UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

ISO New England Inc. and	**)**	
New England Power Pool	**)**	**Docket No. ER14-1050-000**

COMMENTS OF THE NEW ENGLAND POWER POOL PARTICIPANTS COMMITTEE

(February 12, 2014)

The Commission must choose in this proceeding between two competing proposals to modify New England's power markets, both proposals with a common objective of increasing the financial incentive for resources to perform in the Real-Time Energy and Reserve Markets when needed. The two proposals are described fully in the joint filing made on January 17, 2014 (the "Joint Filing"),[1] by New England Power Pool ("NEPOOL") Participants Committee[2] and ISO New England Inc. ("ISO-NE"). The Joint Filing contained a separate transmittal letter and supporting materials for each of the two proposals (respectively, the "NEPOOL Transmittal Letter"[3] and "ISO-NE Transmittal Letter"[4]). The proposal by NEPOOL (the "NEPOOL Proposal") recognizes that there have been substantial recent changes in New England's markets that are designed to improve the incentives for resources to perform in Real-Time and proposes additional incremental changes that were supported by over 80% Vote of NEPOOL.[5] The alternative proposal by ISO-NE (the "ISO-NE Proposal") ignores all of the changes already

[1] *See* Filings of Performance Incentives Market Rule Changes, *ISO New England Inc. and New England Power Pool*, Docket Nos. ER14-1050-000 and -001 (Jan. 17, 2014) (the "Joint Filing").

[2] Capitalized terms not defined herein have the meanings as cited thereto in the Second Restated NEPOOL Agreement, Participants Agreement or the ISO-NE Transmission Markets and Services Tariff (the ISO-NE Tariff). Section III of the Tariff is referred to as Market Rule 1.

[3] *See* NEPOOL Transmittal Letter and attachments, Attachments N-1a – N-2c to the Joint Filing.

[4] *See* ISO-NE Transmittal Letter and attachments, Attachments I-1a – I-1j to the Joint Filing.

[5] *See* NEPOOL Transmittal Letter, Attachment N-1h.

made, was supported by only a handful of votes across three of the six NEPOOL Sectors with zero support in the other three Sectors, ignores ISO-NE's years of declared successes of FCM, ignores the recommendation of its own external market monitor, and declares FCM to be fundamentally flawed in its reliance on availability as a capacity performance measure. It proposes a radical redefinition of the capacity product and an untested new capacity market construct under which resources would be paid or penalized for their production in the Real-Time Energy and Reserve Markets.

NEPOOL demonstrated in the NEPOOL Transmittal Letter and supporting materials why the NEPOOL Proposal is preferable to the ISO-NE Proposal. In these Comments, NEPOOL responds to ISO-NE's attempts to justify its proposed radical and untested re-definition of the capacity product and to create a new market for its newly defined product. NEPOOL also replies in these Comments to the criticism ISO-NE has levied against the NEPOOL Proposal. In support of its Comments, NEPOOL submits the testimony of Julia Frayer, Managing Director of London Economic International LLC, included herewith as Attachment A (the "Frayer Testimony") and the testimony of Richard Tabors, Ph.D., included herewith as Attachment B (the "Tabors Testimony"). The Frayer Testimony concludes that ISO-NE's Proposal: (i) is a fundamental and unnecessary change from the existing capacity market in New England and from other capacity markets across the country; (ii) is not based on sound market design; (iii) will not necessarily achieve the performance objective(s) it sets out to address; and (iv) will entail unnecessary and serious adverse consequences, including for investment, planning and operations.[6] The Tabors Testimony concludes that nothing in the ISO-NE Transmittal Letter or

[6] Frayer Testimony at 10-13, 37-39, 61-62, 79-81, 85-95, 97-109, 112-115.

supporting materials disturbs the conclusions reached in his Report[7] and further concludes that (i) the ISO-NE Transmittal Letter fails to support ISO-NE's conclusion that the FCM structure is broken; (ii) ISO-NE's Proposal is not based on sound market design; (iii) ISO-NE's Proposal does not achieve the objectives of a true two-settlement system; and (iv) ISO-NE's Proposal is likely to have a series of impacts on the structure of the New England Power System that are neither intended nor desirable.[8]

Both Frayer and Tabors strongly disagree with ISO-NE's criticisms of the NEPOOL Proposal: each, based on their respective review of the ISO-NE Transmittal Letter and supporting materials, concluding that incremental changes to the current market design to address Real-Time performance concerns are preferred to the untried approach advanced by ISO-NE. As Ms. Frayer observes, the NEPOOL Proposal represents a "market evolution" while ISO-NE's Proposal represents a "market revolution" and a radical departure from how FCM operates in New England and similar capacity markets across the country.[9] The Frayer Testimony compares both proposals and concludes that NEPOOL's is preferable based on four objective metrics: efficiency, non-discrimination, cost-effectiveness and practicality (commercial reasonableness).[10] The Tabors Testimony likewise reviews both proposals and concludes that the NEPOOL Proposal offers a well-conceived approach for providing the right signals for greater economic efficiency in the capacity, Energy, and Ancillary Services Markets.[11] Through its votes, NEPOOL has come to the same conclusion in a less analytical but nonetheless clear way. Implementation of the ISO-NE Proposal is not needed and not desired.

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[7] *See* NEPOOL Transmittal Letter, Attachment N-1f.a.

[8] *See generally* Tabors Testimony.

[9] Frayer Testimony at 115.

[10] Frayer Testimony at 60-113.

[11] Tabors Testimony at 12.

I. DISCUSSION

At its core, NEPOOL has considered the very substantial set of recent market rule changes to address concerns with Real-Time operations given today's regional resources and has concluded that improvements in the Real-Time Energy and Operating Reserve Markets are preferable to fundamentally redesigning the region's eight year-old capacity market. While the existing capacity market can and should be improved, it is not-- as ISO-NE now asserts -- fundamentally flawed and requiring a radical redesign. The capacity auction that just cleared last week is the very first auction in which there has not been a floor on capacity payments. The retirements that were expected as a result of the elimination of the floor on capacity payments are in fact occurring. Just over three months ago changes to the definition of the Shortage Event mechanism were approved and have since been employed.[12] The capacity market is achieving the intended goal of satisfying resource adequacy, and the Commission has recently directed that ISO-NE file a demand curve for the next Forward Capacity Auction ("FCA9") in order to address, in part, concerns with existing administrative pricing mechanisms, price volatility and market efficiency.[13] Further, NEPOOL proposes incremental improvement to FCM by linking more closely the capacity value assumed for each resource in establishing regional capacity requirements to the actual capacity performance of that resource. Similar to the measure of capacity resource performance used in PJM and New York, NEPOOL looks to the well-recognized Equivalent Forced Outage Rate of resources during times of expected peak load ("EFORp") to measure the level of performance of each capacity resource.

In contrast to the many prior reports of a capacity market in New England that is achieving its design intent to ensure resource adequacy, ISO-NE now argues for a radically new

[12] *ISO New England Inc. and New England Power Pool*, 145 FERC ¶ 61,095 (2013).

[13] *See ISO New England Inc.*, 146 FERC ¶ 61,038 at P 30 (2014) ("*January 24, 2014 Order*").

and untested definition of capacity and an effectively new FCM design that challenges the soundness of capacity markets across the country. The proposal would essentially create a compulsory new forward market for all resources that are counted on to meet the region's Installed Capacity Requirements ("ICR") that looks much like the current, voluntary Forward Reserve Market. Repeating many of the same problems that have been cited to justify numerous recent and pending changes to the energy and reserve markets, many of which were the result of consensus and collaboration in New England, ISO-NE now declares that the source of deteriorating Real-Time Energy Market performance of resources in New England is the result of a fundamentally flawed reliance in the FCM on availability to measure performance of capacity resources.[14] ISO-NE rejects the availability performance measure used in other central capacity markets in the nation, and declares that capacity in New England should be redefined to be an option on the "share of the system's requirements during a reserve deficiency."[15]

ISO-NE has proposed this fundamental change contrary to the desire of the vast majority of New England Market Participants and in the absence of any compliance order or complaint determination requiring it to do so. ISO-NE's proposed radical redefinition and redesign of the capacity product and market is not justified given all the other recent changes to the other New England markets. Further, the ISO-NE Proposal will have unintended adverse consequences that will increase costs to consumers, potentially by billions of dollars, without achieving any of the intended objectives, and while potentially decreasing reliability for the region.[16] For these reasons the ISO-NE Proposal was soundly rejected by NEPOOL and should be rejected by the Commission.

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[14] *See, e.g.*, ISO-NE Transmittal Letter at 11-13, 17.

[15] *See generally* ISO-NE Transmittal Letter.

[16] Frayer Testimony at 10-13, 110-115; Tabors Testimony at 8-9, 12-13.

NEPOOL urges the Commission to let the recent and pending clarifications and changes to the Energy and Ancillary Services Markets work. Those clarifications and changes will effect more immediate improvements in performance than a new untested and dramatically more expensive "capacity" product and market to be implemented in 2018.[17] The incremental changes to the Energy, Ancillary Services and recently required capacity market improvements already underway, coupled with the additional changes contained in the NEPOOL Proposal, will go a long way towards achieving the shared objective of strengthening incentives to improve operational performance and reliability, especially in the near-term.

In the longer-term, there are structural issues relating to the natural gas pipelines and the evolving nature of the New England generation fleet that will need to be addressed to further assure reliability. The New England States are providing powerful incentives for new renewable energy facilities in New England and the New England Governors have recognized and are working together to propose solutions to increase gas transportation into New England.[18] No amount of FCM performance penalties or incentives will change the fact that New England has many aging nuclear, oil, and coal generating units. The latter two of these types of units have environmental attributes and costs of operation that effectively preclude dispatch in the manner

[17] ISO-NE has requested that its proposed "pay-for-performance" mechanism is requested to become effective on June 1, 2018, which is the start of the Capacity Commitment Period associated with FCA9.

