

**To:** NECPUC, NESCOE and NEPOOL  
**From:** ISO New England  
**Date:** October 30, 2015  
**Subject:** Revised ISO New England Discussion Paper

In June, ISO New England released a draft discussion paper titled, “The Importance of a Performance-Based Capacity Market to Ensure Reliability as the Grid Adapts to a Renewable Energy Future.” The draft informed discussions with the New England Conference of Public Utilities Commissioners (NECPUC), the New England States Committee on Electricity (NESCOE), and the New England Power Pool (NEPOOL). The ISO accepted comments on the draft discussion paper and incorporated stakeholder feedback into a revised version of the paper.

The following substantive changes are reflected in the revised version:

- Shifted the terminology away from the word “subsidized” and toward “state-supported” or “state-sponsored” when referring to renewable resources
- Made clear that the paper is not intended to address other factors that have an impact on wholesale electric energy prices (e.g., low natural gas prices)
- Noted that other factors in addition to diminishing energy market revenues drive generator retirements (e.g., environmental requirements, aging equipment)
- Noted that wind does not yet have a significant impact on energy market prices because of its modest levels of penetration
- Added a more in-depth discussion of “Pay for Performance” and its importance in a world with high renewable energy penetration
- Added hydro to the discussion on renewables since state-sponsored hydro would have similar effects on wholesale market revenues, even though the New England states apply different treatment to hydro as a renewable resource
- Noted, in the discussion on the 200 MW exemption from the Offer Review Trigger Price (ORTP) for renewable resources, that in order to be treated as a capacity resource, a project would need to meet deliverability requirements, which could increase the cost of the project (and affect its ability to clear the auction)

- Added a discussion on the potential impacts to merchant storage resources as more renewable energy is brought onto the system, and the economic inter-relationship between merchant and state-sponsored storage
- Added Pilgrim Nuclear Power Station to the discussion of generator retirements driven by low energy market margins (both historical and expected)

Thank you to all who provided feedback on the discussion paper. The ISO is open to any additional comments you may have.

ISO New England



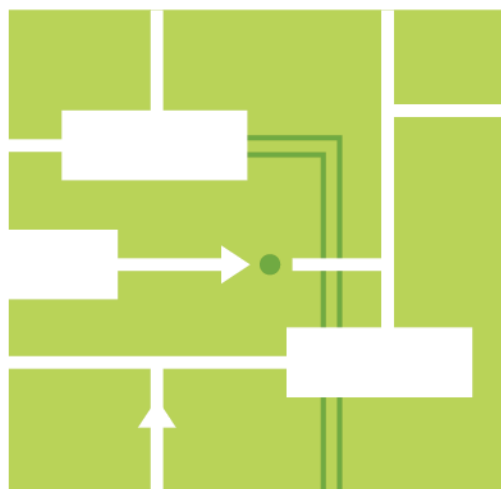
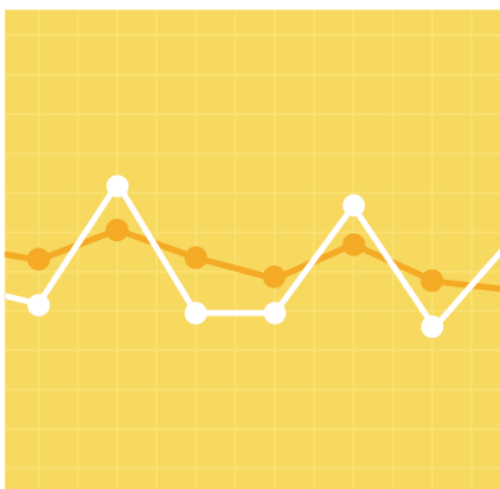
# The Importance of a Performance-Based Capacity Market to Ensure Reliability as the Grid Adapts to a Renewable Energy Future

Revised Discussion Paper

© ISO New England Inc.

OCTOBER 2015

ISO-NE PUBLIC





# The Importance of a Performance-Based Capacity Market to Ensure Reliability as the Grid Adapts to a Renewable Energy Future

Revised Discussion Paper

October 2015

## Introduction

New England has small, but rapidly growing levels of renewable energy resources—notably wind power and solar power. This growth is being spurred by state and federal policies that seek to introduce cleaner, lower-carbon-emitting resources into the energy mix.<sup>1</sup> In New England, the states desire to see these policies influence the design and outcomes of the wholesale electricity markets.

