous example. The alternative first condition is satisfied because New Capacity Required$_T$ + Excess OOM Capacity$_{T-1}$ + Cleared Permanent Delist Bids$_T$ > 0.

Table 5-2
Example Illustrating the Alternative First Condition for Triggering the APR

Year	LSR	Existing Capacity	NCR	New Cleared OOM	Excess OOM Capacity	Modified Condition 1 Satisfied? (NCR + Past Excess OOM + Retired ≥ 0)
1	10,200	10,000	200	650	450	Yes
2	10,400	10,650	−250	0	250	Yes

The third condition for triggering the APR—that OOM additions exceed the need for new capacity (i.e., OOM > New Capacity Required)—is intended to determine when OOM additions fully satisfy the need for new capacity and thus prevent in-market additions from entering and setting prices at competitive levels. However, this condition has at least two problems. First, unlike the first condition, which fails to account for past excess capacity carried forward from past auctions, this condition actually double-counts carried-forward capacity in import-constrained zones. In such zones, carried-forward capacity both adds to OOM additions and reduces the New Capacity Required. This biases the condition toward being satisfied even when in-market additions have been able to clear. Second, having a "greater than" condition does not recognize the possibility that OOM additions exactly equal to the New Capacity Required can entirely exclude in-market resources from clearing without triggering the APR. These two problems could be addressed with a revised third condition:

$$\text{OOM} \geq \text{New Capacity Required} + \text{Cleared Permanent Delist Bids}, \textit{ where}$$

OOM should not include past excess in import-constrained zones, as the current tariff establishes;

New Capacity Required must be allowed to take on negative values to appropriately capture the multiyear impacts of past excess capacity, which will result in triggering this condition more frequently; and

Cleared permanent delist bids should be considered because they add to the need for new capacity.

5.2.2 APR Capacity Clearing Price Adjustment

The APR price adjustment is based on the auction price when the last in-market new capacity offer withdrew from the auction. The INTMMU recommends that the adjusted price apply only to existing capacity, not to OOM new capacity. Allowing the OOM entrants to receive the higher adjusted price would encourage OOM entry. Limiting payment to the auction clearing price would encourage potential self-supply and bilateral contract-based entrants to offer closer to their true costs, with entry contingent on clearing in the auction. This would diminish the incentive for exercising market power because the price for the existing capacity is decoupled from the FCA clearing price and the OOM resources are paid the lower capacity clearing price.

Capping the APR capacity price adjustment by the CONE when the APR is triggered protects against supplier market power when the supply of new capacity is limited. As shown in Section 4.5.2, the supply curves revealed in the FCAs have included a variety of types of uncleared new capacity from a large number of suppliers, with offers spanning a large range of prices. This broad range of supply offers is evidence that new entry has been competitive. Given the excess supply condition, the risk of the last new capacity resource withdrawn occurring at an uncompetitively high level is outweighed by the risk of inefficient pricing, and therefore, limiting the adjusted price to the CONE as a protection against supplier market power seems unnecessary.

5.2.3 Comparison of the APR and the Price Collar

Finally, the surplus capacity that cleared in the first two auctions has raised some stakeholder concerns that the price in the FCA will drop very low, if not collapse to zero. This concern has led to discussion about whether or not the price collar should be extended. Since the price collar may prevent efficient price formation, the INTMMU cannot support an extension of the price collar.[65] However, the INTMMU does support additional changes to the APR to offer some price certainty to existing resources when the price was artificially depressed by the OOM resources. Instead of a price collar that is in effect for all actions, the price-setting mechanism in the APR could be changed to the greater of the price at which the last new capacity resource withdrew from the auction (minus $0.01) or a price floor. As described above, the price resulting from this adjustment would only be paid to existing capacity. This APR approach is superior to the price collar because it achieves the same objective of protecting existing capacity against extremely low prices while allowing new capacity to competitively set the price even below the price floor.

5.2.4 Other Mitigation Mechanisms

Because no price adjustment mechanism can perfectly restore a market to a competitive and efficient outcome, monitoring participant behavior over time and considering refining the monitoring, mitigation, and incentive mechanisms will be needed.