[18] *See* New England Governors' Dec. 6, 2013 statement, "New England Governors' Commitment to Regional Cooperation on Energy Infrastructure Issues," *available at* http://www.nescoe.com/uploads/New_England_Governors_Statement-Energy_12-5-13_final.pdf; *see also Maine PUC chief outlines next steps for New England energy infrastructure initiative,* SNL Power Daily, Vol. 12 Issue 26 (Feb. 10, 2014) (capacity market not conducive to addressing gas pipeline issues); *see also* NESCOE letter to ISO-NE (dated Jan. 21, 2014), "Request for ISO-NE technical support and assistance with tariff filings related to electric and natural gas infrastructure in New England," *available at* http://www.nescoe.com/uploads/ISO_assistance_Trans___Gas_1_21_14_final.pdf. Indeed, ISO-NE has already gone on record as supporting the intents of the Governors' proposal, which proposes expanded transmission facilities and has agreed to work with the States in evaluating funding mechanisms. *See* ISO-NE response to NESCOE letter (dated Jan. 28, 2014), *available at* http://www.nepool.com/uploads/M-ISO__Response_to_NESCOE_1_28_14.pdf.

intended by their original design.[19] Given these realities, these units are expected to and the region is now seeing them retire. The ISO-NE Proposal, quite simply, will not solve the challenges the region is facing and is wrong for New England.

A. STRONGER INCENTIVES TO IMPROVE REAL-TIME OPERATIONAL PERFORMANCE ARE DESIRABLE, BUT ACHIEVING THAT OBJECTIVE THROUGH A FUNDAMENTAL REDESIGN OF THE FORWARD CAPACITY MARKET IS THE WRONG APPROACH

1. *The Current FCM Design is not Fundamentally/Fatally Flawed*

In its January 17 filing, ISO-NE asserts that the current FCM design is deeply flawed because the capacity product in New England is poorly defined ("poorly links capacity payments to resource performance") and the current market includes "numerous one-off provisions and exceptions."[20] As such, ISO-NE argues that FCM must be fixed on a fundamental level.[21] While ISO-NE (in its filing letter and supporting testimonies) now asserts that the capacity market in New England is essentially broken and needs to be changed on a fundamental level, the FCM in many ways has achieved precisely what it and all other organized capacity markets in the U.S. are designed to do – ensure the long-term availability of sufficient capacity resources for the reliable operation of the bulk power grid.[22] The current FCM does this by providing a mechanism for reasonably predictable and stable capacity revenues. As stated in the Frayer Testimony, a critical part of the value provided by the capacity product is the predictability and general stability in the capacity revenues so that longer term retirement and investment decisions

[19] *See* Frayer Testimony at 82-83.

[20] *See, e.g.,* ISO-NE Transmittal Letter at 2-3.

[21] *See id.*

[22] *See* Frayer Testimony at 19.

can be made.[23] Given the forward concept of most capacity markets, the capacity revenues are known in advance, which allows for the orderly planning of new entry and retirement in markets.

If resource adequacy is what the region is purchasing, then that is what the region has been getting through the current capacity market design. While improved performance in Real-Time operations is desirable, that does not mean that the basic construct of the capacity market in New England, and across the country, is broken and needs to be fixed. Rather than proposing an efficient solution to Real-Time performance, ISO-NE's Proposal is instead "a solution in search of a problem",[24] as it seeks changes far beyond what is necessary or desired by Market Participants. It is as if ISO-NE, enamored with and transfixed by its new market design, is eager to try it out and is using Real-Time operational concerns as justification for subjecting the region to this experimentation, regardless of the adverse consequences.

ISO-NE's new assertion that the current FCM design is broken or flawed is contrary to prior statements/filings where ISO-NE has said that the FCM is the right design for a capacity market and has achieved precisely what it was designed to achieve (i.e., ensuring long-term resource adequacy).[25] Indeed, as recently as September 2013, ISO-NE's Vice President of Market Development, Dr. Robert Ethier, provided the following written comments for the

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[23] *Id*. at 17.

[24] *See, e.g., Nat'l Fuel Gas Supply Corp. v. FERC*, 468 F.3d 831, 834 (D.C. Cir. 2006) (holding that FERC did not have proper justification for expanding standards of conduct for natural gas suppliers where the record lacked any concrete examples of harm).

[25] 2011 Assessment of the *Filings of Performance Incentives Market Rule Changes* New England Electricity Markets, prepared by the External Market Monitor for ISO-NE (Potomac Economics), dated June 2012, *available at* http://www.isone.org/markets/mktmonmit/rpts/ind_mkt_advsr/emm_mrkt_rprt.pdf; 2012 Assessment of the ISO New England Electricity Markets, prepared by the External Market Monitor for ISO-NE (Potomac Economics), dated May 2013, *available at* http://www.isone.org/markets/mktmonmit/rpts/ind_mkt_advsr/isone_2012_emm_rprt_final.pdf.

Commission's September 25 Technical Conference on centralized capacity markets in RTOs/ISOs:

> To date, New England's capacity market has achieved the high-level goals that capacity markets are designed to accomplish. It has procured resources needed to meet the region's capacity requirement. It has addressed the so-called "missing money" problem and paid resources for providing capacity. It has effectively replaced out-of-market reliability must-run ("RMR") contracts with market-based compensation. And it has allowed entry of new resources and created a platform on which demand response can participate as a resource. The mechanics of the New England market are working.[26]

Using these measures, there is ample evidence that the capacity market in New England is working as intended[27] and, while requiring some improvement, is hardly fundamentally flawed.

2. *Incremental Improvements in the FCM Have Been Made and are Working*

While there are no fundamental flaws with FCM, there certainly is room for improvements in the FCM and other ISO-NE Markets and changes are being, and have been, implemented in this regard. Changes to the FCM and other markets that have been implemented in recent years are starting to have their intended effects.[28] Some of these recently implemented changes include the elimination of the administrative price floor in the forward capacity auction,[29] establishment of a buyer-side mitigation scheme,[30] and a newly defined "Shortage Event" mechanism.[31] With respect to existing capacity resources, the elimination of the FCM floor price has already triggered a high level of active efforts to exit the market (i.e., the

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[26] Written Comments of Robert G. Ethier, Ph.D. Vice President of Market Development, ISO-NE, Docket No. AD13-7-000 (dated Sept. 19, 2013), at 1-2 ("Ethier Comments").

[27] *Id*. at 3.

[28] *See* Frayer Testimony at 66-69.

[29] *See ISO New England Inc.*, 142 FERC ¶ 61,107 (2013), *reh'g requested*.

[30] *Id.*

[31] *ISO New England Inc. and New England Power Pool*, 145 FERC ¶ 61,095 (2013) ("*Shortage Event Trigger Order*").

submittal of de-list bids and Non-Price Retirement Requests for FCA8) by existing resources, based on their economic outlook under the existing FCM construct.[32] As such, the region is now beginning to see increased retirements and a rationalization of the oversupply in the FCM.[33] In addition, the Commission just recently directed ISO-NE to file a proposed downward sloping demand curve for implementation by FCA9.[34] ISO-NE has explained that the limitations of the vertical demand curve has led to a "general decline in the amount of new resources seeking to participate in the auction (likely because of low prices set by the current vertical demand curve structure, which signaled that new resources were not needed)."[35] ISO-NE expects the downward sloping demand curve to "solve significant flaws in the FCM."[36] Likewise the investment community believes a sloped demand curve "should help provide some 'stability' to forward pricing"…and "could help make ISO-NE a more investable market."[37]

In short, NEPOOL agrees that there should be improvements to the FCM to increase the incentives for performance. Such improvements are being made, some have been ordered and

[32] Fuller Testimony at p. 20; Forshaw Testimony at p. 6; *see also* Press Release, ISO New England Inc., Auction Ends with Slight Shortfall in Power System Resources Needed for 2017–2018 in New England, Resource shortage pushes up capacity market costs (Feb. 5, 2014) available at: http://www.iso-ne.com/nwsiss/pr/2014/fca8_initial_results_02052014.pdf. ("The first seven auctions concluded at the floor price with a significant surplus of capacity (with the exception of the NEMA/ Boston zone, which had insufficient competition in the previous auction). However, for the first time in auction history, New England's capacity auction was conducted this year without a floor price; and in recent months, the region's capacity was substantially reduced, resulting in a small shortfall relative to the requirement. In advance of this auction, 3,135 MW of resources announced plans to retire, in addition to several major plants that had previously announced their plans to retire starting this year.")

[33] Frayer Testimony at 67.

[34] *January 24, 2014 Order* at P 30.

[35] *See* Exigent Circumstances Filing of Revisions to Forward Capacity Market Rules, *ISO New England Inc.*, Docket No. ER14-463-000 (filed Nov. 25, 2013) at p. 3 ("November 25 Filing").

[36] November 25 Filing at 4.

[37] UBS Report (dated Jan. 27, 2014), *US IPP Weekly Power Points: New England Getting Its Act Together*, at p. 1.

are currently being discussed in the stakeholder process, and additional improvements are proposed by NEPOOL. Improvements to, not redesign of, FCM, should be continued.