Because the resources the states are supporting have no fuel costs, they are generally dispatched ahead of conventional generation, such as gas-, coal-, and oil-fired resources with fuel costs which are included in their offers to sell electricity into New England's wholesale electric energy market. These renewable resources are expected to put downward pressure on energy market prices, but this action is not without consequences: a decrease in electricity prices will put upward pressure on prices in the capacity market. The capacity market will help balance the revenue needs of resources needed for reliability as the energy market provides fewer opportunities for resources to recover their fixed costs.

This paper discusses the quantity of renewable resources coming onto the system and the interaction of related state policies with the region's wholesale electricity markets. The capacity market will play a key role in ensuring that reliability is maintained as increasing levels of renewables are integrated onto the system. Additional renewables are expected to decrease wholesale electric energy prices, which in turn will increase capacity prices to meet resource adequacy needs. The shift in revenues from the energy to the capacity market will also affect the resource mix, putting additional financial pressure on energy-market-dependent resources.

---

<sup>1</sup> Mechanisms to implement these policies include, but are not limited to: state renewable portfolio standards and similar renewable energy goals; state initiatives to reduce greenhouse gas emissions (e.g., global warming solutions acts) and regional carbon cap-and-trade programs, such as the Regional Greenhouse Gas Initiative; state-sponsored, long-term contracts to develop renewable resources; and federal production and investment tax credits.

The purpose of this paper is to examine how increasing levels of renewable energy resources affect the wholesale electricity markets. This paper is not intended to address other factors that have an effect on wholesale electric energy prices, such as low natural gas prices and emissions policies; however, the market dynamics described in this paper will apply to any market condition that incrementally shifts revenue dependency from the energy to the capacity market.

## **Renewable Energy in New England**

By the end of 2014, 800 MW of wind power (nameplate capacity) had been installed in the region, which produced nearly 1% of the region's electricity that year. By 2015, developers had proposed 4,000 MW of additional wind power.<sup>2</sup> Furthermore, ISO studies have shown that New England has vast wind power potential that could generate nearly a quarter of the region's electricity under high wind penetration scenarios (up to 12,000 MW of onshore and offshore wind power resources).<sup>3</sup>

By the end of 2014, 900 MW of solar photovoltaic (PV) resources (AC nameplate capacity) had been installed in the region, and ISO New England's solar PV forecast projects the region will realize nearly 2,500 MW by 2024.<sup>4</sup>

## **Capacity and Energy Markets**

The capacity market is a forward market intended to ensure New England will have adequate resources to meet all electricity demand plus reserve requirements under most conditions three years in the future. Beginning in June 2018, capacity payments will be based on an individual resource's performance during scarcity conditions (times when the system is unable to meet its energy or reserve requirements), which will allow the capacity market to meet two primary objectives: ensuring resource adequacy and providing appropriate incentives for resource performance. The ISO obtains the resources needed through annual forward capacity auctions. In this auction, bidders reduce their offers by each resource's expected net energy market revenues in the capacity delivery period. The two markets (capacity and energy) are linked; higher energy market net revenue reduces competitive capacity market offers. As such, changes in the fundamentals in one market will affect the other.

---

<sup>2</sup> ISO New England Generator Interconnection Queue, June 2015

<sup>3</sup> *New England 2030 Power System Study: Report to the New England Governors*, February 2010; [http://www.iso-ne.com/static-assets/documents/committees/comm\\_wkgrps/prtcpnts\\_comm/pac/reports/2010/economicstudyreportfinal\\_022610.pdf](http://www.iso-ne.com/static-assets/documents/committees/comm_wkgrps/prtcpnts_comm/pac/reports/2010/economicstudyreportfinal_022610.pdf)

<sup>4</sup> Final 2015 PV Forecast, April 2015; [http://www.iso-ne.com/static-assets/documents/2015/05/final\\_2015\\_pv\\_forecast.pdf](http://www.iso-ne.com/static-assets/documents/2015/05/final_2015_pv_forecast.pdf)

## *“Pay for Performance”*

Under the new performance incentives design, known as “Pay for Performance” (PFP), a resource’s capacity market revenues comprise two parts – a *base payment* and a *performance payment*. The base payment is determined by the forward capacity auction result. The performance payment is determined by a resource’s performance whenever scarcity conditions occur during the capacity commitment period. A resource’s performance payment may be a positive or negative adjustment to its base payment, reflecting over- or under-performance during scarcity conditions.