5.3 Analysis of Demand Resources in the FCM

Attracting demand resources is a major goal of the FCM, because their participation can increase the competitiveness and efficiency of both the FCM and, with appropriate enhancements, the electric energy market. To ensure efficient pricing in the FCM, demand resources and generation must be treated comparably. In the FCM, the comparability of demand resources and generation should be evaluated on the basis of product definition, qualification criteria, and performance requirements. To account for the three-year forward commitment of capacity supply obligations, this section compares these attributes and the associated incentives with a focus on three different timeframes:

- Will resources materialize from the time of an FCA to its commitment year?
- Will resources deliver when called during the commitment year?

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[65] For example, the price floor has prevented the INTMMU from knowing at what price the excess capacity would have left the market.

- Will large amounts of resources delist from future auctions in future years?

5.3.1 Product Definition

The capacity product that a particular type of resource is supposed to deliver is defined by the resource's performance obligations. In the FCM, the performance of each type of demand resource is measured slightly differently, both from each other and from generation. Generators with capacity supply obligations receive a reduced availability score and performance penalties if they fail to respond during three types of shortage events: operating reserve shortages, capacity deficiencies (OP 4 actions), and emergencies (OP 7).[66] Active demand resource also must respond during such events but only when dispatched by the ISO. While passive demand resources are not structured to respond to dispatch instruction, they are rated based on expected load reductions during "measurement hours," as summarized in Table 5-3. These measurement hours were selected to coincide with the times when load is the highest and shortage is most likely to occur. The framework was structured so that if a demand resource is able to fulfill its performance requirements, it is providing the same amount of "capacity" value as generation and should be compensated accordingly.

Table 5-3
Comparison of Performance Obligations for Demand Resources and Generation

<table>
<tr><th></th><th>Resource</th><th>Operating Reserve Shortage[(a)]</th><th>OP 4 Activation</th><th>OP 7 Activation</th><th>Example</th></tr>
<tr><td></td><td></td><td colspan="3">Performance Hours (Y/N)</td><td></td></tr>
<tr><td></td><td>Generators</td><td>Yes</td><td>Yes, pursuant to OP 4 (Action 6, 12, or 13)[(b)]</td><td>Yes</td><td></td></tr>
<tr><td rowspan="3">Active Demand Resources</td><td>Critical-peak demand resources[(c)]</td><td rowspan="2">Yes, if day-ahead dispatch is anticipated per OP 4 (Action 6) [(b)]</td><td rowspan="2">Yes, pursuant to actual or forecasted OP 4 (Action 6) [(b)]</td><td rowspan="2">Yes, if day-ahead dispatch is anticipated per OP 4 (Action 6)</td><td rowspan="2">Dispatchable by ISO</td></tr>
<tr><td>Real-time emergency demand resources</td></tr>
<tr><td>Real-time emergency generation</td><td></td><td>Yes, pursuant to OP 4 (Action 12) [(b)]</td><td></td><td>Distributed generators with environmental permits restrict operating reserves during shortage events.</td></tr>
<tr><td></td><td></td><td colspan="3">Measurement Hours (Y/N)</td><td></td></tr>
<tr><td rowspan="2">Passive Demand Resources</td><td>On-peak demand resources</td><td>Only if it occurs on nonholiday weekdays, between 1 p.m. and 5 p.m., in June to August, or 5 p.m.–7 p.m. in December and January</td><td></td><td></td><td>Nonweather-sensitive efficiency improvements (e.g., lighting, motors)</td></tr>
<tr><td>Seasonal demand resources</td><td>Only when real-time system load ≥ 90% of 50/50 summer/winter load forecast[(d)]</td><td>No</td><td>Only when real-time system load ≥ 90% of 50/50 seasonal load forecast</td><td>Weather-sensitive efficiency improvements (e.g., heating, ventilation, and air conditioning)</td></tr>
</table>

(a) Occurs when positive systemwide reserve-constraint penalty factors are included in the LMP.

(b) Action 6 is for allowing the depletion of some types of operating reserves; Actions 12 and 13 are to implement several types of voltage reductions,

[66] The OP 4 guidelines contain 16 actions that can be implemented individually or in groups depending on the severity of the situation. OP 4 and OP 7 are available online at http://www.iso-ne.com/rules_proceds/operating/isone/index.html.

(c) Will be phased out by FCA #3; see the FERC filing by the ISO and the New England Power Pool; *Tariff Revisions Regarding Demand Resource Integration*; filed October 1, 2008; docket no. ER09-5-000, p. 8.

