UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMISSION

ISO New England Inc. and	**)**	**Docket Nos.**	**ER14-1050-000**
New England Power Pool	**)**		**ER14-1050-001**
	)		

SUPPLEMENTAL TESTIMONY OF PETER CRAMTON
ON BEHALF OF ISO NEW ENGLAND INC.

I. WITNESS IDENTIFICATION

Q: Please state your name, title, and business address.

A: My name is Peter Cramton. I am a Professor of Economics at the University of Maryland. My business address is Economics Department, University of Maryland, College Park, MD 20742.

Q: Have you previously testified in this proceeding?

A: Yes. I filed testimony as part of the ISO's initial filing in this proceeding on January 17, 2014.

II. PURPOSE AND OVERVIEW OF TESTIMONY

Q: What is the purpose of your testimony?

A: The purpose of my testimony is to comment on the New England Power Pool's ("NEPOOL") filing of January 17, 2014 in this proceeding. I will examine

NEPOOL's critique of the Pay For Performance ("PFP") capacity market design and identify the major flaws in the NEPOOL proposal.

Q: Can you summarize your main points?

A: Yes. Contrary to the assertions in the NEPOOL filing, PFP is an economically sensible capacity market design based on sound market principles. The NEPOOL proposal is not based on sound economics. PFP fixes the shortcomings of the current Forward Capacity Market ("FCM").[1] The NEPOOL proposal fails to address these shortcomings. The NEPOOL proposal has poor long-run properties, in contrast to the desirable long-run properties of PFP. My testimony will explain each of these points.

III. PFP IS AN ECONOMICALLY SENSIBLE CAPACITY MARKET DESIGN

Q: What is the goal of the capacity market and how does this goal impact the capacity product?

A: The goal of the capacity market is to procure adequate resources to reliably meet electricity demand in a cost-effective manner. Fundamentally this is accomplished by having sufficient energy and reserves during scarcity conditions. This goal cannot be economically met simply by procuring installed capacity. The capacity product must include obligations to provide energy and reserves in scarcity

[1] Capitalized terms not otherwise defined herein have the meanings ascribed thereto in the ISO New England Inc. Transmission, Markets and Services Tariff, or in the tariff sheets filed in *ISO New England Inc. and New England Power Pool, Filings of Market Rule Changes to Implement Pay for Performance in the Forward Capacity Market*, Docket No. ER14-1050 (filed January 17, 2014) ("January 17 Pay For Performance Filing").

conditions. Then the capacity product contributes to reliability and is valuable to consumers.

Q: Please summarize the economic logic behind the PFP design that you detailed in your initial testimony.

A: The economic logic of the capacity market begins by identifying the market failure that makes a capacity market necessary. The basic problem is that energy prices are too low during scarcity conditions, because of price caps and other market rules that address insufficient consumer response to high real-time electricity prices. This creates missing money that needs to be restored in order to induce investment at the desired reliability level.

To motivate investment in the right mix of resources it is essential that the missing money be restored as would occur in an "energy only" market in which a high scarcity price is set administratively based on the reliability criterion. PFP does this by paying resources at the Capacity Performance Payment Rate for their performance during periods of scarcity, and reducing their compensation when they fail to perform during those periods.

The PFP design thus is based on the logic that underlies the energy market, while addressing the market failure—inadequate demand response—that necessitates a regulatory standard to assure reliability. PFP then improves on the energy-only market in two ways. First, PFP coordinates overall investment at a level necessary

to satisfy the reliability standard. Second, PFP reduces risk for both consumers and suppliers by substituting a capacity payment for the volatile energy rents that otherwise would be earned by performing during scarcity conditions.

Q: What is NEPOOL's main economic criticism of the PFP design?

A: NEPOOL's primary economic critique of PFP is presented in a report by Richard D. Tabors.[2] Dr. Tabors questions the economic logic of the PFP design. Specifically, he asserts that PFP has two problems: (1) the share of system forward financial position "is not logical, is arbitrary and is contrary to the actual requirements of a [Capacity Supply Obligation]" and (2) the magnitude of the incentive payment has no connection to the magnitude of the scarcity problem.[3] I address each in turn.

Q: Please explain how the share-of-system financial obligation works.