3. *"Availability" is a Just and Reasonable Way to Measure the Performance of Capacity Resources*

After supporting the core design elements of the FCM since its inception, ISO-NE claims that "with the benefit of experience … it is now clear that the Shortage Event mechanism is fundamentally flawed."[38] As recently as just over three months ago, ISO-NE represented to the Commission that Tariff changes were needed to fix a "flaw" in the "Shortage Event" mechanism in order to "restore critical functionality to the FCM design".[39] The Commission accepted ISO-NE's representations, ordering the changes[40] implemented "immediately rather than several years in the future", noting the changes "have the potential to incent better performance during periods of system stress, thus helping to ensure that reserve requirements are met and system reliability is protected."[41] With that "flaw" fixed as of November 3, 2013, and with just 3 months of experience with this newly defined availability metric, and only a single Shortage Event to test the impact of that change,[42] ISO-NE now represents that the whole concept of availability is fundamentally flawed and should be thrown out.[43]

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[38] ISO-NE Transmittal Letter at 13; Testimony of Dr. Matthew White, submitted as Attachment I-1c to the Joint Filing ("White Testimony") at 14-15.

[39] *See* Answer of ISO-NE in Opposition to NEPOOL Alternative Proposal, Docket No. ER13-2313-000 (filed Sept. 25, 2013) at 2; *see also Shortage Event Trigger Order*.

[40] The changes expanded the definition of a Shortage Event to include any deficiency of Thirty-Minute Operating Reserves for 30 or more contiguous minutes ("Shortage Event Trigger").

[41] *Shortage Event Trigger Order* at P 27.

[42] *See* 2013 Fourth Quarter Quarterly Markets Report, ISO New England Inc. Internal Market Monitor, Docket No. ZZ13-4 (filed Feb. 10, 2014) at 12-15.

[43] Dr. White even claims that the current mechanism creates financial disincentives for resource owners to incur additional expenses that would improve performance and reliability. *See* White Testimony at 14-15.

Remarkably, all of the experiences ISO-NE cites for its new-found conclusion pre-dated both this redefinition of Shortage Event and numerous other improvements made to the New England markets. Figure 1 of Mr. Brandien's testimony describes events from 2010 through March of 2013. Figure 2 relates to a February 2013 event. The clarifications/directives to generators cited by Mr. Brandien was issued on December 6, 2013.[44] Figure 3 relates to performance in the first quarter of 2012. The "near misses" he describes on pages 23 to 24 of his testimony occurred in January 2013 and December of 2010. Figure 4 of the Brandien Testimony relates to events occurring in July 2013. Reported start-up problems go through September 2013. Failed and late starts go to July 2012 and June 2013. The concerns with performance issues following system contingencies cite problems in 2010, with analysis reported for the period 2009-2011. The EFORd data provided only covers through August 2013, before the very changes proposed were able to have <u>any</u> impact.

The point of these observations is not to suggest New England's aging fleet is not experiencing a deterioration in performance. Rather the point is that many changes NEPOOL and ISO-NE have worked together to address this trend have yet to take effect. While it is fact that the NEPOOL Proposal, like ISO-NE, would also replace the Shortage Event mechanism beginning June 1, 2018, the NEPOOL Proposal importantly retains the underlying availability metric.[45]

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[44] *New England Power Generators Assoc., Inc. v. ISO New England Inc.*, 144 FERC ¶ 61,157 (2013), *order on reh'g*, 145 FERC ¶ 61,206 (Dec. 6, 2013).

[45] The NEPOOL-proposed "EFORp" metric would still measure the availability of capacity resources, but would do so during pre-defined peak periods (instead of during random reserve deficiency events). *See* Tabors Testimony at 4, 11-12.

ISO-NE asserts that "basing capacity payments on a resource's availability is deeply flawed."[46] With its proposal, ISO-NE makes clear that it no longer wants to measure capacity resource performance based on an availability metric because availability is "not the same thing as actually delivering energy or reserves."[47] NEPOOL agrees with ISO-NE that the current design does not measure actual delivery of energy or reserves in five-minute intervals (as ISO-NE proposes its "pay-for-performance" scheme). NEPOOL disagrees, however, that the capacity market is the appropriate market in which to measure performance in Real-Time. That performance should be measured and rewarded in the Energy and Ancillary Services Markets. The capacity market has always been designed to be a resource adequacy market measured in availability. As such it provides the basis for long-term investment decisions, based on predictable revenue streams.[48]

In advocating for this fundamental change to the FCM design, ISO-NE also claims that its pay-for-performance scheme follows a "blueprint that has been tested", and that it is a "straightforward solution," and is "completely standard in forward contracts."[49] This assertion does not appropriately reflect the market realities of the wholesale power markets. There is nothing standard about the ISO-NE Proposal.[50] While a two-settlement forward market might be standard with respect to other forward-sold goods such as gold or soybeans, ISO-NE's proposed design has never been applied to define the capacity product in the wholesale electric markets.[51] Nor does the ISO-NE Proposal include a second market settlement. Rather, it just imposes an

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[46] ISO-NE Transmittal Letter at 12.

[47] *Id*.

[48] Frayer Testimony at 15-17.

[49] ISO-NE Transmittal Letter at 5.

[50] Tabors Testimony at 7-8.

[51] Frayer Testimony at 72-74, 112-113; Tabors Testimony at 7.

administrative penalty or makes an administrative payment.[52] As noted in the Frayer Testimony, if accepted and ultimately implemented, the "pay-for-performance" mechanism as proposed by ISO-NE would eliminate the stand-alone capacity market definition and the conventional 'must offer' obligation that has linked the capacity and energy markets.[53] In essence, ISO-NE is undertaking a market re-design of not just the capacity market but also indirectly the Energy Market as well.[54]

It is the NEPOOL Proposal, not ISO-NE's new market product and design, that follows a "blueprint that has been tested" and is a "straightforward solution". Availability mechanisms have already been approved by the Commission as just and reasonable ways to measure the performance of capacity resources not only in New England, but in other RTO capacity markets.[55] As explained in the NEPOOL Transmittal Letter, the current capacity product definitions and markets in all other RTOs, already approved as just and reasonable, focus primarily on resource adequacy – not Real-Time production of energy or operating reserves.[56] It is NEPOOL's strong preference to retain the fundamental FCM design, while continuing to work with ISO-NE and State regulators on refinements/improvements to the markets, including an FCM demand curve and further enhancements to the Energy and Ancillary Services Markets.

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[52] Tabors Testimony at 7-8, 12-13. ("The result of the ISO-NE's proposed two settlement system is a 'pseudo market' because no actual transactions would take place at closing.")

[53] Frayer Testimony at 22.

[54] *Id.* at 12, 22.

[55] *Id.* at 20-23.

[56] *See* NEPOOL Transmittal Letter at 15-21. During the Commission's September 25 Technical Conference on Centralized Capacity Markets in RTOs/ISOs, panelists described the current capacity product as: "a single capacity product focused on meeting basic resource adequacy requirements, with any operational attributes needed to meet system requirements procured in the energy and ancillary services markets." Notice Allowing Post-Technical Conference Comments, *Centralized Capacity Markets in Regional Transmission Organizations and Independent System Operators*, Docket No. AD13-7-000 (Oct. 25, 2013). In fact, one of the topics of the September Technical Conference was to evaluate whether capacity products should be modified to reflect various operational characteristics. *Id*.

NEPOOL is not alone in this view. NYISO, for example, in written comments provided in response to the Commission's Notice for Post-Technical Conference Comments in AD13-7 expressed its preference that it would be best, at least at this time, to retain "the current design."[57] That is, a capacity market design based on "procuring a single capacity product focused on meeting basic resource adequacy requirements, with any operational attributes needed to meet system requirements procured in the Energy and Ancillary Services Markets."[58]

4. *Evolving Operational Performance Challenges Identified by ISO-NE are Better Addressed in Other ISO-NE Markets*

NEPOOL and ISO-NE agree that the region should pursue changes to improve the performance of resources in New England.

a. NEPOOL's Proposal Appropriately Addresses Real-Time Performance through the Real-Time Energy and Ancillary Services Markets

The NEPOOL Proposal does not redefine the product or goal of the capacity market to drive Real-Time performance in the energy and reserve markets. Rather, NEPOOL focuses on the Energy and Ancillary Services Markets to improve the incentives in these markets to perform in Real-Time.[59] Simply put, Real-Time performance and energy delivery issues are appropriately and more efficiently addressed through the Real-Time Energy and Ancillary

[57] Post-Technical Conference Comments of the New York Independent System Operator, Inc., Docket No. AD13-7-000 (Jan. 8, 2014) ("NYISO Post-Technical Conference Comments") at 4.

[58] *Id*.

[59] In Post-Technical Conference Comments of Potomac Economics Ltd, Docket No. AD13-7-000 (Jan. 8, 2013) ("Patton Post-Technical Conference Comments") at 2, Dr. David Patton explains, "a well-designed capacity market works in tandem with efficient Real-Time energy and ancillary service prices (particularly during shortages) to produce economic signals that lead to an equilibrium level of resources that satisfy the region's resource adequacy needs."

Services markets, and the NEPOOL Proposal seeks to improve the financial incentives through more efficient price signals in those hourly markets.[60]

One of ISO-NE's primary goals in proposing its "pay-for-performance" mechanism is to incent certain flexible resources, such as fast-start or dual-fuel capable units or units that can ramp up and down more quickly than the current fleet (i.e., the goal is essentially to attract certain operating characteristics). This is precisely what the Forward Reserve Market ("FRM") was designed to do[61] and NEPOOL cautions against redesigning a capacity market with over 30,000 MW to meet ISO-NE's objective(s) that are being addressed through other markets. In reflecting on current challenges facing the region, ISO-NE's own External Market Monitor recommends "that the first step in doing so would be to explore whether the Energy and Ancillary Services Markets can be modified to recognize the characteristic."[62] NEPOOL agrees, and believes that the region's evolving challenges are better addressed through enhancements to all of ISO-NE's markets, including in the Energy and Ancillary Services Markets.

b. Recent Incremental Changes in the Energy and Ancillary Services Markets are Moving New England in the Right Direction

The NEPOOL Proposal as whole is designed specifically to augment other changes recently made in the Energy and Ancillary Services Markets that are moving New England in the

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[60] Fuller Testimony at 4. ("Increasing the value of these penalty factors will allow prices in the Real-Time Energy and Ancillary Service Markets to better reflect reserve scarcity when it occurs, leading to more efficient valuation of the products needed to balance supply and demand in Real-Time while protecting against contingency events. This in turn will lead to better incentives for Real-Time availability and performance of resources, and better information with which load-serving entities and end-use consumers of electricity can manage their consumption and commercial hedging activities."); Katz Testimony at 6-8; Tabors Report at 11-12; Frayer Testimony at 73-77; Tabors Testimony at 10-11.