(d) A 50/50 load forecast has a 50% chance of being exceeded and is expected to occur at a weighted New England-wide temperature of 90.4ºF. Peak loads with a 10% chance of being exceeded, expected to occur at a weighted New England-wide temperature of 94.2ºF, are considered "90/10 " load forecasts.

A generation resource with a capacity supply obligation also is required to offer into the Day-Ahead Energy Market every day or to notify the ISO that it is not available. This obligation is necessary to ensure reliable system operation. Generation resources receive compensation for their additional obligations through electric energy market revenues. Demand resources do not offer into the energy market but are required to operate when shortage conditions occur. The performance obligations are similar enough that paying both types of resources the same compensation in the capacity market is appropriate.

5.3.2 Deficiency Risk between the Time of FCA and the Commitment Year

Resources with capacity supply obligations that drop out, derate, or fail to materialize between the time of the FCA and the delivery year may create resource deficiencies that could be costly to mitigate or could compromise reliability. This deficiency risk exists with both existing and new generation. Existing generation can suffer a major outage or be shut down for various reasons; new generation projects may be delayed or cancelled because of permitting, interconnection, construction or financial challenges. The FCM includes qualification criteria and financial assurance deposits (three equal installments at the CONE of the auction on a $/kW-month basis) to minimize the risks that new projects will fail to materialize on time. To qualify, new generation must demonstrate that it has passed a number of key milestones, and progress is monitored against a development plan as the delivery year approaches. The ISO has the ability to assess whether the generation owner is developing "steel in the ground."

Suppliers of new resources (generation or demand resources) have up to two years to cover their obligation from the beginning of the commitment period. If their project is delayed or cancelled and they do not find their own replacement, they can attempt to shed their obligation by submitting bids in the reconfiguration auctions. If they still are deficient and do not bid in the third reconfiguration auction, the ISO will put a demand bid in for them at 2 × the CONE. If that demand bid does not clear, it loses its obligation and financial assurance before the commitment period begins. In effect, the penalty is that it loses not only the entire year's revenue, but also the financial assurance deposit equal to a quarter of a year's revenue. The penalty structure for existing capacity is similar, except that these resources have no financial assurance deposit and nothing to lose except their revenues.

Demand resources are less vulnerable to loss of the entire resource, either new or existing, since most demand resources consist of aggregations of many individual assets. However, demand resources do have their own deficiency risks. Existing demand resources are subject to attrition if the end users decide that interrupting their business activities is more costly than participating in the capacity market. This attrition risk may be mitigated by the opportunities that demand resource providers have to recruit new customers, depending on market saturation. They also are subject to changes in the economy that can force business to reduce operations or cease operations entirely.

For a new demand resource to qualify, it must submit a number of documents including project descriptions, measurement and verification (M&V) plans, customer acquisition plans, funding plans, supporting documents, and critical-path schedules or milestones. Almost half of new demand resources have come from planned deployments or expansions of utility programs. The rest has come from third-party aggregators, and the majority of their cleared megawatts was based on business plans to acquire new, yet-to-be-found customers. (Without accommodating such resources, the FCM would thwart the participation of many demand-resource assets with lead times shorter than the three- to four-year forward-commitment period). The ISO qualifies such resources only after reviewing their business plans and determining that they are credible. The ISO also performs quarterly checks of demand-resource providers to ensure they are on track to meet their milestones.

The market has the best chance of success if the ISO sets the qualification requirements, financial-assurance deposits, and deficiency penalties so that all types of resources materialize as promised, without imposing undue financial risk on suppliers. To date, generation and demand resources have had very few deficiency determinations. Hence, no evidence exists that the deficiency risks of demand resources are any larger than those for new generation, or that the current qualification requirements and deficiency penalties are inadequate. As more data are gathered, reviewing the qualification and critical-path schedule to determine whether they have been too conservative, or not conservative enough, will be useful.

5.3.3 Performance Risks during the Commitment Year

There is no guarantee that active demand resources, generation, or imports will perform when called during shortage conditions. Generators can experience forced outages, and active demand resource can underperform because the end user does not respond. The operational performance of passive demand resource should not be an issue because, once installed, its load reductions occur unless the load no longer exists or the measure no longer is installed, although the risk of a deficiency still exists, as described in the previous section.