A: Under PFP, the capacity product has two components. The first is physical—the physical capability to generate energy (or to reduce load) consistent with the Capacity Supply Obligation ("CSO"). This physical obligation is taken on three years in advance by offering resources into the Forward Capacity Auction. The second is financial—a financial obligation to deliver a share of energy or reserves in real-time during scarcity conditions. The financial obligation matches the load level. Thus, if the Installed Capacity Requirement ("ICR") is 32 GW, then a supplier with 3.2 GW of CSOs would have a financial position to supply 10% of

[2] *See* Attachment N-1f.a ("Tabors Report") to the January 17 Pay For Performance Filing.
[3] Tabors Report at 7-8.

the system's energy and reserve requirements during scarcity conditions. Thus, the financial obligation is scaled down at lower load levels so that the supply obligation matches demand. Each supplier covers its financial obligation with its own supply of energy and reserves, or by purchasing supply from others.

Q: What is Dr. Tabors' criticism of the share of system approach?

A: Dr. Tabors provides two examples to illustrate his objection to the share of system approach. In both examples, a one-hour scarcity event occurs during a low-load situation in which demand (load plus reserve requirement) is 50% of ICR.[4]

In the first example, a low marginal cost unit is operating at 100% of its CSO. As a result, the unit receives a large performance payment since its actual performance (100% of CSO) is much better than its financial position of 50% of its CSO during the event. Dr. Tabors asserts that the unit is already fully compensated in the energy market and in the capacity market, and should not be paid more.

Q: Do you agree with Dr. Tabors that this is a problem?

A: No, in fact I believe this is one of the key strengths of the PFP design. This unit is providing energy during a scarcity condition and this is precisely what consumers are paying the resource to do. Providing a strong incentive to produce energy or provide reserves during scarcity conditions is precisely the goal of PFP.

[4] *See* Tabors Report at 5-7.

In effect, the base capacity payment only is compensating the resource to provide energy up to its financial obligation, which in the example is 50% of its CSO. The resource must be compensated at the scarcity price for the additional energy delivered during the scarcity event. Further the share-of-system obligation provides the proper hedge, since then the supply obligation matches the demand requirement.

In this way, PFP is similar to how the Day-Ahead Energy Market works, and to other forward-sold goods markets. If a resource cleared 50% of its CSO MW in the Day-Ahead Energy Market, its payment in that forward energy market is compensating the resource to provide energy up to its Day-Ahead financial obligation of 50% of CSO. The resource must be compensated at the real-time energy price—which would include the energy market's scarcity price during scarcity conditions—for the additional energy delivered during the scarcity event. The Pay For Performance design is based on the same, sound economic principles applied to the capacity market.

Q: What is Dr. Tabors' second example?

A: The second example compares two resources, both of which fail to supply energy or reserves during the scarcity event. The first is a low-cost resource that is scheduled to supply 100% of its CSO, but has a forced outage. The second is a higher-cost resource that is not scheduled and cannot get online in time. Under PFP, both resources receive the same second settlement (in this case, a charge) of

50% of the CSO times the Capacity Performance Payment Rate for not providing energy or reserves in the scarcity event. Dr. Tabors argues that the second resource should be paid more because it followed dispatch instructions, whereas the first unit did not.

Q: Is there a problem if the capacity market pays a resource simply to follow dispatch instructions, rather than for its contribution to the system's requirements during scarcity conditions?

A: Yes. Such an approach would provide poor incentives. A high-cost slow-start resource that is never scheduled and never able to contribute to reliability would be paid more than a fast-start resource that is always scheduled during scarcity conditions and occasionally fails. By subsidizing resources that contribute less to reliability, either reliability is compromised or consumers must pay more to acquire additional resources that are not cost-effective. In this example, it is preferable that the high-cost resource operate and thereby help to resolve the scarcity condition, but it was not asked to run because the ISO respects a resource's stated operating characteristics when issuing dispatch instructions. Simply noting that the resource was following dispatch hides the fact that the resource by its own submissions has acknowledged that it is unable to respond to the scarcity condition.

Q: How can this problem be avoided?

A: The direct solution is to pay resources based on their contribution to reliability—their supply of energy and reserves during scarcity conditions. Once one recognizes the need for performance-based compensation, the share-of-system financial position in PFP makes perfect economic sense. It is simply a forward contract that covers demand during scarcity conditions, thereby reducing risk for both consumers and suppliers, while providing efficient performance incentives.