[61] The FRM is designed to procure sufficient short-term reserve obligations in order to satisfy the New England system-wide TMNSR requirement, the New England system-wide TMOR requirement, and any local TMOR requirement in a Reserve Zone. *See New England Power Pool and ISO New England Inc.*, 105 FERC ¶ 61,204 (Nov. 14, 2003) (accepting initial FRM filing).

[62] Patton Post-Technical Conference Comments at 7.

right direction. Those changes are improving economic incentives and resource performance by refining the process for structuring, submitting and modifying Supply Offers, facilitating and verifying resource operation and performance, and enhancing the provision of Ancillary Services. Specific examples include the following energy market, performance, and Ancillary Service Market reforms:

- ***Accelerated Day-Ahead Energy Market Schedule.*** Earlier closing of the Day-Ahead Energy Market bidding window and earlier completion of the Day-Ahead Energy Market closing and initial Reserve Adequacy Analysis ("RAA") processes became effective May 23, 2013.[63] The accelerated schedule permits ISO-NE to commit long lead-time resources earlier (providing ISO-NE with additional time needed to address any unavailability of gas resources) and permits Participants with gas-fired resources to learn their next-day commitments earlier so that they have more time to make fuel arrangements reflecting those commitments. As ISO-NE's Vice President of Operations testified, "moving the schedule forward provides more time for [ISO-NE] to address any resource performance problems."[64] These changes should help in reducing the procurement problems identified on page 17 of Mr. Brandien's testimony.

- ***Energy Offer Flexibility Changes.*** Energy Market enhancements to provide greater flexibility for Market Participants to structure and modify their Supply Offers in the Day-Ahead and Real-Time Energy Markets (the "Energy Offer Flexibility Changes") were accepted in October 2013 and will become effective in December 3, 2014.[65] Accordingly, there is no experience with these improvements. The Energy Offer Flexibility Changes will provide Market Participants with greater flexibility in the submission of Supply Offers in the Energy Market by allowing the submission of Offers that vary by hour, changes to Offers in Real-Time, and the submission of Offers as low as negative $150/MWh.[66] These Real-Time Operating Day changes will improve a Market Participant's ability to reflect in its energy market offer the cost of procuring fuel

[63] *ISO New England Inc. and New England Power Pool*, 143 FERC ¶ 61,065 (Apr. 24, 2013) (accepting, in accordance with the jump ball provisions of the Participants Agreement, NEPOOL's proposal to have the Day-Ahead Energy Market bidding window close at 10:00 a.m., as opposed to the 9:00 a.m. deadline proposed by ISO-NE). In accepting the NEPOOL Proposal, the Commission found that "the NEPOOL Proposal has the potential to not only enhance reliability but also better account for market efficiency." *Id.* at P 26.

[64] Testimony of P. Brandien, Filings of Market Rule Changes to Modify Day-Ahead Energy Market Schedule, *ISO New England Inc. and New England Power Pool*, Docket No. ER13-895 (Feb. 7, 2013) at 10.

[65] *ISO New England Inc. and New England Power Pool*, 145 FERC ¶ 61,014 (Oct. 3, 2013).

[66] *Id.* at P 7.

in Real-Time and thereby improve energy market price signals.[67] As ISO-NE Market Development staff has testified, these changes "will better ensure that market results, Market Participants' financial incentives and the requirement for resources to follow dispatch instructions are aligned."[68] Such alignment provides precisely what ISO-NE claims is needed to provide greater incentive for Real-Time performance.

- ***Redesigned NCPC Credit Rules.*** Proposed revisions to modify the Net Commitment Period Compensation ("NCPC") credit rules so that they properly account for the increased Energy Market Offer flexibility afforded by the Energy Offer Flexibility Changes and otherwise ensure that Market Participants are generally not financially disadvantaged for complying with ISO-NE operating instructions ("Redesigned NCPC Credit Rules") are pending before the Commission.[69] The Redesigned NCPC Credit Rules are proposed to become effective concurrently with the Energy Offer Flexibility Changes, or December 3, 2014.[70] Under the Redesigned NCPC Credit Rules, the appropriate NCPC payment is the amount which makes a Market Participant financially indifferent between following ISO-NE's instructions and taking the best feasible alternative course of action.[71] As ISO-NE Market Development staff has testified, an anticipated benefit of the Redesigned NCPC Credit Rules is that the Rules reduce the incentive for Market Participants to self-optimize the operation of their Resources through self-scheduling and bidding strategies, relying instead on the combination of ISO-NE dispatch plus NCPC payments to produce the best financial outcome, thereby providing ISO-NE with greater flexibility to determine which Resources to utilize to optimize overall system cost and performance in meeting New England's energy needs.[72]

- ***Winter 2013/2014 Reliability Program.*** The 2013/2014 Winter Reliability Program implemented a set of short-term solutions intended to support reliability during the cold-weather months of December 2013 through February 2014, including: (1) a new Demand Response program, (2) an oil inventory service, (3) incentives for dual-fuel units, and (4) market monitoring changes. The Winter 2013/2014 Reliability Program became effective September 6, 2013 and will

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[67] *See* Energy Market Offer Flexibility Changes, *ISO New England Inc. and New England Power Pool*, Docket No. ER13-1877 (July 1, 2013) at 6.

[68] *Id.*, Joint Testimony of R. Ethier and C. Parent at 10:19-22.

[69] *See* Market Rule 1 Revisions to the NCPC Credit Rules, Docket No. ER14-1477 (Jan. 24, 2014).

[70] *Id.* at 3.

[71] A best alternative could be operating for a shorter period of time, or not operating at all if a Market Participant is unprofitable during a period in which the ISO instructs the Market Participant to operate its resource.

[72] *Id.*, Joint Testimony of J. Lowell and M. Brewster at 8.

expire February 28, 2014.[73] Provisions addressing the procedures followed when a Market Participant with a dual-fuel Resource wants to switch to its secondary fuel, and ensuring that the Market Participant switching to its secondary fuel is evaluated for mitigation and compensated based on the resource's operation on the secondary fuel will remain in effect after the expiration of the Winter 2013-14 Reliability Program.[74] While that program to increase dual-fuel capabilities was expensive for the region, the $78 million in costs[75] is considerably smaller than the over $3 billion that the simple Analysis Group calculations suggest would be added to capacity costs associated with the ISO-NE Proposal.[76]

- ***Generator Audit Revisions.*** Enhanced auditing requirements for generation resources became effective in 2013.[77] The revisions included changes to the manner in which the fast start capability of off-line reserve resources are audited, new rules for auditing the maximum claimed capability of generation resources, and a series of "parameter" audits, which audit a number of generator operating parameters that ISO-NE relies upon in making generator commitment and operational decisions (collectively, the "Generator Audit Revisions"). The Generator Audit Revisions help ensure that the true capability of a Resource (and hence the amount of Forward Reserve Obligation that a Participant is able to assign to a Resource) is better reflected and that ISO-NE maintains a clearer understanding of the physical capability of each generation Resource, ultimately

[73] *ISO New England et al.*, 144 FERC ¶ 61,204 (Sep. 16, 2013) ("*2013/2014 Winter Reliability Program Order*"), *reh'g requested*. In accepting the Program, the FERC found that, "as a general matter, market-based solutions are preferable to out-of-market solutions like the Winter Reliability Program. However, given the importance of ensuring reliability in New England this coming winter and the late date at which ISO-NE has developed this proposed solution to the particular challenges ISO-NE faces this coming winter, such as increased reliance on natural gas-fired resources, we accept the Program for the limited period requested". *Id.* at P 42.

[74] *See ISO New England Inc. and New England Power Pool Participants Committee*, Docket No. ER14-707 (Jan. 15, 2014) (unpublished letter order).

[75] *ISO New England Inc.*, 145 FERC ¶ 61,023 at P 3 (2013).

[76] Joint Filing Attachment I-1g, Todd Schatzki and Paul Hibbard, "Assessment of the Impact of ISO-NE's Proposed Forward Capacity Market Performance Incentives," The Analysis Group (Sept. 2013) ("The Analysis Group Report") at pp. 30, 41.

[77] *See ISO New England Inc. and New England Power Pool*, 142 FERC ¶ 61,024 (Jan. 9, 2013) ("*Generator Audit Revisions Order*"). Notice of June 1, 2013 Effective Date of Tariff Changes Regarding CLAIM10 and CLAIM30 Auditing; Docket No. ER13-323-000 (May 17, 2013); Notice of Sep. 1, 2013 Effective Date of Tariff Changes Regarding Generator Auditing and Generator Seasonal Claimed Capability Values, Docket No. ER13-323-000 (Aug. 15, 2013). In accepting the auditing revisions, the Commission agreed with ISO-NE that the "Revisions will provide a clearer understanding of the physical capability of generation resources and thereby facilitate resource commitment and real-time operational decisions. The Generator Audit Revisions will also help verify that generators actually have the capability to meet, and are meeting, capacity commitments for which they receive compensation. Indeed, it is undisputed that, in furtherance of these purposes, the Generator Audit Revisions ultimately will help ensure reliability." *Generator Audit Revisions Order* at P 33.

improving resource commitment and Real-Time operational decisions.[78] More careful auditing of capacity resources should help alleviate those circumstances where ISO-NE implies resources were overstating their operating characteristics.