One possible difference between active demand resources and generation is that the response of active demand resource may be a function of the number of hours it is called, whereas for generation, the response is more stable. Analogous to an energy-limited generation resource, demand resources may not operate at fully rated capacity indefinitely without becoming "fatigued" (like exhausting a limited energy resource). The total amount of the NICR that demand resources can meet is not unlimited. As the amount of demand resources procured to meet the NICR increases and generation decreases, the number of hours that demand resources would need to operate increases. When the number of hours reaches a certain level, its performance would deteriorate and the operator would need to cycle demand resources; thus, its capacity value would be reduced.

However, research efforts have not yet substantiated the extent of demand-resource fatigue or found evidence of fatigue. The only study identified that has addressed this question actually shows the opposite. In Pacific Gas and Electric's full-scale deployment of residential demand resources in Bakersfield, California, responsiveness increased over the course of three-day heat events.[67] The results of other experiments or experience with larger customers or more prolonged events are not yet available.

Even if active demand resources were to become fatigued from large numbers of events, ISO analyses suggest that fatigue will be of limited concern in 2010 to 2012 because the number of events is unlikely to be large. Before the existing capacity qualification deadline, the ISO performs the Demand Resource Operable Capacity Analysis (DROCA), systemwide and for each load zone. DROCA estimates the likely number of dispatch hours of active demand resources given different assumed levels of total demand resources clearing in the FCA. The DROCA for the 2011/2012 delivery year showed that some amount of demand resources are expected to be activated in 102 hours in 2011/2012, assuming normal load conditions.[68] Under 90/10 load conditions for August 2011, some demand resources are forecast to be

[67] Freeman, Sullivan & Co., 2008 Ex Post Load Impact Evaluation for Pacific Gas and Electric Company's SmartRate™ Tariff, Final Report, December 30, 2008, Page 4.

[68] The actual number of hours of activation would likely be lower than the DROCA estimate for two reasons. First, this is the "intermediate" estimate based on an assumption that 2,219 MW of active demand resources would clear in FCA #2, about

activated in 86 hours.[69] However, activating *some* demand resources in 102 or 86 hours does not mean that all demand resources are activated that frequently. Most individual assets are called much less frequently because only a fraction of the demand resources needed in the peak hour are needed in the other 101 or 85 hours. This is because the New England load factor still is quite low, and a large quantity of the system peak occurs in just a small number of hours, as shown in Figure 4-5.

Nevertheless, to ensure that demand-resource providers account for the possibility of fatigue in the amount of capacity they clear, appropriate penalties and incentives must be in place to keep these resources performing even after multiple calls. The DROCA analysis helps demand-resource providers anticipate their likely number of performance hours and how much they will need to rotate calls among their assets to avoid fatigue, and thus how much capacity to acquire to ensure their portfolios can perform. Demand-resource providers derate their portfolios to account for the need to rotate activations among assets, for nonresponsiveness by some assets, or from a combination of both types of circumstances.

5.3.4 Deficiency Risks—Penalties and Incentives

Demand resources face several types of penalties and incentives to ensure that these resources are efficient and comparable to other resources. These penalties and incentives were developed before the large amount of demand resources cleared in the FCAs.

5.3.4.1 Penalties

As shown in Table 3-2, the penalty structures of demand resources and generation differ to suit different resource characteristics, but the net effects are comparable. Neither penalty structure is punitive in that penalties are capped by the revenues received.[70] Both penalty structures depend roughly on the level of nonperformance relative to their total obligation.

As the examples in Table 5-4 illustrate, demand resources can face higher penalties in some cases, while generation can face higher penalties in others. For example, for a given month, assume one event took place (lasting four hours) and the resource was unavailable for the entire event. The generator penalty, which scales with the number of nonresponses, equals the annual capacity payment (or 12 × the monthly capacity payment) × a PF of 0.05. The total monthly penalty is then 0.6 × the monthly capacity payment. In this case, the demand-resource penalty, which scales with the average rate of nonresponses, simply equals the monthly capacity payment and is greater than the generator penalty. However, as the number of events and nonresponses increases from one to two, the generator penalty will become 1.2 × the monthly capacity payment, while the demand-resource monthly penalty stays the same. Demand resources that are nonresponsive during summer events can be required to pay as much as 267% of the monthly capacity payment as a result of the additional penalties in subsequent months. This would depend on how many of those months have no shortage events. A generator's monthly penalty could increase with additional nonresponses, but this payment is capped at 250% of the monthly capacity payment.