PFP will be an important design element as the power system experiences growth in variable energy resources, such as wind and solar. The bulk power system will experience more frequent and rapid changes in generator output as wind and solar levels change, increasing the need for resources that can come online and ramp quickly. PFP provides strong incentives for the development of such resources.

## **Interaction of State-Sponsored and Conventional Resources**

Stakeholders are asking the ISO what will be the impact of increasing levels of state-sponsored renewable resources (e.g., solar, wind, and hydro) on resources participating in the wholesale market.<sup>5</sup> In particular, we are asked: Will this drive conventional generation out of the market by suppressing energy market prices and thereby making conventional generation uneconomic?

This concern has been raised in the context of specific nuclear unit retirements (e.g., Vermont Yankee) and potential retirements (e.g., other nuclear resources in New England and resources in Illinois and New York).<sup>6 7</sup> And it is easy to understand why this concern arises: wind, hydro, and solar resources generally produce zero (or even negative) marginal cost energy.

Adding wind, hydro, and solar to the grid is expected to result in lower energy prices when the wind is blowing, the water is flowing, or the sun is shining. This will reduce the inframarginal rents earned by all resources during those hours, and may have significant effects on the net revenues of

---

<sup>5</sup> The New England states apply different treatment to hydropower as a renewable resource, but for purposes of this paper, hydro has been included in the discussion on renewables since state-sponsored hydro would have similar effects on wholesale market revenues.

<sup>6</sup> <http://www.renewableenergyworld.com/rea/news/article/2014/06/old-reactors-v-new-renewables-the-first-nuclear-war-of-the-21st-century>

<sup>7</sup> [http://www.rochesterhomepage.net/story/d/story/the-future-of-ginna-nuclear-power-plant-uncertain/48117/YHLnyTmFt0StIE4Xth\\_4VA](http://www.rochesterhomepage.net/story/d/story/the-future-of-ginna-nuclear-power-plant-uncertain/48117/YHLnyTmFt0StIE4Xth_4VA)

baseload resources for which the energy market is the primary revenue source. It may also be expected to increase the price of reserves, and the revenues of flexible, reserve-providing resources.

In New England today, the total resource mix comprises a relatively small percentage of locally produced renewable energy, with a larger percentage of imported Canadian hydro energy. With only 800 MW of wind power on the system, it does not have a large impact on energy prices at this modest level of penetration. But the percentage of wind and other renewables such as hydro and solar is expected to grow substantially over the next decade. This growth in renewables is being driven by both the falling cost of installing these resources (by some estimates wind is already a low-cost provider in certain areas), and by sizeable direct and indirect state support, through incentive mechanisms or direct contracts for the energy output.

For example, in late 2015, Connecticut, Rhode Island and Massachusetts, and certain of their electric distribution companies, plan to issue an RFP to help fulfill these states' clean energy goals. This action is in addition to having instituted Renewable Portfolio Standards (RPSs) and other mechanisms for clean energy over the last fifteen years.

As the penetration of wind and solar resources grows, any price-reducing effects of renewables on electric energy prices will increase. This will in turn increase the financial pressure on energy-market-dependent resources with high capital costs, for example, nuclear, storage (pumped hydro and other emerging forms of storage) and legacy fossil-fueled steam generators (coal and oil). These sorts of projections have caused industry participants to worry about a wave of forthcoming retirements of resources that will harm reserve margins and reliability. These concerns are in addition to other factors that drive generator retirements, including the reductions in energy market revenues due to low gas prices and the increased cost of complying with environmental regulations and maintaining aging equipment.

Some argue that the concern over generator retirements warrants changes to the market designs of the RTOs, or policy changes to prevent these retirements and their associated reliability impacts. These suggestions range from clean energy standards, to carbon taxes, to requiring a "baseload" tranche in the capacity market, to requiring a specific resource mix to ensure fuel diversity, to unit-specific reliability agreements to preserve reliability in the absence of an explicit market mechanism to support these resources.