- ***Pipeline Information Sharing Changes.*** On January 10, 2014, ISO-NE filed changes to its Information Policy, to become effective January 11, 2014, to improve communication and coordination between the control room operators of the gas and electric networks in New England, thereby ensuring that operators have better information upon which to base operating decisions (the "Pipeline Information-Sharing Changes").[79] Specifically, the changes allow ISO-NE to share confidential information concerning natural gas-fired generation resources in New England with the operating personnel of the interstate natural gas pipeline companies. For example, the proposed Pipeline Information-Sharing Changes allow ISO-NE to provide the gas pipeline operators with output schedules for individual generators and discuss Real-Time information concerning specific resources for the purpose of maintaining reliability. As explained by ISO-NE, by sharing this information, ISO-NE and the pipeline operators will have a better picture of their combined systems, will be able to discuss specific conditions instead of generalities, and may be able to take actions, under their existing authorities, to avoid reliability problems.[80] Additionally, ISO-NE claims that, by sharing this information with the pipeline operators, the pipeline operators may be able to provide information on gas availability that will allow ISO-NE to better anticipate and address potential reliability problems in the event that there is insufficient fuel for all gas-fired generators to meet their schedules. If information from pipelines indicate that units are unavailable during peak hours (when the pipelines may be most stressed), the availability of such units will suffer under both the current market and the NEPOOL Proposal.

- ***Increased Real-Time 10-Minute Operating Reserves.*** On July 23, 2012, ISO-NE increased the amount of 10-Minute Operating Reserves it maintains in Real-Time in recognition of increased concerns over reserve Resource performance.[81] Prior to this increase, ISO-NE maintained a 10-minute reserve level that assumed 100% performance of a reserve resource's offered capability. A historical analysis performed by ISO-NE indicated that many reserve Resources often provide less than 100% of their claimed 10-minute reserve capability when dispatched in response to a contingency. Since NERC Balancing Standards for reserves utilize

[78] *See* Joint Testimony of P. Brandien and P. Harris, Market Rule 1 Revisions Relating to Auditing of Generation Resources, *ISO New England Inc. and New England Power Pool*, Docket No. ER13-323 (Nov. 6, 2012) at 4.

[79] *See* Pipeline Information-Sharing Changes, *ISO New England Inc., New England Power Pool Participants Committee*, Docket No. ER14-970 (Jan. 11, 2014).

[80] *Id.* at 5.

[81] *See* Market Rule 1 Revision Relating to the Procurement of Ten-Minute Non-Spinning Reserve in the Forward Reserve Market, *ISO New England Inc. and New England Power Pool*, Docket No. ER13-465 (Nov. 27, 2012) at 4; Testimony of C. Parent, *Id.* at 3.

performance-based criteria requiring activation of an adequate level of reserves to cover at least the largest contingency, ISO-NE modified the amount of 10-minute reserves it requires in Real-Time to reflect a 20% average fleet-wide historical non-performance of Resources called upon to address a contingency (i.e., Resources providing 10-minute reserves). In explaining that it had resolved problems that had resulted in a violation of inter-Control Area balancing requirements, ISO-NE identified this change specifically.[82]

- ***TMNSR Procurement Revision in the Forward Reserve Market.*** A companion change to the increase in Real-Time Ten-Minute Operating Reserves, ISO-NE increased the amount of Ten-Minute Non-Spinning Reserve ("TMNSR") to be procured in the FRM[83] if system conditions forecasted for the Forward Reserve Procurement Period indicate an amount of TMNSR equal to 50% of the forecasted largest first contingency would be insufficient, on its own, to meet Real-Time Operating Reserve requirements.[84] Increasing the amount of TMNSR procured in the FRM ensures the procurement of sufficient reserve resources that have FRM performance incentives and will be subsequently available in Real-Time to respond to system contingencies. The minimum TMNSR value will be increased as necessary to account for two factors: (a) any historical under-performance of resources dispatched in response to a system contingency and (b) the likelihood that more than one half of the forecasted first contingency supply loss will be satisfied using TMNSR. As explained by ISO-NE's Manager of Market Development, "accounting for the historical underperformance of reserve resources in the TMNSR calculation will help ensure that the resources available to provide reserves in Real-Time have sufficient reserve capacity to meet Real-Time reserve requirements <u>despite</u> the likelihood of resource underperformance … considering the amount of TMNSR that is likely to be used in Real-Time to restore a first contingency supply loss – helps ensure that the amount of TMNSR procured takes account of changes in system conditions and changes in New England's fleet of reserve resources."[85] The Generator Audit Revisions described above should reduce the circumstances under which ISO-NE will utilize these provisions given the convergence that should emerge between the historical

[82] *See* attachments a (Settlement Agreement by and between NPCC and ISO-NE dated July 2, 2013) and b (Additional Terms to the Mitigation Provisions of the July 2 Settlement Agreement), NERC Full Notice of Penalty regarding ISO New England, Inc., *N. Amer. Elec. Rel. Corp.*, Docket No. NP13-52 (Sep. 30, 2013).

[83] *See* n.61 *supra*.

[84] *ISO New England Inc. and New England Power Pool*, Docket No. ER13-465-000 (Feb. 8, 2013) (unpublished letter order accepting revisions to FRM Rules to permit the procurement of additional TMNSR).

[85] *See* Testimony of C. Parent, Market Rule 1 Revision Relating to the Procurement of Ten-Minute Non-Spinning Reserve in the Forward Reserve Market, *ISO New England and New England Power Pool*, Docket No. ER13-465 (Nov 27, 2012) at 7.

performance of reserve resources and the reserve capability values of resources used for meeting Forward Reserve Obligations.[86]

- ***FRM Incentives Changes.*** On October 1, 2013, ISO-NE implemented changes intended to improve the performance incentives in the FRM by making changes to the calculation of the Forward Reserve Failure-to-Reserve Penalty and to the "trigger" that is used to determine whether a resource should be assessed a Forward Reserve Failure-to-Activate Penalty ("FRM Incentives Changes").[87] Since the FRM was first implemented, both ISO-NE and the Commission have recognized that the performance penalties must be carefully balanced to ensure that it is not advantageous to forgo reserve payments, accept the penalties and provide Energy instead of Reserves.[88] The FRM Incentives Changes supplement the minimum penalty rate by penalizing a failure to perform based on the Real-Time Reserve Clearing Price when that penalty would be higher than the minimum penalty rate, incenting reserve suppliers to meet their Forward Reserve Obligations in Real-Time either by assigning sufficient resources to meet their Forward Reserve Obligation or, if the Market Participant does not have sufficient resources available to meet their Forward Reserve Obligation, by trading their obligation to another Market Participant who can meet the Forward Reserve Obligation. This minimum penalty rate reduces the need for ISO-NE to take costly actions to ensure sufficient resources are available to meet Real-Time reserve requirements that might not be reflected in the Real-Time Reserve Clearing Price. The new trigger will ensure that resources providing TMOR, when they are dispatched to restore the total system ten-minute reserve requirement, have their performance evaluated and are penalized if appropriate. If these changes, which became effective October 1, 2013, operate as intended, they will provide incentives designed to address the same specific performance issues ISO-NE now claims must be addressed through the fundamental redesign of the capacity product and market. Importantly, by limiting this enhanced performance requirement to those resources looked to specifically for Operating Reserve, the cost to customers is far less than the ISO-NE suggestion to impose substantially similar obligations on every MW of capacity in New England.

- ***RCPF for Replacement Reserves.*** Also on October 1, 2013, ISO-NE began using a replacement reserve requirement (160 MW in the summer; 180 MW in the winter) to procure additional reserves, subject to a replacement reserve requirement RCPF (i.e. price cap) of $250/MWh.[89] The $250/MWh replacement

[86] *Id.* at 9.

[87] *ISO New England Inc. and New England Power Pool*, Docket No. ER13-1733-000 (Aug. 15, 2013) (unpublished letter order accepting FRM incentives revisions).

[88] *See New England Power Pool and ISO New England Inc.*, 105 FERC ¶ 61,204 at PP 23-24 (Nov. 14, 2003) (accepting initial FRM filing).

[89] *ISO New England Inc. and the New England Power Pool Participants Committee*, Docket No. ER13-1736-000 (Aug. 15, 2013) (unpublished letter order accepting revisions to establish a Reserve Constraint Penalty Factor for the Replacement Reserve Requirement).

reserve requirement RCPF was set high enough to ensure that the unit dispatch system has the capability to re-dispatch the system under most conditions to maintain the total system operating reserve requirement. As the Vice President and Manager of ISO-NE Market Development testified, this separate RCPF, in conjunction with the minimum replacement reserve requirement above zero, "will reduce the need [for ISO-NE] to schedule additional resources above the load and reserve requirements in the RAA and is expected to produce market prices that better reflect the cost of operating the system."[90] Again, importantly this change targets improvements to the specific problem identified, rather than seeking a fundamental re-design of the capacity market.