Q: What is the advantage of a share-of-system capacity product based upon providing energy or reserves in scarcity conditions?

A: In a one-product capacity market, the product necessarily must have a share-of-system obligation so that the aggregate of all supply obligations matches the demand requirement and thereby provides a hedge to consumers. Such arrangements are standard and are the simplest hedge for consumers. Suppliers routinely offer share of requirement contracts (also known as partial requirements contracts), and tailor their portfolio of resources to cover their energy and reserve obligations under these share-based contracts.

In the PFP design, consumers are hedging 100% of the scarcity price premium during scarcity conditions. This is done with a share-of-system forward obligation in which each supplier's share is proportional to its CSO. Thus, the obligation is directly related to the supplier's CSO and matches load so that consumers are

neither under- nor over-hedged. Such a match of resources and load is exactly what electricity markets do in aggregate: system-wide supply matches demand.

Q: Are there any alternatives to a share-of-system capacity product?

A: One could imagine a multi-product capacity market that procured for example a baseload product with a fixed quantity obligation, an intermediate product that is expected to perform for several hours on normal business days, and a peaking product that followed the residual demand after netting out the baseload and intermediate supply. The downside of this approach, in addition to much greater complexity, is that such a market would require a determination of how much of each product to buy—a function that is essentially integrated resource planning—and that puts the risks of buying the wrong quantities back on consumers. The presumed upside of such an approach—that resource owners are given clear signals about the value of different types of capacity, and that capacity is paid a market value unique to its type—is also achieved through PFP, and with a much simpler design. PFP pays resources precisely their reliability value, and does so without the need to estimate the quantities of each resource type, or even specify resource types at all.

More broadly, the multi-product resource planning approach would undo the principal benefit of using markets instead of centralized planning: Well-designed markets, like the PFP design, can select the most cost-effective resource mix

using simple price signals, and put the risk of inefficient or poorly performing investments on suppliers – where the risk belongs.

Q: Does the share-of-system, single capacity product have other advantages?

A: Yes. A further desirable feature of the share-of-system capacity product is that suppliers are in aggregate in a balanced position in periods of scarcity: the financial supply obligation is exactly equal to demand. This means that as a group, neither supply nor demand benefit from a scarcity event. The balanced positions of supply and demand reduce incentives to exercise market power during scarcity conditions. This allows the market to perform better during these critical periods of stress.

Q: Does the share-of-system capacity product have advantages for supplier risk management?

A: Yes. Unlike the current market, the share-of-system capacity product has the clarity and simplicity of a standard two-settlement design. Suppliers know their obligations and can better manage risks as a result. In particular, the downside risk from the financial obligation does not depend on any attributes of the supplier and therefore insurance against this downside risk is a readily tradable financial product that facilitates hedging.

Q: Please explain how such a financial hedge would work.

A: The downside risk from the share-of-system financial obligation arises only from the financial obligation, which per MW of CSO is:

(1) Capacity Performance Payment Rate × Capacity Balancing Ratio × Scarcity Hours.

This term does not depend on any resource-specific attributes, thus there are no moral hazard issues with writing a fixed-for-float contract (effectively, an insurance contract) against it that pays out this variable amount (1) in consideration for a fixed monthly payment. An under-performing supplier, such as a supplier experiencing a long outage, is able to hedge the downside risk by buying this type of product, which is standard in financial markets. And an over-performing supplier can sell the product and use the capabilities of its portfolio to hedge the downside risk. In the summer when scarcity conditions are more likely, such a contract may trade at high prices (but never more than the PFP monthly stop-loss limit), and in the off season the contract may trade at low prices.

Q: Is there a problem with the money transfers that occur under PFP?

A: No. Although Dr. Tabors expresses concern over the purportedly large "redistributions" that occur under PFP in low-load situations,[5] this concern is ill-founded. There are no large redistributions. Rather, resources are simply paid based on their contribution to reliability by providing energy and reserves in scarcity conditions. Settling deviations from forward positions is simply paying for supplied services—nothing more, nothing less. The performance payments are

[5] Tabors Report at 8.

not “redistributions;” they are simply purchases from other suppliers. This is how two-settlement systems work. There is nothing inappropriate about buying or selling to other suppliers that are long or short their forward positions at the time of delivery.