While policy initiatives like these may be desirable for other reasons, such approaches should not be needed to ensure reliability, or efficient market responses to an increased penetration of renewable resources. The current market design should ensure adequate resources to meet the reliability standards for which the markets are designed, as long as prices in the capacity market are appropriately formed. Appropriate price formation in the capacity market should ensure that the resulting resource mix appropriately complements the capabilities and limitations of the renewable resources entering the market.

### **The Capacity Market Will Ensure Resource Adequacy**

Under the current New England market construct, the capacity market is designed to ensure resource adequacy. The supply in the market is determined by offers from competitive suppliers of both new and existing resources. Demand in the market is determined by an administratively defined downward sloping demand curve, which is calculated to ensure adequate resources to meet expected operating needs. Price and quantity are determined by the intersection of the supply and demand curves, just as in any market.

Two important elements of the capacity market design ensure that the market is “calibrated” to reflect both the region’s capacity needs and the price needed to induce new capacity when required. These elements are the Installed Capacity Requirement (ICR) and the Cost of New Entry (CONE). The ICR determines the target amount of resources that the ISO seeks to procure through the capacity market. The CONE calculation is an estimate of the cost of building an efficient new generating resource. These elements are expanded upon below.

#### *ICR and CONE*

The ICR is calculated by the ISO’s System Planning department. Using system load and outage data, System Planning calculates the expected frequency of outages on the bulk power system due to insufficient available capacity resources. From these calculations, System Planning is able to determine the quantity of resources that should be adequate to ensure that a loss of load does not occur more frequently than once every ten years. The ICR increases as the region’s demand for electricity grows over time. Similarly, if the outage rate were to increase for resources unexpectedly forced out of service (i.e., an unplanned outage), the ICR would also increase.

This calculation also takes into account the expected availability of renewable resources (or any variable resource). The less frequently a variable resource is expected to operate during a year, the

less the resource contributes to ensuring reliability. Thus, a 100 MW wind resource which operates 20% of the time, when the wind blows, contributes less to meeting capacity needs than a 100 MW combined-cycle generator that operates 80% of the time, and on demand.<sup>8</sup> The total quantity of resources needed should be expected to grow as more variable and renewable resources are added to the system; these resources typically make contributions to reliability that are only a fraction of the value of their nameplate capacity. For this reason, variable resources like wind have their capacity severely discounted when counted toward meeting the ICR.

The second important element used for calibrating the capacity market is the Cost of New Entry (CONE). CONE is an estimate of the competitive offer that would be submitted into the capacity market by a prospective new entrant such that, if the market cleared at that price, it would be just sufficient to induce entry into the market.

CONE is calculated by estimating the total cost of a new resource (including permitting, siting and construction costs, and a competitive return on capital), and then calculating a levelized annual cost for the resource (similar to the mortgage payments on a home). These annual costs are then reduced by any forecast net revenues from the energy and ancillary service markets. The remaining revenue requirement is the Cost of New Entry, which is the amount that the resource would need to earn from the capacity market in order to be induced to enter the market.<sup>9</sup>

The simplest calculation would be for a peaking unit with a relatively low capital cost, but a high marginal cost. Such a unit would be expected to earn essentially no money in the energy market, and only a modest amount in the reserve market, so its capacity market offer would be close to its levelized capital cost. This is the amount that a for-profit developer would require in order to build the resource.

The ICR and CONE are used in determining the precise nature of the sloped demand curve. The sloped demand curve helps to determine the purchase quantity and price in the forward capacity auction, causing the FCA to procure less capacity at high prices and more at low prices. This reflects both the fact that the desired level of reliability changes with the price of reliability and that

---

<sup>8</sup> The difference between resources that operate on-demand versus those that operate when the wind is blowing (or the sun is shining) is important to reliability, but this paper does not focus on those differences and instead only addresses the differences currently relevant for ICR calculation purposes.

<sup>9</sup> There are additional complexities, like variable revenues from year to year and a whole range of operating and market risks which are not discussed here, but which would be expected to influence an actual resource's offer as well as any calculation of CONE.

elasticity of demand helps to control market power. The ICR determines how far “right” the demand curve is positioned. CONE is used to set the “height” of the demand curve.

The “target” procurement is the ICR at an expected price of CONE.<sup>10</sup> That is, the demand curve is set to procure enough to meet the reliability target assuming that CONE is a reasonable estimate of the price that a new resource would require to enter the market.