B. IMPLEMENTATION OF THE ISO-NE PROPOSAL MAY NOT ACHIEVE THE PERFORMANCE OBJECTIVE BUT WOULD LEAD TO UNINTENDED, ADVERSE CONSEQUENCES

The Frayer Testimony lays out Ms. Frayer's analysis of the two competing proposals and their relative merits. In the course of that analysis she points out why she believes the ISO-NE Proposal might not achieve its performance objective and some of the adverse consequences that are likely to follow from adoption and implementation of that proposal. She draws her conclusions based on her analysis of the competing proposals that considers them in light of four objective metrics: efficiency, non-discrimination, cost-effectiveness and practicality. The Tabors Testimony identifies several "areas of concern" based on his review of the ISO-NE's Transmittal Letter and supporting materials and also foresees significant adverse or unintended consequences resulting from the ISO-NE's Proposal.

1. *The ISO-NE Proposal is Less Efficient than the NEPOOL Proposal.*

On the basis of efficiency, Ms. Frayer concludes that the ISO-NE Proposal is less likely to be effective in achieving the performance objective(s) because it would address Real-Time energy and reserve market performance indirectly through the capacity market and would rely heavily on a penalty scheme that is imposed even when generators are not able to respond to

[90] *See* Joint Testimony of R. Ethier and C. Parent, Revisions to Market Rule 1 to Establish a Reserve Constraint Penalty Factor for Replacement Reserve Requirement, *ISO New England Inc. and the New England Power Pool Participants Committee*, Docket No. ER13-1736 (June 20, 2013) at 22.

calls for Real-Time operation.[91] The NEPOOL Proposal would directly address Real-Time performance challenges by motivating more generation in the energy/reserve markets to participate in the hope of capturing higher Real-Time market prices.[92] The NEPOOL Proposal would refine performance incentives for capacity to focus on availability when demand is highest and would remove generators from the capacity market that do not perform consistent with historical levels and performance embedded in the ICR.[93] An important adverse consequence of the ISO-NE Proposal is that the penalty scheme would disrupt the ability of the capacity market to provide a predictable revenue stream for financing new entry and may cause abrupt and large-scale retirements for some existing technology classes.[94] Thus, while the ISO-NE Proposal would raise capacity clearing price and provide some resources with additional revenues from performance payments, the higher capacity prices and performance payment scheme will not guarantee that performance will improve and generators will be able to become more responsive to Real-Time dispatch instructions. Moreover, the risk of penalties and consequential losses may lead many existing generators to exit the market and then long-term resource adequacy might suffer in the near future, and for some time.

2. ***The ISO-NE Proposal Discriminates Against Certain Mid-Merit Resources.***

On the basis of non-discrimination, Ms. Frayer concludes that, while the ISO-NE Proposal purports to be resource neutral, it contains an embedded discrimination in the ability of generators to earn performance payments versus penalties.[95] That discrimination clearly works

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[91] Frayer Testimony at 10-11, 62-65, 70, 112-113; *See also* Tabors Testimony at 5.

[92] Frayer Testimony at 74-79.

[93] *Id*. at 11, 74-79.

[94] *Id.* at 11, 72, 97-109, 112-114.

[95] *Id*. at 81-83.

against fossil-fired steam units that generally cannot respond to dispatch instruction to start quickly.[96] Those kinds of units would be subject to penalties, which would undermine their going forward viability. An unnecessary adverse consequence of the ISO-NE Proposal would be that these resources could be driven into early retirement before new types of resources are willing and able to replace them.[97] Under the EFORp provisions of the NEPOOL Proposal, all capacity suppliers are measured against the same standard without deliberately disadvantaging slower-starting units or discriminating against peaking generation, with the specific thresholds developed by reference to actual plant performance during peak periods.[98]

3. *The ISO-NE Proposal is Less Cost-Effective than the NEPOOL Proposal.*

On the basis of cost-effectiveness, Ms. Frayer concludes that the NEPOOL Proposal is likely to be more cost-effective because of the significantly greater risks and lack of ability to hedge those risks in the ISO-NE Proposal and the fact that the NEPOOL Proposal's increased costs are from the more targeted (and therefore more efficient) Real-Time Energy Market reform.[99]

4. *The ISO-NE Proposal Would Hinder Investment and Lacks Practicality.*

Finally, on the basis of practicality, Ms. Frayer concludes that the NEPOOL Proposal is preferable for several reasons. The ISO-NE Proposal would be a fundamental change in capacity market design both here in New England and with respect to other capacity markets in the United States.[100] This new design is untested and has not been tried on a pilot basis or even been

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[96] *Id*. at 83.

[97] *Id.*

[98] *Id*. at 83; *See also* Tabors Testimony at 10-12.

[99] Frayer Testimony at 85-97.

[100] *Id*. at 10-13, 112-113.

comprehensively analyzed.[101] This new design could lead to increased seams between the New England capacity market and capacity markets in neighboring regions.[102] This design change would make FCM, which is already quite complex, far more so.[103] This new design would inject a degree of risk that is not seen in other electricity markets or in any normal commercial arrangement, which almost always allow for excused performance when conditions beyond the control of the performing party prevent performance.[104]

This lack of practicality in the ISO-NE Proposal is likely to have adverse consequences on investment, planning and operation, potentially creating more problems than it solves.[105] Market analysts are already suggesting that the mere filing of the ISO-NE Proposal is raising concerns about investment risk in New England. A recent UBS Research Report notes that scarcity performance and penalties on IPP's under the ISO-NE Proposal adds "to the risk profile of the ongoing gas supply uncertainty".[106] In this regard, UBS goes on to express concern that "[w]hile it appears technically there are no impediments to bidding gas, without certainty of supply, and the threat of implementation of so-called 'Performance Incentives', designed to penalize those unable to secure adequate gas during periods of tightness," new gas generation capacity is "a relatively low probability."[107]

Conversely, the NEPOOL Proposal contains only incremental changes and no fundamental change to the New England Markets. The NEPOOL Proposal does not contain the

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[101] *Id*. 12, 98-100.

[102] *Id*. at 13, 108-109.

[103] *Id*. at 97-98.

[104] *Id*. at 111.

[105] *See id*. at 97-111.

[106] *See* UBS Securities LLC – Global Research (dated Feb. 5, 2014): *US Electric Utilities & IPPs: New England Capacity Price Sets New Record*, at pp. 2-3.

[107] *Id*. at 3.

commercially unreasonable "no exemption" rule, and does not rely on a penalty-heavy set of provisions, but instead relies on rewards in the Real-Time markets to improve Real-Time performance.[108] The NEPOOL Proposal will not create new market seams or a much more complex set of capacity market rules, nor will it disrupt existing contracts and financing arrangements.[109]

Summing up her conclusions, Ms. Frayer recommends that the Commission adopt the NEPOOL Proposal as just and reasonable and preferable to the ISO-NE Proposal:

> With this in mind, I recommend that the Commission accept the NEPOOL Proposal. The NEPOOL Proposal represents an incremental change that addresses directly the real-time performance concerns raised by ISO-NE, while maintaining the important role of capacity markets in providing for an orderly and predictable pathway to retirement and an efficient market signal for new investment. Furthermore, the incremental changes under the NEPOOL Proposal are likely to complement the numerous other changes that have been or are currently being made to ISO-NE markets. It is important to allow appropriate time for the full impact of these recent and on-going changes to be realized.[110]

Based on his review of ISO-NE's Transmittal Letter and supporting materials, Dr. Tabors concludes, just as he did in his Report, that:

> NEPOOL approaches the question with a logical step forward from the current FCM structure recognizing that greater incentives are required and that there is a need for a revised metric that can both measure performance and be used to penalize consistent under performers . . . Improvements to the current FCM are needed. The NEPOOL Proposal provides the more logical and reasonable improvements.[111]

In a less analytical but just as important way NEPOOL, through its votes, has also concluded that the NEPOOL Proposal is more likely to ensure resource adequacy, achieve the performance objective and avoid serious adverse consequences than the ISO-NE Proposal. ISO-

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[108] Frayer Testimony at 11-13, 109-110; *See also* Tabors Testimony at 10-12.

[109] *See* Frayer Testimony. at 109-110.

[110] *Id.* at 115.

[111] Tabors Testimony at 12-13.

NE's witness, Dr. White, makes clear in his testimony that resolving the region's reliability risks "requires improving suppliers' financial incentives to undertake the investments *they* determine will best improve resources' performance during periods of heightened reliability risk."[112] Given suppliers' (as well as consumers') overwhelming opposition to the ISO-NE Proposal, they appear to have determined that they are unlikely to undertake such investments if the ISO-NE Proposal is implemented.

C. ISO-NE'S LIMITED CRITICISMS OF THE NEPOOL PROPOSAL ARE MISPLACED

NEPOOL in its January 17 filing letter and supporting testimonies explained at length why the NEPOOL Proposal is just and reasonable and preferable to the ISO-NE Proposal. NEPOOL reiterates here to respond to all that ISO-NE has said at this juncture in the proceeding with respect to the NEPOOL Proposal.

In its limited criticism, ISO-NE first argues that NEPOOL's proposed $500/MWh increase to the RCPF value for the TMOR product (from $500/MWh to $1,000/MWh) "is an order of magnitude too small" because it is not equivalent to ISO-NE's derived Performance Payment Rate of $5,455/MWh.[113] To be clear, NEPOOL's proposed RCPF value was never intended to mirror the Performance Payment Rate proposed by ISO-NE, but instead was designed to allow ISO-NE access to all capacity resources that have must offer requirements in the Day-Ahead and Real-Time Energy Markets. At the same time, the increase is not too small to enhance economic incentives in the Real-Time hourly markets.[114] In addition, the NEPOOL Proposal increases the RCPF value for the TMNSR product from $850/MWh to $1,500/MWh. Combined, these new RCPF values are not insignificant increases to the Real-Time incentive

[112] White Testimony at 12.

[113] ISO-NE Transmittal Letter at 27.