Q: One of the oft-repeated criticisms that the NEPOOL filing makes against PFP is that the strong performance incentives increase risk. How do you respond to concerns about risk?

A: There are two responses to this concern. The first is that without strong performance incentives the capacity market would suffer from adverse selection (less cost-effective resources would clear in the forward capacity auction) and moral hazard (the resources that do clear would underinvest in reliability-improving activities, such as dual fuel). The ISO has made clear that it believes that the current market design has resulted in both of these problems.

The second response is that the claims of increased risk are greatly overstated. There are many scarcity events over the year. Poor performance at one time may simply be bad luck (an untimely forced outage, say), but the luck will tend to average out over many scarcity events. As a result, under PFP a resource’s annual profits better reflect its average performance during scarcity conditions. Furthermore, suppliers have many ways to mitigate risk.

Q: How can a supplier mitigate risk under PFP?

A: There are three ways to manage risk. First, if a particular resource is a chronic under-performer, the supplier should take on a smaller CSO for that resource. The supplier simply bids in the Forward Capacity Auction an increasing step function that reflects the additional risk of acquiring a larger CSO. In this way, the supplier's bidding strategy for each resource can properly reflect the additional risk from taking on a larger CSO with a poor performing resource.

Second, the supplier can trade the financial obligation in secondary markets. A supplier that expects to over-perform can take on some of the financial obligation of a supplier that expects to under-perform. Such a trade would reduce risk for both suppliers, and is easily accommodated with Capacity Performance Bilaterals that the ISO settles under PFP. Particularly in the lower-load situations that Dr. Tabors posits, this is an extremely effective mechanism to manage the risk of actions such as planned outages. With the overall design of PFP, under-performance closely balances over-performance; thus, the market for capacity performance is nearly balanced.

Finally, a supplier typically has a portfolio of resources and indeed may tailor the portfolio to manage its own portfolio risk. Thus, in any particular scarcity event the supplier is apt to have some over-performing resources and some under-performing resources. The profit variation of the portfolio is much less than that of individual resources.

Q: You mentioned that Dr. Tabors had a second concern about the size of the incentive payment. What is the concern and why is this not a problem?

A: Dr. Tabors' second critique of PFP is that the size of the incentive payment does not depend on the severity of the scarcity condition.[6] The amount at stake per MW is the scarcity price (the Capacity Performance Payment Rate), initially $2000/MWh and rising in later years to $5455/MWh. This is true regardless of whether the system is 1 MW, 10 MW, or 100 MW short of reserves. As in the energy market or any other single-price market, the clearing price is used in settling all deviations from forward positions. Under PFP, the scarcity price is triggered whenever the system is in reserve shortage. The severity of the shortage is immaterial. This is the same in any clearing price market. If an increase in quantity causes the clearing price to move to the next higher step on the supply curve, it makes no difference whether we are 1 MW, 10 MW, or 100 MW into the next step. The price is determined at the margin, and the same price applies to all deviations.

However, by measuring scarcity conditions in five-minute increments, the *length* of the event will appropriately determine the total value of a resource's performance payment. In the lower-load examples about which Dr. Tabors complains, it is likely that the scarcity condition will be cured more quickly by starting additional resources; in turn, this will lessen the financial impacts of the event. Similarly, less-severe shortages are apt to cure more quickly, because fewer MWs are needed to resolve the shortage. In this way, the total value of a

[6] *See* Tabors Report at 8.

resource's performance payment does properly reflect the severity of the event and the resource's contribution to resolving the event.

Q: Would there be an advantage to increasing the scarcity price as the system shortage grows larger?

A: No. One could imagine a more complex capacity market that increased the scarcity price as the system went further into reserve shortage. This would make sense if the increasing scarcity price was intended to elicit an increasing real-time supply response. However, the ISO's current energy-market scarcity price is already sufficiently high that essentially all supply that is capable of responding would be dispatched for energy or supply reserves to mitigate the reserve shortage. Additional real-time supply would not suddenly materialize in response to an even higher scarcity price—that is missing the point. Rather, the high scarcity price serves to provide the correct long-run, medium-run, and short-run incentives for investments that enhance resources' capabilities to perform and assure reliability. Thus, we can simplify the market and have just a single scarcity price that does not vary with the size of the shortage without compromising the necessary incentives.

Q: Did Dr. Tabors raise further concerns about PFP?