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260 MW more than actually cleared. Second, the estimate is based on the assumption that there is no excess capacity. In fact, the auctions cleared with excess capacity, including generation, which will reduce the reliance on demand resources.

[69] See p. 11 and 63 of Demand Resource Operable Capacity Analysis –Assumptions & Results, Oct. 22, 2008, at http://www.iso-ne.com/markets/othrmkts_data/fcm/reports/demand_res/2008/ccp_2011_2012/dr_op_cap_2011-2012_fnl_10-17-08.pdf.

[70] The penalties for underperformance can exceed revenues only if future delivery years also are considered. Underperforming resources can be rerated, which can require the resource owner to bid in reconfiguration auctions for replacement capacity for supply obligations already committed for future delivery years, and it can limit the amount of capacity it can qualify to offer into future FCAs.

Table 5-4
Penalty Examples

Number of Events[(a)]	Number of Nonresponses	Average Rate of Nonresponsiveness	Monthly Penalties (expressed as a fraction of monthly capacity payment)	
			Generators Varies linearly with number of nonresponses, subject to cap[(b)]	**Demand Resources** Minimum depends on Average rate of nonresponses[c]
10	**1**	**0.1**	0.6	0.1 to 0.267
2	**1**	**0.5**	0.6	0.5 to 1.34
10	**5**	**0.5**	2.5[(d)]	0.5 to 1.34
1	**1**	**1.0**	0.6	1.0 to 2.67
2	**2**	**1.0**	1.2	1.0 to 2.67
10	**10**	**1.0**	2.5[(d)]	1.0 to 2.67

(a) Shortage events are assumed to last four hours (therefore, PF = 0.05 for generators).

(b) Generators are assumed to be unavailable for all hours of the shortage event (Shortage Event Availability Score = 0%). If a generator's availability score varies between events within a month, monthly penalties will not increase linearly with the number of nonresponses.

(c) The range above the minimum depends on how many spring and fall months use summer performance as a proxy, which depends on the type of demand resources and whether each future month experiences its own shortage event.

(d) Penalties are limited by a monthly cap of 2.5 × the monthly capacity payment. Otherwise, a penalty of 1.2 × and 6× the monthly capacity payment would be assessed on each of the scenarios with five and 10 nonresponses, respectively.

5.3.4.2 Incentives

Generators have an incentive to be available during shortage conditions that demand resources do not—their opportunity to earn revenues in the electric energy market whenever they generate. A demand resource that does not respond during a shortage event forgoes only a part of its capacity payment, while a generator's opportunity cost includes its forgone capacity payment *and* revenue from the energy market. That is, a generation resource receives energy payments but a demand resource does not. Demand resources that provide capacity have only fixed revenues, even though each load-reduction event has opportunity costs.

5.3.5 Risks of Asset Turnover in Years beyond the First Commitment Period

All resources incur the cost of investment to enter ISO-administered wholesale markets and need to recover going-forward costs, including opportunity costs, to continue providing capacity to the market. Existing generation could export energy or retire but will find very few other opportunities more attractive than producing and selling power. For generation capacity, new investments generally require a large fixed-cost commitment; these fixed costs are relatively large compared with going-forward costs. However, this asymmetric cost structure provides a disincentive for generators to leave the market once the generator commits to these fixed costs (e.g., acquired siting, built the generation facility, installed the transmission interconnection and fuel supply infrastructure), which lowers the risk of asset turnover. Similarly, the cost of new investment in passive demand resources is largely fixed. Therefore, passive demand resources do not present a significant risk of asset turnover.

Active demand resources appear to have a more symmetrical cost structure and tangible opportunity costs. That is, when an active demand resource is dispatched, a customer's energy usage is interrupted, which in turn could disrupt the customer's core business in manufacturing, retail, or the maintenance of productive living and work environments. Moreover, the fixed costs of an active demand resources appear to be largely internalized by the demand-resource providers (e.g., the cost of metering, communication, and control infrastructure). Therefore, given a relatively lower fixed-cost commitment and relatively higher opportunity costs, individual active demand- resources would likely have a higher risk of asset turnover than generation. Experience with the Southwest Connecticut Gap RFP and the Winter Supplemental Demand Response Program shows that individual active demand-resource assets generally exhibit a greater ramp rate than generation resources. However, the risk of losing active demand resources is mitigated by demand-resource providers' interest and ability to recruit new assets quickly. The ability of demand-resource providers to recruit new assets could be constrained if the market is oversaturated. But, as discussed in Section 4.3.3, no evidence exists that the market is oversaturated with an unsustainably large amount of active demand resources. On the contrary, a significant potential capability remains in the market to provide active demand resources.