### *Interaction of renewable resources and the FCM*

From this discussion, it is straightforward to see how the capacity market would respond to an influx of renewable resources with zero marginal cost energy. This would affect both the amount of capacity installed in the region and CONE, with the change in CONE consistent with expected changes in bidding behavior by market participants. The total amount of capacity (i.e., nameplate capacity) would increase with the addition of more renewables relative to a system populated entirely by conventional resources. The ICR calculation discounts the nameplate value of renewable resources as an input, so this increase would not be directly reflected in the ICR.

As an example, 1,000 MW of additional wind resources might only count 200 MW toward meeting the ICR. The gross capacity required to meet the ICR would therefore rise as the proportion of variable generation increased. It might take five 1,000 MW wind facilities to equal the contribution of one 1,000 MW combined-cycle generator.<sup>11</sup>

The introduction of larger quantities of renewable resources would also be expected to increase both CONE and offers from competitive capacity suppliers. CONE would increase because additional renewable resources, which typically act as price takers in the energy market, would be expected to decrease energy prices and therefore net revenues for all resources in the energy market. This expected reduction would be reflected in reduced net energy market revenues calculated for the hypothetical new entrant as part of the CONE calculation. A reduction in net energy market revenues would increase the amount that a new entrant would require from the capacity market in order to move forward.

What is true for the CONE calculation would also be expected to be true for the offers submitted by capacity resource owners: capacity market offers should rise as energy market revenues decrease.

---

<sup>10</sup> This is a simplification in that the demand curve is set to procure slightly more than the ICR at CONE to allow for error in the CONE calculation.

<sup>11</sup> This is an illustrative example only.

Both elements of the capacity market that calibrate it to reflect reliability needs and market conditions would reflect the addition of renewable resources (as they have to date). These two elements would ensure that sufficient additional nameplate capacity was built to meet reliability requirements (by discounting the capacity value of variable renewable resources), even with the relatively low capacity value of many renewable resources. These elements also would ensure that the price set by the demand curve at the reliability target is increased to reflect any expected reduction in energy market revenues caused by increased levels of renewable resources.

The capacity market would continue to ensure that the reliability target is met just as it does today. If necessary, the capacity market could set a CONE that reflects new entrant capital costs with no energy market revenue offset because expected energy market net revenues are zero.

### **The Combined Capacity and Energy Markets Will Shape the Resource Mix**

While the capacity market will ensure that the region's reliability target is met, the addition of large quantities of renewable resources that reduce energy market prices will influence the long-run resource mix in New England beyond just the quantity of renewables. It will affect what resources retire and what types of resources get built in the future; not all resource types will be affected equally.

#### *Energy market revenues affect cost recovery and retirements*

New England has already experienced a number of retirements of coal, oil, and nuclear units in recent years due to economic, environmental, and other factors. While it is not possible to know if all of these retirements would have occurred with fewer renewables as part of the resource mix, they are certainly indicative of the expected future retirements in New England. They include baseload coal and nuclear units that depend relatively heavily on consistent inframarginal rents in the energy market. Entergy, the owner of the Vermont Yankee and Pilgrim nuclear units, has made clear that low energy market margins (both historical and expected) were the driver for their retirements.<sup>12</sup> While the primary driver in current energy market pricing is the relatively low price of natural gas in New England (during the spring, summer, and fall months), renewable energy will become an ever-more-significant factor since the fuel cost for renewable resources is zero.

---

<sup>12</sup> *Entergy to Close, Decommission Vermont Yankee*, Entergy press release, August 27, 2013; [http://www.entergy.com/News\\_Room/newsrelease.aspx?NR\\_ID=2769](http://www.entergy.com/News_Room/newsrelease.aspx?NR_ID=2769); *Entergy to Close Pilgrim Nuclear Power Station in Massachusetts No Later than June 1, 2019*, Entergy press release, October 13, 2015; <http://www.entergynewsroom.com/latest-news/entergy-close-pilgrim-nuclear-power-station-massachusetts-no-later-than-june2019/>

With the expected increased penetration of renewable resources, more such retirements should be expected in the future. For example, at current energy and capacity prices, nuclear units might earn almost ten times more revenue from the energy market than they earn from the capacity market.<sup>13</sup> Modest changes in energy market revenues could have large impacts on the bottom line of a nuclear unit, or baseload coal unit. This may be especially true for nuclear units, which have very high fixed operating costs and typically operate at very high capacity factors.