[114] Frayer Testimony at 77-78; Tabors Testimony at 10; *see generally* Fuller Testimony.

structure of the hourly markets and importantly represent a step in the right direction.[115] The Frayer Testimony further explains why the NEPOOL Proposal regarding the increase to the RCPF values is a more efficient way to improve performance in Real-Time: (i) it provides an incentive directly in the market where improvement is sought; (ii) it pays those Market Participants that most directly contribute to solving the problem; and (iii) it does not rely on a penalty but on a financial reward.[116]

In its filing, ISO-NE then turns its attention to NEPOOL's proposed "EFORp" metric. ISO-NE asserts that the product that *must* be purchased in the capacity market is actual performance – the delivery of energy and reserves during scarcity conditions.[117] As explained above, this assertion is simply misplaced. ISO-NE further claims the NEPOOL Proposal would leave the FCM "even weaker than it is today."[118] Such a claim is unsubstantiated. Consistent with the goals of the current FCM design as well as other RTO capacity market designs, NEPOOL's proposed "EFORp" metric *is precisely* intended to improve availability, adding incentive during all peak hours to be available rather than just during limited and unpredictable Shortage Events. Precisely because it is a capacity market and not a Real-Time market, the NEPOOL Proposal properly *is not* designed to improve the Real-Time delivery of Energy and Operating Reserves during short, unpredictable five-minute intervals of Operating Reserve scarcity. The purpose and goal of a resource adequacy mechanism, such as an EFOR mechanism, is to improve incentives for adequate capacity to be "available" by providing a

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[115] *Id.*

[116] Frayer testimony at 75-78; *See also* Tabors Testimony at 11 (The increase to the RCPF "provides for more efficient market signals and thereby a greater positive incentive to generators to be available during periods of shortage.")

[117] ISO-NE Transmittal Letter at 27-28; *see also* Cramton Testimony at 18-9; White Testimony at 15-17, 42-43.

[118] ISO-NE Transmittal Letter at 27.

stable source of revenue to maintain the fleet (unrelated to the volumetric output or delivery of Energy and Reserves). As explained in these Comments, the daily Energy and Ancillary Services Markets should be the primary drivers of Real-Time incentives and Real-Time operational performance.

ISO-NE also claims that measuring availability during summer and winter peak hours does not ensure that performance is measured "when it most matters."[119] From a resource adequacy perspective, "when it most matters" is when actual load plus reserves is approaching the forecasted peak levels that were used to determine ICR.[120] Measuring the performance of capacity resources during pre-defined peak hours is an appropriate improvement to the current resource adequacy construct of the FCM. The Frayer Testimony further explains how the EFORp mechanism will help improve performance. Ms. Frayer states:

> One of the operational challenges ISO-NE is trying to address is the increasing EFORd rates it has observed across the fleet. It is noteworthy that generators' capacity compensation today has not been tied to EFORd rates (unlike the UCAP measurement in other US capacity markets). ISO-NE procures and pays for capacity based on maximum summer rating of capacity, but incorporates availability of generation indirectly into its calculations of performance and how it set the overall ICR. In NEPOOL's Proposal, generators would be effectively paid on the basis of their effective unforced capacity (during peak demand conditions) since performance payments will be based on EFORp, which will require that generators perform in high demand periods. Holding generators accountable for their effective unforced capacity during pre-specified periods where demand is likely to be highest provides a viable path for generators to improve EFORd rates. Improving EFORd (or EFORp) rates is possible for generators because the measurement periods are predictable and generators can use best efforts to be most available in advance for these periods. On the other hand, ISO-NE [pay-for-performance]'s procedures relying on scarcity conditions are not predictable and therefore generators cannot as easily make themselves maximally available for scarcity conditions.[121]

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[119] ISO-NE Transmittal Letter at 28.

[120] *See generally* NEPOOL Transmittal Letter; Frayer Testimony at 77-78; Fuller Testimony at 4, 17.

[121] Frayer Testimony at 76-77.

In this regard, Dr. Tabors observes that "EFORp combined with the significant increase in Reserve Consultant Penalty Factors proposed by NEPOOL provides a . . . superior incentive structure, without the owners penalty for non-performance and without the unwarranted cost to consumers. Given the NEPOOL proposal, capacity reserves are able to forecast their revenue and operate so as to be available during times of expected shortage."[122]

ISO-NE also uses an example in its effort to demonstrate that the five-year average of NEPOOL's proposed "EFORp" metric as the benchmark to measure availability "has a significant perverse result".[123] Again, ISO-NE's criticism is misplaced. When ICR is developed/calculated for a Capacity Commitment Period, ISO-NE takes into account the EFOR rating of every individual unit on the system. Therefore, in the example of a unit with a 0.5 EFORp, in determining ICR, the expectation of relatively low availability of such a unit would be reflected. So when that unit is actually available at 60% (per ISO-NE's example), it would provide more than what was bargained for/expected when ICR was initially set. It is reasonable that such an improvement would result in an upward payment adjustment. Likewise, the 0.95 resource is expected to be available at that level for the region to have exactly the mix that supports the ICR. By dropping in its availability, such a unit would be providing less than what was bargained for. The low availability units would also have lower energy and reserve revenues, consistent with their low availability, and thus will have lower overall revenues to

[122] Tabors Testimony at 12.

[123] ISO-NE Transmittal Letter at 28: "use of the five-year average of EFORp as the benchmark by which to measure availability and purportedly incent performance has a significant perverse result which can be demonstrated by a simple example. Assume two resources of the same size whose performance is being measured. The first resource is a historically poor performer that has an EFORp value of 0.5. As long as that resource raises its EFORp, to say 0.6, it will receive an enhanced performance payment. Assume the second resource has been an excellent performer with an EFORp of 0.95, but its EFORp falls to 0.9. That resource will be penalized for "poor performance." It is patently obvious that consumers are getting much better value from the second resource, yet the first resource will be paid more under NEPOOL's proposal."

support their continued operation. This would result in more likely retirements over time, which is in fact what has been happening. If the 0.5 EFORp resource is nonetheless among the lowest-cost capacity providers, it should, logically and economically, remain in the market if it is able to survive with the capacity revenues it receives. If, on the other hand, it gets replaced by a more "available" resource that can offer a lower capacity price because of its infra-marginal Real-Time revenues, that would represent a more efficient outcome. Ultimately, the way to get more efficient outcomes is not by forcing low-cost resources to become high-cost resources because of the assessment of a virtually unmanageable market risk such as that proposed by ISO-NE.

Finally, ISO-NE's January 17 filing asserts that the NEPOOL's "force majeure" provision is an overly broad exemption, moving New England in the wrong direction.[124] Consistent with all other RTO/ISO markets and New England's market to date, certain exemptions are entirely appropriate.[125] ISO-NE agrees that capacity suppliers may not be able to prevent some force majeure events, but explains that consumers cannot manage any such risks. Yet, it is the consumer groups of every New England state that registered support for the NEPOOL Proposal and oppose ISO-NE's no exemptions, overly punitive FCM redesign proposal. As stated further in the Frayer Testimony, ISO-NE's punitive approach and no exemption policy is not consistent with commercially reasonable arrangements, and will significantly raise the risk profile for generation owners/investors to the detriment of consumers and long-term resource adequacy in New England.[126]

Admittedly, the NEPOOL Proposal was never intended to do *everything* to address the strategic risks facing the region, particularly those evolving challenges associated with Real-

[124] ISO-NE Transmittal Letter at 28.

[125] *See* Frayer Testimony at 111; Tabors Testimony at 5, 12.

[126] Frayer Testimony at 10-13, 70-71, 112-113.

Time operational performance and increased reliance on natural gas-fired generation. NEPOOL does not argue that its Proposal represents all that is necessary to improve economic incentives and performance in the hourly markets nor does NEPOOL claim that its proposed improvement to the availability mechanism obviates the need for further refinements and improvements to the FCM design. Ultimately however the NEPOOL Proposal reflects a preferable, rational step in the right direction that is more likely to achieve improved performance while avoiding the unnecessary adverse consequences of the ISO-NE Proposal.[127]

[127] As detailed more fully in the NEPOOL Transmittal Letter, NEPOOL members from all six Sectors, representing both consumers and suppliers, overwhelming prefer the NEPOOL Proposal to the ISO-NE Proposal. To be clear, the NEPOOL Proposal and the ISO-NE Proposal, respectively, ultimately represent/reflect markedly different market philosophies. This is not a case where the ISO-NE Proposal reflects an appropriate balancing of interests due to conflicting parochial interests among various NEPOOL members and State regulators (i.e., "if everybody hates it, we must have gotten it right"). In other words, this is not the story of Goldilocks, where one side of the NEPOOL table is arguing that the porridge is too hot, and the other side of NEPOOL asserts that the porridge is too cold and it is ISO-NE serving the porridge that is "just right." NEPOOL collectively, like Goldilocks (and consistent with how the story has been told all along) is seeking the porridge that is just right and before pursuing its "performance incentives" proposal so was ISO-NE. Now ISO-NE proposes to serve something completing different than porridge, even more extreme than hot or cold versions of the same porridge. ISO-NE is proposing to serve something that no one has ever had (including any RTO to date) and the more Market Participants and consumers get a "taste" of it, the less they like it and the less likely they will come back for more. In sum, fundamentally this is a case about different visions, not about ISO-NE pursuing a state of equilibrium.

II. CONCLUSION

For the reasons stated herein, including the Frayer Testimony and the testimony of Dr. Richard Tabors, and in the NEPOOL Transmittal Letter and supporting testimonies, the Commission should approve the NEPOOL Proposal, which is just and reasonable and preferable to the ISO-NE Proposal.