Moreover, the decrease in the total amount of demand resources would likely not be problematic because of the forward nature of the FCM. The three-year forward period provides sufficient lead-time for other resources to enter as needed, including new generation, capacity upgrades, imports, and passive demand resources.

5.3.6 Comparability of Demand Resources and Generation

In general, demand and generation resources are found to have comparable performance requirements and penalty structures. Demand resources are substitutable for generation as capacity products, and both types of resources are obligated to perform during shortage events during the delivery year. However, generation has more incentive to perform because generation that does not respond during shortage conditions not only faces penalties (loss of capacity revenues) but also forgoes the opportunity to earn net energy revenues. Moreover, generation resources are subject to the peak energy rent deduction that reduces capacity payments to generators by the difference between the locational marginal price and the PER threshold price for all hours when the LMP exceeds the threshold price (see Section 3.3.3). Thus, generators that are not available when the LMP exceeds the PER threshold price lose both capacity revenue and energy revenue.

The INTMMU concludes that the PER deduction should be applied to generation and all demand resources. This will make the compensation between the two resources more comparable and help ensure that the FCA price does not drop too low because demand resources face lower risks and possibly higher revenues than capacity resources. A companion recommendation is to allow demand resources to submit offers into the electric energy market and be dispatched in merit order; if they are dispatched, they should be paid the difference between the LMP and the retail rate.[71]

Generally, customers with a low value of service would be more likely to participate with the PER deduction and energy revenue mechanism, and those with high a VOS would be less likely to participate. This should lead to efficient outcomes through customers' self-selection.

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[71] Ideally, all consumers should have the opportunity to participate in price-responsive demand through a dynamic retail rate that reflects the real-time energy price. Allowing demand resources to participate in the wholesale energy markets in the same way that supply resources do is a second-best solution given the constraint of fixed uniform retail rates, which impede price-responsive demand in the wholesale electricity market. Given these considerations, paying customers the LMP net of the retail generation rate is an essential design requirement to avoid creating price-formation problems in the energy market. Because discovering and maintaining the retail generation rate paid by each demand resource participant could be very complicated, alternative approaches that use a proxy of the retail generation rate should be carefully evaluated.

5.4 Analysis of the Cost of New Entry

The FCM design, intended to let the cost of new entry determine the capacity clearing price, adjusts the CONE after each successful FCA to incorporate the new information about the CONE contained in the auction clearing price. As a result of the magnitude of excess supply, the next several FCAs are likely to not require any new capacity. Thus, the CONE will not be adjusted and will remain at the current level, which appears low relative to the cost of new generation but may well reflect the cost of additional demand resources. If this occurs, the CONE may not effectively serve its intended purposes of setting the auction starting prices, price collars, floor price in the Alternative Price Rule, offer thresholds for INTMMU reviews, the Quantity Rule for replacing delisted capacity, and credit requirements. Moreover, if auction clearing prices are depressed by a large amount of out-of-market entry, the clearing prices may not reflect the cost of new entry; if the FCM price is below the true cost of new entry, it is unlikely to attract new investments when new generation is needed (e.g. to offset units that retire).

The following subsections discuss separating the use of the CONE to set the auction starting price from other uses of the CONE; to assess whether to extend, or not extend, the use of the price collars; and to evaluate other uses of the CONE.

5.4.1 Auction Starting Price

The use of the CONE to set the starting FCA price should be separated from the other uses of the CONE. Generally, the starting price for a descending-clock auction should be set high to attract enough participation for a competitive auction. Too low a starting price runs the risk of short supply and a failed auction.

The starting price for FCA #1 was set at $15.00/kW-month based on a CONE of $7.50/kW-month. The original CONE value was based on the cost of a new peaking unit as the best estimate of the cost a generating resource would need to recover in the capacity market. The first two auctions closed at the floor price and each included over 2,000 MW of demand resources.