The economic viability of merchant storage resources may also be affected, since storage resources have high capital and fixed costs and rely on daily energy market price arbitrage to recover those costs.

Renewable resources produce energy whenever the wind is blowing or the sun is shining and, because they are the lowest-cost producers of energy, will typically not modify their production in response to changing demand for electricity. Therefore, renewable resources will tend to displace conventional resources and reduce energy prices during all hours. However, because solar production can only occur during the day and is additive to other renewable resources such as wind and hydro, it is likely that the average price differential between the day (peak demand) and the night (off-peak) will be reduced, therefore reducing the revenue opportunity for merchant storage technologies that depend on buying energy when prices are low (at night) and injecting energy when prices are high (during the day, or during scarcity conditions).

For this reason, merchant storage investors are also likely to become more dependent on capacity market revenues. The introduction of state-supported storage at either the wholesale or retail level will tend to further reduce price differentials between peak and off-peak periods and therefore reduce the economic incentives for investors in merchant storage resources.

#### *Energy market shifts could affect technology types*

Lower energy market margins are also likely to shift the new generation mix away from energy-market-dependent resources to capacity-market-dependent resources. In the current environment, that might mean a shift from gas-fired combined-cycle resources toward peaking resources that will tend to raise capacity prices, such as gas-fired combustion turbines and emerging storage technologies. For example, a combined-cycle (CC) resource is currently expected to earn double the net revenues from the energy and ancillary markets when compared to a combustion turbine (CT),

---

<sup>13</sup> 8760 hours\*\$65/MWh\*.95 capacity factor=\$540,930/MW vs. \$4.75/kW-mo.\*12 months\*1000kW/MW=\$57,000/MW

but a decrease in available energy revenues may cause combined-cycle generators to become less competitive.<sup>14</sup> This shift is also consistent with the expected increase in reserve market needs as the penetration of variable renewable resources grows.

#### *Generator retirements will affect carbon emissions*

The expected future increase in renewable resources, and the consequent reduction in energy prices, will put increased pressure on existing baseload units and any technology that is highly capital intensive or has high fixed costs. This financial pressure will likely cause them to retire sooner than they otherwise would. While this is an expected market response given the changing resource mix and incentives, it will have side effects. In addition to accelerating the retirement of otherwise reliable resources, to the extent that nuclear units are shuttered it will likely result in increased CO<sub>2</sub> emissions as fossil resources fill at least some of the energy gap. This is almost certainly an unintended consequence given that much of the rationale for states to sponsor renewable resources is the reduction of CO<sub>2</sub> emissions.

#### **The Increased Importance of the Capacity Market Will Make the ISO's Execution of Administrative Functions Even More Important**

Capacity markets include complex administrative elements to ensure appropriate price formation. They rely on accurate calculations of the cost of new entry, sloped demand curves, the installed capacity requirement, offer review trigger prices, and scrutiny of the prices at which resources seek to exit the market (i.e., delist bids are reviewed and potentially capped by the market monitor). While this overhead is necessary because of administratively-imposed reliability standards and lack of substantial demand-side price response by electricity consumers, the reduction in energy margins and greater reliance on the capacity market to assure resource adequacy will *increase* the importance of these administrative determinations.

If they are allowed to operate as designed, these administrative calculations will be successful in ensuring a reliable system and an orderly transition as the share of renewable energy grows rapidly over the next decades.

---

<sup>14</sup> For example: [http://www.iso-ne.com/static-assets/documents/committees/comm\\_wkgrps/mrks\\_comm/mrks/mtrls/2014/mar192014/a02\\_iso\\_net\\_cone\\_capital\\_budgeting\\_model\\_03\\_14\\_14.xlsx](http://www.iso-ne.com/static-assets/documents/committees/comm_wkgrps/mrks_comm/mrks/mtrls/2014/mar192014/a02_iso_net_cone_capital_budgeting_model_03_14_14.xlsx). See column "E&AS Offsets."

Some of these functions are relatively new to the market, or will take on greater importance. In particular, getting CONE right and guarding against uneconomic new entry through realistic offer review trigger prices (ORTPs) will be necessary to attract the resources needed to operate reliably.