A: Yes. Dr. Tabors challenges three properties of the PFP design, but in each case his challenges are misplaced and the desirable properties of PFP hold true.[7]

[7] *See* Tabors Report at 8-10.

The first property is that suppliers earn missing money, as would occur in an efficient energy market, by delivering energy and reserves during scarcity conditions. Dr. Tabors argues that a positive performance payment to a resource that provides its full CSO in a low-load scarcity event represents an "overpayment." But this is incorrect; such resources are not overpaid. The scarcity price (the Capacity Performance Payment Rate) reflects the missing money in current electricity markets. All resources earn the missing money through supply of energy and reserves during scarcity conditions. Non-performers have an expected payment of zero. An over-performer gets an additional payment for supplying more than its share-of-system obligation, just as would occur in an energy-only market with true consumer price responsiveness and uncapped prices. The payment in each case is based on the forward position with the appropriate adjustment for deviations from forward positions. This two-settlement system is completely standard, just, and reasonable.

The second property is that PFP provides payments contingent on actual performance irrespective of fault. Dr. Tabors argues that "actual performance" should not be based on real-time production alone, but should include other factors such as whether dispatch instructions were followed and who was at fault for a failure to produce. Defining actual performance as Dr. Tabors suggests would severely undermine performance incentives and destroy the two-settlement design. The power and simplicity of PFP depends on the two-settlement design. Actual performance *is* the supply of energy and reserves during scarcity

conditions. Dr. Tabors does not discuss any other market where "fault" is an automatic excuse for failure to deliver. This is because other two-settlement forward markets do not consider fault, they simply consider performance.

The third property is that PFP provides the same incentives to all suppliers, regardless of resource type. Consistent with a competitive market, it neither favors nor discriminates against any class of resources. Dr. Tabors points out that resources have different characteristics. Some are simply better performers, in the relevant sense that they are better able to supply energy and reserves during scarcity conditions. PFP favors these resources, in exact proportion to what they contribute to system reliability during scarcity conditions. This is exactly what an efficient, competitive energy-only market would do and what consumers should desire, because these resources make the greatest contribution to reliability. Each resource, regardless of type, is evaluated in the capacity auction based on its cost-effectiveness. The FCM with PFP selects the most cost-effective resources and each resource is paid the clearing price—the capacity price of the marginal resource. The non-discrimination is with respect to an efficient competitive market, not the current FCM. The current FCM discriminates in favor of unreliable resources. These resources are paid more than their contribution to reliability in the current FCM. Adopting PFP corrects this problem.

Q: In its filing letter, NEPOOL asserts, "The ISO-NE Proposal does not treat all capacity resources comparably because it seeks to redefine capacity

effectively as a product that can only be provided economically by baseload energy resources or fast-start peaking resources that can operate within 10 to 30 minutes of being called upon." Do you agree with this assertion?

A: No. While it is true that baseload resources that are operating during a scarcity event and fast-start resources that provide reserves during the event will both receive additional compensation for their performance, it is not true that all other resources are being treated in a discriminatory fashion. The significant majority of scarcity conditions are apt to occur during summer and winter peaks. In these circumstances, resources with longer start times will generally be in economic merit and scheduled to operate. If they perform, they will be paid more; if they fail to perform they will be paid less. While in aggregate these resources may receive lower compensation than efficient baseload or highly flexible peaking resources, this is because they contribute somewhat less to reliability than those resources. However, they will still receive capacity compensation commensurate with their performance and it is likely that their capacity revenues will exceed their going-forward costs of providing capacity, which means they will remain as viable capacity resources.

Q: In his report, Dr. Tabors states, "the ISO-NE Proposal is not a market and in and of itself provides no tradable products or services. This fact alone would prevent entities with CSOs from hedging their transactions." Is this a true statement?

A: No. In fact, the ability to appropriately hedge risk is one of the major strengths of the PFP design. The product definition is clear and, as I already discussed,

hedging the risks will be straightforward either among suppliers or within an entity's own portfolio. Suppliers expecting to under-perform can buy a hedge for the downside risk from suppliers expecting to over-perform. The share-of-system forward obligation means that the market for performance is balanced: the quantity of under-performance nearly equals the quantity of over-performance.

IV. THE NEPOOL PROPOSAL IS NOT BASED ON SOUND ECONOMICS

Q: What are the main market changes in the NEPOOL proposal?