If the CONE does not increase because no new capacity is needed, the auction starting price could stay at $9.836/kW-month for the next few auctions. This number may be too low to attract a sufficient amount of new generating resource entry to ensure a competitive auction. Given that robust participation from new generating resources is necessary to ensure a competitive market, setting the starting price high enough to attract their participation in the auction is important. Since significant differences are apparent between the prices at which new demand resources and new generation resources stay in the auction, the auction starting price should be decoupled from the CONE and set at a level high-enough to ensure competition among various sources.

To address this problem, the INTMMU recommends setting CONE at a minimum of $15.00/kW-month, and perhaps higher, to recognize that costs have increased since the $15.00/kW-month cost was developed. A mechanism for adjusting the starting price also should be developed; one as simple as adjusting it for a construction cost index, or one that is more complex.

The above recommendation also affects the market rule for inadequate supply (see Section 3.2.2.1). When an auction results in inadequate supply, new capacity will be paid the starting price, and existing capacity will be paid at 1.1 × CONE. The differentiation of prices between new and existing capacity is appropriate, because the high starting price will motivate the new entry needed to alleviate the supply shortfall and improve competition, while linking the compensation for the existing capacity to a close approximation of the cost of new entry appears reasonable. On the basis of these assessments, the INTMMU recommends that no change be made to the FCM rule governing inadequate supply.

The Quantity Rule is designed to mitigate market power by deferring some of the delisted resources to the reconfiguration auction. When the CONE is adjusted downward because of a low capacity clearing price, it lessens the market power concern. With the exception of keeping the starting price fixed, the INTMMU recommends not changing the Quantity Rule but monitoring its effectiveness in the future.

5.4.2 Price Collars and Other Uses of the CONE

The results of the first two auctions show no evidence to justify the extension of the use of price collars or a change in any of the other uses of the CONE. The price collars were put in place to protect against extremely high or extremely low clearing prices. The use of price collars is a nonmarket mechanism motivated by the need to mitigate price volatility, but it may reduce competition and increase customer costs. A price floor keeps prices at an artificially high level, which may defer retirements and thereby delay new entry. A price collar also compromises the effectiveness of the various measures within the FCM rules that remedy deficient price formation conditions: (1) inadequate supply, (2) insufficient competition, and (3) the Alternative Price Rule.

The use of price collars, introduced mainly as a safeguard in the initial phase of the FCM, is scheduled to expire after the third auction. The first two FCAs demonstrate that the FCM is able to attract and retain sufficient resources competitively. Thus the expiration of the price collars is appropriate. In fact, the large amount of surplus argues that removing the collars is essential to determining the equilibrium price for capacity. An extension of the collar would raise the price of capacity and discourage resources from retiring, thereby hindering the development of new, more efficient investment.

The INTMMU reviews delist bids to ensure that market power was not exercised for static and export delist bids (above 0.8 × the CONE) and permanent delist bids (above 1.25 × the CONE). Dynamic delist bids are allowed only below 0.8 × the CONE. The INTMMU also reviews offers below 0.75 × the CONE for new capacity and imports. No evidence suggests that a threshold of $4.918/kW-month for the CONE would be too low.

The other uses of the CONE are related to the auction and the auction clearing price, so continuing to use the CONE as defined in the market rule is appropriate, as long as the CONE continues to stay at its current value of $4.918/kW-month. If it drops below this level, reevaluating the use of CONE for some of its current purposes would be appropriate.

Appendix
Summary of Stakeholder Inputs and Concerns

During January 2009, the ISO's INTMMU met with a broad group of New England stakeholders, including the New England Power Pool (NEPOOL) and each of the six New England states, to receive input on issues relating to the design and performance of the FCM with a focus on the first two auctions.[72] The intent of these sessions was to obtain stakeholder perspective on FCM issues and the performance of the FCAs to ensure a comprehensive report. Stakeholders expressed diverse viewpoints on the outcome of the first two auctions. There were areas of agreement across the states and sectors and also different views within individual sectors and among the states. These are summarized below. Four major issues generated the most discussion with the INTMMU and stakeholder requests for further evaluation of the performance of the FCM:

- Capacity zones
- Demand resources
- Cost of new entry
- Alternative Price Rule

While this report does not propose market rule changes, the NEPOOL Markets Committee is expected to discuss the INTMMU's findings, which could lead to consideration of market rule changes. Stakeholders seemed to agree that the market rules should not be changed before the first commitment period of June 1, 2010, through May 31, 2011. Several stakeholders expressed their concern about not wanting to reopen the FCM Settlement Agreement at this time.