### *Cost of New Entry*

CONE is a key parameter because, when calculated correctly, it causes the demand curve to induce new entry when quantities fall below the ICR. If CONE is too low, there will be insufficient new entry and the region's reliability targets will not be met. Because of the complexity of the CONE calculation, sensitivity to key assumptions like internal rates of return, and the necessary projections of future energy, capacity and ancillary service market revenues, CONE is particularly vulnerable to miscalculation.

### *Offer Review Trigger Prices*

ORTPs are also important components to a successful capacity market. The ORTP is intended to prevent uneconomic new entry from distorting market prices by setting a price floor below which new entrants must demonstrate their costs or be withdrawn from the capacity auction.

Inappropriate entry by uneconomic new resources will lower the capacity price for all existing resources, which in turn will reduce the incentives for new, market-rate resources in the future. Because the volume of new entry needed in any particular year is generally small relative to the total capacity need, even a modest amount of uneconomic new entry could meaningfully depress capacity prices.

### *Features in FCM that address entry by new renewable resources*

To address this, the New England capacity market has two complementary features that address capacity market entry by new, renewable resources: ORTPs designed to prevent uneconomic entry, and a 200 MW per-year exemption from the ORTP for renewable resources. The exemption allows, within limits, the resources being developed in response to state policy to enter the market and count as capacity resources.<sup>15</sup>

The 200 MW limit on the amount of renewable resources that may clear in an auction is intended to ameliorate price suppression concerns given that the combination of load growth and retirement of

---

<sup>15</sup> To be eligible for treatment as a capacity resource, a project would need to meet deliverability requirements, which could increase the cost of the project and affect its ability to clear in the FCM.

existing resources would have to be less than 200 MW in order to result in suppression of prices when the market is at or near equilibrium. This is appropriate to avoid creating a large quantity of state-backed resources that do not count towards meeting the region's reliability requirements. Ignoring these resources would be costly and inefficient. Allowing unlimited entry by such resources, however, would undermine long-term price expectations and confidence in the capacity market. This would make it more difficult for the market to attract new resources, and would increase the price necessary to attract those that do come forward.

The ORTPs are necessary to ensure that resources that do enter the market, including renewables, do so at a competitive price. This acts as a filter to ensure consistently competitive pricing in the capacity market and provides appropriate long-term price signals to new entrants. If renewables are economic at quantities that exceed the renewables exemption, the ORTPs will allow them to enter the market at a competitive level. If they are not, the ORTPs will ensure that more economically-efficient new entrants clear in the auction.

Calculating class-specific ORTPs is an involved task, but doing these calculations correctly is important to ensure that uneconomic resources do not depress the capacity price and that economic resources are not inappropriately excluded from the market. Either would reduce efficiency and ultimately increase costs to consumers.

While the renewables exemption and ORTPs contribute both to the administrative nature of the capacity market and the difficult set of calculations that must be performed by the ISO for each capacity auction, they have emerged as accommodations to state programs and policies outside the control of the ISO. If government policies were to reduce the emphasis on targeted mechanisms, such as direct contracting and picking specific preferred technologies, and instead focus on broad-based mechanisms such as regional carbon-cap-and-trade markets or other resource-neutral carbon reduction incentives (that can be easily monetized by the wholesale market), these types of administrative safeguards might be relaxed.

The interaction of competitive wholesale electricity market design and state policy objectives requires a delicate balance.



## Conclusion

The development of large quantities of state-sponsored renewable resources will present opportunities and challenges for New England.<sup>16</sup> The current markets are equipped to respond appropriately to the entry of these resources, maintaining reliability and market efficiency. However, this new entry will likely drive down energy prices, but lead to an increase in capacity prices. Capacity market revenues will become even more critical to the continued operation of existing resources and the entry of new resources. This entry also will likely incent some existing baseload resources to retire earlier than they otherwise would.

In the medium to long term, the capacity market will enable the region to achieve necessary levels of resource adequacy and resource performance while transitioning toward a system with greater levels of renewable resources. In the near term, the entry and exit of specific resources will continue to be monitored to ensure reliability needs are met.

---

<sup>16</sup> The introduction of similar quantities of renewable resources because of naturally occurring, private-sector investment (without state support) would have the same effect, but state policies appear to be the primary driver of this type of investment, not private investment.