A: The NEPOOL proposal consists of one change to the energy market and three changes to the Forward Capacity Market.

Q: Please explain the change to the energy market.

A: The change to the energy market is adding $500 per MWh or, in certain circumstances, $650 per MWh to the real-time energy and reserve prices during scarcity conditions through higher Reserve Constraint Penalty Factors ("RCPFs"). This change is in the right direction, as the higher scarcity price strengthens incentives for providing energy and reserves during scarcity conditions. However, the incentive is much too weak by a factor of about ten. Poor performing resources would remain profitable and displace efficient new entry. As fully discussed in Dr. White's initial testimony, at ICR the market requires a scarcity price about $5455/MWh higher than today in order for the FCM to induce cost-

effective investment and for new entry to be profitable.[8] The $500/MWh increase in prices during scarcity conditions under the NEPOOL proposal would not properly motivate cost-effective investments in reliability.

Q: What are the changes to the capacity market?

A: The changes to the FCM are three. The NEPOOL proposal: (1) eliminates FCM Shortage Event penalties entirely, (2) adds a rule that limits deductions to the capacity payment if the resource is subject to a Force Majeure event that results in an extended outage, and (3) creates a long-term availability incentive based on an annual credit or charge for changes to a resource's 5-year equivalent peak-period forced outage rate ("EFORp"). Clearly, eliminating Shortage Event penalties and limiting deductions for Force Majeure events further weaken performance incentives from the current FCM which, as I discussed in my initial testimony, are already far weaker than needed to incent performance during scarcity conditions.

Q: But does the EFORp mechanism restore performance incentives appropriately?

A: No. The annual EFORp credit/charge provides very weak and even destructive performance incentives. Under the NEPOOL proposal, each resource is evaluated relative to its 5-year historic performance. Thus, a poor resource with a historic EFORp of 45% that has a "good" year and turns in an EFORp of 50% gets an additional credit; whereas an excellent resource with a historic EFORp of 95% that has a "bad" year and turns in an EFORp of 90% pays a charge. The resource

[8] *See* pages 86-111 of Attachment I-1c ("White Testimony") to the January 17 Pay For Performance Filing.

with peak availability of 50% gets paid more than the resource with 90% peak availability. This makes no sense. Overpaying poor performers has the predictable implication that too many poor performers are selected in the Forward Capacity Auction.

Moreover, since the EFORp mechanism would not start until 2018, suppliers would have a perverse incentive to have poor EFORp performance in the years leading up to 2018 in order to show "improvement" once the NEPOOL alternative takes effect.

Q: But doesn't PJM use this EFORp mechanism in its capacity market?

A: No. Although PJM uses an EFOR-based mechanism, the mechanism is fundamentally different. Most importantly, PJM uses an EFOR-based measurement to de-rate capacity and hence payments. Thus, in PJM, a 100 MW resource with an EFOR-based availability of 50% is paid the same as a 50 MW resource with an EFOR-based availability of 100%. Both provide 50 MW of de-rated capacity. In PJM, resources with higher EFOR-based availability are paid proportionally more in their base capacity payment. NEPOOL's proposal does not work this way.

Q: What about adopting the PJM mechanism in New England?

A: Although the PJM approach to de-rating capacity (and base capacity payments) would be a clear improvement to the NEPOOL proposal, the PJM approach also

suffers from performance incentives that are far too weak to resolve the problems New England faces.

The basic problem is that EFORp is a poor measure of performance in scarcity conditions. First, EFORp measures availability in many hours without scarcity and fails to include some hours with scarcity. Second, EFORp is based on availability. Resources can be "available" and yet unable to supply energy or reserves during a scarcity event. A much better and simpler measure of performance is the direct calculation of energy and reserves supplied in scarcity events, as in the PFP design.

V. PFP FIXES THE SHORTCOMINGS OF THE CURRENT FCM; THE NEPOOL PROPOSAL DOES NOT

Q: What is the main problem with the current FCM design?

A: The primary problem with the current FCM design is performance incentives that are too weak.

As explained in detail in my initial testimony and that of Dr. White, the use of "availability" to measure performance has been shown to be highly problematic in New England.[9] Resources are often credited with being "available" even when they provide no energy or reserves during scarcity conditions. There are simply

[9] *See, e.g.*, White Testimony at 15-24; pages 14-15, 18-19 of Attachment I-1d ("Cramton Testimony") to the January 17 Pay For Performance Filing.

too many exemptions that allow a resource to claim to be available when the resource is unable to provide energy or reserves in scarcity conditions.