Stakeholders recognized that the first two auctions succeeded in attracting new resources as intended. Some emphasized the importance of evaluating resource availability during the commitment period as a further measure of the performance of the FCM. Some stakeholders expressed concern about how the region would continue to attract investment after the third auction—the last auction with a floor price—if the price of capacity goes to zero, noting that the capacity clearing price declined from the first to the second auction.

Capacity Zones

Stakeholders generally supported having the capacity zones determined in advance of the auction. In addition, stakeholders indicated that they did not anticipate the use of different reliability standards for different aspects of the FCM (e.g., the local sourcing requirement for determining the configuration of capacity zones and the Transmission Security Analysis for evaluating certain delist bids) and would participate in the ISO-led stakeholder process to reevaluate those standards.

Some stakeholders expressed concern for any action that would result in creating separate capacity zones for individual states, while others suggested the need for stronger locational price signals.

[72] NEPOOL was formed by the region's private and municipal utilities to foster cooperation and coordination among the utilities in the six-state region and ensure a dependable supply of electricity. Today, NEPOOL members serve as ISO stakeholders and market participants. More information on NEPOOL participants is available online at http://www.iso-ne.com/committees/nepool_part/index.html.

Demand Resources

Most stakeholders said they did not expect such a large amount of demand resources to come forward and then subsequently be selected in the auction. Some expressed uncertainty about the ability of demand resources to sustain the interruptions that could be needed under the FCM. Some argued that the large amount of demand resources in the first auction had the effect of driving down prices in the auction.

Some argued that demand resources and generators offer distinct services and are subject to different obligations for participation in the wholesale markets, have different lead times for development, and have different capital structures that must be taken into account in future discussions of the market design.

Some expressed concern that the complexity of the market design, the qualification process, and the cost to participate in the market are particularly burdensome for smaller resources. Stakeholders said they have benefited from ISO-led training opportunities before the auctions, and expressed support for additional training, particularly for smaller resources.

Cost of New Entry

Stakeholders said the CONE does not appear to reflect the cost of building new generation, but recognized that it does reflect the cost of new entry for the new resources that have come forward under the first two auctions.

Some entities said they were pleased that prices had gone lower than expected, but recognized that this might not be sustainable. Some said the region may not need to build new generation now because of the surplus of capacity, but they questioned how the market would support new generation when it is needed, pointing out that the surplus could turnaround in a few years if more-stringent environmental regulations force some generators to retire.

Some said the three-year lead time between the auction and the commitment period may work for building peaking plants, but it does not work for building baseload units.

Some suggested revisiting the use of the CONE as the starting point for the auction and as a threshold for submitting certain types of delist bids. Stakeholders supported having future discussions on extending the floor price beyond the third auction.

Alternative Price Rule

Some stakeholders argued that the Alternative Price Rule, which is intended to guard against monopsony power, should not be changed since the rule has not yet been implemented. Others argued, however, that the rule can be thwarted and should be revisited, noting concerns that out-of-market incentives for certain resources are suppressing prices in the auction.

List of Acronyms and Abbreviations

Acronym	Definition
APR	Alternative Price Rule
CONE	cost of new entry
CP	capacity payment
CSO	capacity supply obligation
DROCA	Demand Resource Operable Capacity Analysis
FC	fixed cost
FCA	Forward Capacity Auction
FCM	Forward Capacity Market
FCTS	Forward Capacity Tracking System
FERC	Federal Energy Regulatory Commission
HQICC	Hydro-Québec Phase I/II Interface
ICAP	installed capacity
ICR	Installed Capacity Requirement
IMR	inframarginal rent
INTMMU	Internal Market Monitoring Unit
LICAP	locational installed capacity
LMP	locational marginal price
LSR	local sourcing requirement
MCE	Market Clearing Engine
MCL	maximum capacity limit
MCV	Monthly Capacity Variance
NCR	New Capacity Requirement
NEPOOL	New England Power Pool
NERC	North American Electric Reliability Corporation
NICR	Net Installed Capacity Requirement
OOM	out-of-market
PER	peak energy rent
RCPF	Reserve-Constraint Penalty Factor
RMR	reliability-must-run
RPM	PJM’s Reliability Pricing Model

Acronym	Definition
RR	retail rate
RTEG	real-time emergency generation
RTO	Regional Transmission Organization
TSA	Transmission Security Analysis
VOS	value of service