In fact, suppliers at times can benefit from making a resource more expensive and less flexible so that it is not scheduled and cannot get online during the scarcity event, and therefore the resource gets full "availability" credit even though it cannot run. This property is contrary to sound market design and highlights the fundamental flaws of "availability" as a performance measure in the FCM. The testimony of Mr. Brandien gives recent examples of fast-start resources lengthening start times well beyond the resources' known capabilities.[10]

Q: How do PFP and the NEPOOL proposal compare in measuring performance?

A: The NEPOOL proposal continues to base performance incentives on the flawed "availability" measure. PFP fixes this problem by directly measuring performance based on the delivery of energy and reserves during scarcity events. Exemptions are eliminated under PFP.

Q: Doesn't NEPOOL argue that exemptions are desirable?

A: Yes. NEPOOL criticizes the elimination of exemptions under PFP. One example is planned maintenance. The NEPOOL Transmittal Letter asserts, "penalizing capacity resources for not operating while on a planned maintenance outage for example will tend to create a perverse incentive for those resources to forestall or

[10] *See* page 52 of Attachment I-1b ("Brandien Testimony") to the January 17 Pay For Performance Filing.

minimize planned maintenance, thereby putting into jeopardy system reliability."[11]

Q: But you disagree?

A: Yes. In fact, PFP provides the correct incentives in this case. Without an exemption, suppliers are motivated to schedule maintenance at times when scarcity events are least likely, and to perform maintenance as rapidly as is feasible.

Further, NEPOOL's assertion makes no economic sense. The strong performance incentives in the PFP design will motivate suppliers to perform maintenance to make resources more reliable during periods when scarcity events are most likely; taking a short outage when shortage events are unlikely makes much more sense than risking being unable to operate when shortage events are most likely. Furthermore, as I discussed earlier, managing risks during planned outages is simple and will protect resource owners from loss of capacity revenues during such outages.

In contrast, it is the NEPOOL proposal that has perverse incentives. With the NEPOOL exemption, resources can safely schedule maintenance at times when scarcity is more likely (the pre-defined hours under EFORp) and yet receive full "availability" credit throughout the period. Resources, especially unreliable ones,

[11] *See* page 23 of Attachment N-1a (NEPOOL Transmittal Letter) to the January 17 Pay For Performance Filing.

also have a perverse incentive to extend maintenance outages to increase the amount of time during which they are granted full availability credit. Contrast this with the PFP incentives, where resources have strong incentives to complete outages as soon as possible.

Similarly, the NEPOOL proposal allows a supplier to safely avoid expenditures, such as off-peak resource staffing, that economically improve reliability outside of the peak hours included in EFORp.

Q: How do the two designs compare in motivating reliability-enhancing investments that are useful in only a few hours each year?

A: In the NEPOOL proposal, performance incentives are far too weak to motivate reliability-enhancing investments that are useful only a few hours each year. Dual fuel is a lead example. Without these investments, New England is vulnerable to inadequate fuel supply. This systemic risk is avoided with backup fuel but such investments are unprofitable under the NEPOOL proposal. In contrast, PFP addresses this issue. By rewarding performance during scarcity hours, PFP targets investments, like dual fuel, that improve performance during scarcity events when primary fuel supplies are tight or not readily accessible.

Q: How do the two designs compare with respect to the "money for nothing" problem?

A: The NEPOOL proposal actually increases the "money for nothing" problem. Resources that do not perform will continue to receive capacity revenues as they do in the current FCM; indeed, by eliminating the existing Shortage Event penalties and adding a new Force Majeure exemption, the NEPOOL proposal will significantly increase the probability that poor performing resources will retain essentially all their capacity revenue. This is a manifestation of performance incentives that are too weak. In contrast, non-performing resources under PFP expect to receive zero capacity revenues.

Q: What is the implication of favoring poor performers in the NEPOOL proposal?

A: The implication of overpaying poor performers, as occurs currently and in the NEPOOL proposal, is to adversely select poor performers in the Forward Capacity Auction. Poor performers that are less cost-effective in supplying energy and reserves in scarcity conditions are selected ahead of more cost-effective resources. The weak performance incentives bias the market in favor of less reliable resources.

Q: How does PFP avoid the adverse selection problem?

A: PFP addresses this problem by clearing resources in order of cost-effectiveness. This is the beauty and necessity of rewarding resources based on performance

during scarcity conditions. Those resources with the best performance per dollar cost are selected. This property of PFP—selecting the most cost-effective resources—is explained in detail in Section VI of Dr. White's initial testimony.[12]

Q: Can you contrast the product definitions in the two designs?

A: The NEPOOL proposal, like the current FCM, is based on a capacity product definition that lacks coherence. It is not based on basic economic and engineering principles. Rather the NEPOOL proposal appears to be motivated to provide a subsidy to existing, and often poorly performing, nameplate capacity. This is perhaps clearest with the use of a resource's historic EFORp as the benchmark for performance. Poor performers are paid the same as good performers. Such a system will lead to a continual erosion of reliability, as we have seen under the current FCM, as explained in the Brandien Testimony.

In contrast, the PFP design has a simple and coherent product definition based on sound principles: physical capacity together with a financial obligation to cover a share of demand during scarcity conditions. The physical capacity assures there are adequate resources. The financial obligation provides a hedge and performance incentives. These performance incentives are carefully tailored to select the most cost-effective resources and to induce cost-effective investments in reliability, whether long term (type of plant), medium term (reliability upgrades and fuel contracts), or short term (such as staffing).

[12] *See* White Testimony at 116-133.

The tailoring of incentives under PFP is remarkably simple. The financial component is a completely standard two-settlement forward contract. As a standard financial contract, it is easily understood and readily traded. This allows suppliers to better manage performance risk.

VI. PFP HAS DESIRABLE LONG-RUN PROPERTIES; THE NEPOOL PROPOSAL DOES NOT

Q: What are the long-run implications of the performance incentives in the two designs?

A: The full-strength performance incentives of the PFP design have an important long-run property: the most cost-effective resources clear in the Forward Capacity Auction. That is, resources that supply more energy and reserves in scarcity conditions per dollar of capacity cost clear first. In this way the Forward Capacity Auction selects over time the set of resources that satisfies the Installed Capacity Requirement at least cost.

In contrast, the NEPOOL proposal, as a result of weak performance incentives, adversely selects less reliable resources. In order to maintain the desired level of reliability, additional capacity must be acquired (more than under PFP) to account for a fleet with lower performance. This is why the NEPOOL proposal is ultimately more expensive than PFP, unless reliability is compromised.

Q: Do the two designs differ in other long-run properties?

A: Yes. A second long-run property of PFP is that consumers get what they pay for. This follows from the fact that resources are compensated based on their contribution to reliability—the supply of energy and reserves in scarcity conditions. Resources that expect to contribute nothing expect to receive nothing.

In the NEPOOL proposal resources can receive substantial capacity market revenues even if they expect to contribute little or nothing to reliability. Again this follows from the weak performance incentives that pay resources roughly the same amount, regardless of performance.

VII. CONCLUSION

Q: Please summarize your assessment of NEPOOL's criticism of PFP and your analysis of the NEPOOL proposal.

A: NEPOOL's criticisms of PFP are incorrect. PFP selects the most cost-effective resources to satisfy the Installed Capacity Requirement. It is in this appropriate sense that PFP is neutral with respect to resource type. Resources are selected in order of their contribution to reliability per dollar capacity cost. The share-of-system financial obligation provides the right hedge to consumers and reduces risk for both sides of the market, while allowing strong performance incentives. Resources do face performance risk, but this is essential to motivate cost-effective

investment in reliability. PFP is based on the standard two-settlement system that is commonly used in forward contracts.

PFP is a carefully thought-out change that addresses simply and fully the problems of the current market—problems that are increasing and now well-understood.

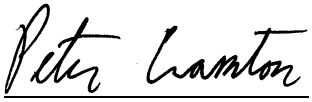
By contrast, the NEPOOL proposal is completely inadequate. Performance incentives in the proposal remain much too weak. The NEPOOL proposal does not address the identified problems of the current capacity market. It would perpetuate the disturbing trend toward less reliability.

Q: Does this complete your testimony?

A: Yes.

I declare, under penalty of perjury, that the foregoing is true and correct.

Executed on February 12, 2014



Peter Cramton