Respectfully submitted,
NEPOOL PARTICIPANTS COMMITTEE

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Its Attorneys

Dated: February 12, 2014

UNITED STATES OF AMERICA

BEFORE THE

FEDERAL ENERGY REGULATORY COMMISSION

ISO New England Inc. and	**)**	
	)	**Docket No. ER14-1050-000**
New England Power Pool	**)**	

TESTIMONY OF

JULIA FRAYER

Dated: February 12, 2014

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BEFORE THE

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TESTIMONY OF JULIA FRAYER

I. INTRODUCTION

Q. Please state your name and business address.

A. My name is Julia Frayer. I am one of the partners and the Managing Director of London Economics International LLC ("LEI"). My business address is 717 Atlantic Avenue, Suite 1A, Boston, MA 02111.

Q. What is the purpose of your testimony?

A. I was asked by the New England Power Pool ("NEPOOL") to review the "jump ball" filing made by ISO New England ("ISO-NE") and NEPOOL on the issue of Performance Incentives and proposed market rule changes in the Forward Capacity Market ("FCM"). As part of my review, I was asked to provide an independent comparative evaluation of ISO-NE's and NEPOOL's Proposals for market rule changes. I approached the comparative evaluation using my experience and knowledge of the New England markets, leveraging my experience of other North American power markets and my knowledge of market design best practices.

Q. Please summarize your relevant professional background.

A. As Managing Director of LEI, I currently oversee many of the company's engagements involving market analysis in the electricity sector, including market design projects, market power analysis and consulting and advising on commercial activities in the wholesale power markets.

I have been actively engaged in New England power market-related work since before ISO-NE began market operations, having assisted potential buyers in the due diligence of various generation asset sales since the mid- to late 1990s. I have performed numerous analyses involving the forecasting of future prices and the impact of market design and other institutional changes, as well as structural changes in the market.

Since the formation of ISO-NE, I have monitored or actively participated in several ISO-NE working groups and committees for market participants and interested stakeholders, including the Planning Advisory Committee that is tasked with analyzing the long-term needs of the ISO-NE system and resource adequacy.

I have also closely followed the evolution of the New England power markets, including prominent changes such as the transition from uniform pricing to Locational Marginal Pricing, ASM Phase I and Phase II re-design efforts, and the move from an Installed Capacity ("ICAP") market to the FCM.

I have a deep understanding of ISO-NE market dynamics with respect to resource adequacy and capacity, including the Transition Period arrangements that were negotiated as part of the Settlement Agreement in 2006 by ISO-NE and key stakeholders. In 2006 and 2007, I advised the Connecticut Department of Public Utility Control ("DPUC") in designing a

competitive solicitation for new generation to hedge the potential wholesale market costs to Connecticut ratepayers associated with approval of the Settlement Agreement and creation of the FCM. Subsequently, I worked with a number of market participants advising on market outcomes in ISO-NE's markets and evaluating infrastructure investment opportunities. My firm's market analysis surrounding ISO-NE's markets is used by many entities in the industry to support mergers and acquisitions ("M&A"), asset financing, and due diligence of investment opportunities. I have also advised utilities and state policymakers in the design of capacity markets. For additional information, please refer to my curriculum vitae which can be found in Appendix A.

Q. Have you testified before regulators such as the Federal Energy Regulatory Commission?

A. Yes, I have submitted written testimony before many regulators and legislatures in US and abroad, and have also testified orally. Specifically, I have submitted written testimony before the Federal Energy Regulatory Commission ("FERC" or the "Commission") with respect to market power issues and in relation to market disputes, including cases involving capacity market disputes.

II. SUMMARY OF FINDINGS

Q. Please summarize the analysis you performed.

A. I evaluated the Proposals put forth by ISO-NE and NEPOOL, each of which seeks to introduce market rule changes to incent performance improvements to address the operational challenges ISO-NE has observed in its energy and reserve markets.

In brief, ISO-NE proposes to improve performance in the energy and reserve markets by redefining the capacity product it procures in the Forward Capacity Market ("FCM"). Under ISO-NE's Performance Incentives Proposal (which I refer to as "ISO-NE PI" or "PI"), resources[1] clearing the capacity market would receive a base capacity payment (similar to the payment received under the current FCM based on the clearing price in the Forward Capacity Auction ("FCA")) and would receive a performance payment for 'good' performance or pay a performance payment as a penalty for 'bad' performance (referred to herein as "Performance Payment"). The Performance Payment would be based on a resource's actual performance in the real-time energy market during five-minute intervals when there is a shortage in real-time reserves. Based on my review of the analysis that has been presented by ISO-NE, most resources should expect the Performance Payment to be a penalty. Importantly, the ISO-NE would not grant any exemptions from the performance penalties for failing to provide energy and reserves in real-time, even if that failure was a result of operational or system conditions beyond the control of the resource.

[1] When I discuss "resources" or "generators," I am referring to capacity suppliers generally, unless otherwise noted.

In contrast to the ISO-NE's PI, NEPOOL proposes to improve performance in the real-time energy market by increasing the effective scarcity adder associated with real-time revenues earned by resources during periods of shortages in real-time reserves. NEPOOL also proposes to modify the performance standard in the capacity market, so that resources are evaluated against historical average performance during peak hours when the system is most likely to experience high load. NEPOOL also proposes a reasonable waiver to the performance standard under certain conditions outside management's control.

Q. How did you complete your evaluation?

A. I studied each of the Proposals to understand the principle dynamics and impacts from the perspective of resources and the market institutions. I also reviewed the real-time operational challenges that the ISO-NE and NEPOOL Proposals are each attempting to address. I then evaluated each Proposal against a set of four objective metrics: efficiency, non-discrimination, cost effectiveness, and practicality (commercial reasonableness). My comparative analysis is supported by my experience and knowledge of the New England market, as well as other markets in the US and abroad with capacity institutions. I did not have sufficient time to conduct independent modeling-based analysis of the ISO-NE and NEPOOL Proposals, but I leveraged observations from my prior experiences with simulation modeling and price forecasting of both energy and capacity markets to critically examine the analysis performed by the Analysis Group with respect to possible FCA impacts of the ISO-NE PI Proposal.

Q. What information did you rely upon?

A. I relied on the Testimony submitted by ISO-NE and NEPOOL in this "jump ball" filing, as well as on preceding documents that were published by ISO-NE and NEPOOL during their on-going discussion of this matter over the past year and a half. I also reviewed other

available market information, including strategy documents from ISO-NE and materials submitted to the Commission to provide context and important information related to previous and on-going market changes made by ISO-NE. In addition, I relied on my experience with and understanding of capacity markets and wholesale energy market design more generally. A full list of the documents consulted can be found in Appendix B.

Q. What were your overall findings?

A. Based on my review, ISO-NE's PI Proposal could fall short on the goal of improving real-time energy market and reserve market performance and may undercut the resource adequacy goal associated with capacity markets. I find that the real-time performance challenges that ISO-NE faces are not an indication of a flawed FCM design but a challenging situation relative to the New England energy and reserve markets. ISO-NE's PI, by redefining capacity, would cause a major change to the capacity market (and possibly also to the energy market due to unintended adverse consequences). ISO-NE would then have a different form of capacity product as compared to other organized capacity market institutions in the US. The new definition of capacity would increase significantly the risks of the capacity supply obligation that resources taken on; clearing prices in the FCAs would rise as a consequence of these risks. In its analysis of the PI, the Analysis Group used the word "ambiguous" when describing potential outcomes of PI, and I would agree. In fact, it is likely that the PI would create adverse consequences for existing generators and new entry, as well as for overall system resource adequacy, which could harm consumers. The NEPOOL Proposal includes refinements to performance incentives currently in the FCM, but in contrast to the ISO-NE PI Proposal, NEPOOL's Proposal retains a conventional definition of capacity. Moreover the NEPOOL Proposal puts forward changes in real-time markets that could help address the

identified performance challenges. The NEPOOL Proposal does not create new risks that require significant operational changes for resources to handle, making it less likely to lead to the unnecessary adverse consequences of the ISO PI Proposal.

Figure 1 below provides a summary of the results of my evaluation, demonstrating how ISO-NE's and NEPOOL's Proposals measured up against the four objective metrics: efficiency, non-discrimination, cost-effectiveness and practicality.

Figure 1. Summary of Findings

	ISO-NE PI	NEPOOL
Efficiency	• Indirectly addresses real-time challenges through penalties • Disrupts the ability of capacity market to provide a predictable revenue stream for financing new entry and may cause abrupt and large-scale retirements for some existing technology classes	• Directly addresses real-time performance challenges by motivating more generation to participate in the hope of catching higher real-time market prices • Refines performance incentives for capacity to focus on availability when demand is highest • Removes bad performers; generators that do not perform consistent with historical levels and performance embedded in the ICR would not qualify for capacity markets after two years
Non-discrimination	• Although the same formula is applied to calculate performance payments (penalties), there is an embedded discrimination in the ability of resources to earn performance payments versus penalties	• All suppliers are measured against the same standard, with the specific thresholds developed by reference to actual plant performance during peak periods

	ISO-NE PI	NEPOOL
Cost-effectiveness	• Expected costs to consumers are greater under ISO-NE's PI Proposal as compared to the status quo (annual capacity costs increase by up to $1.32 billion according to the Analysis Group)[2] • No demonstration of the expected benefits to consumers • PI dramatically increases risk, which would likely lead to further increased costs (borne by consumers)	• Does not dramatically change risks, so we would not rationally expect a significant change to FCA clearing prices or costs to consumers • Increases costs of real-time energy markets, but the benefits are more likely as well (efficient, lower cost dispatch)
Practicality	• Significant change/market redesign that is untested and has not been piloted or even comprehensively analyzed • Creates potential capacity market seams with neighboring regions • Great risk of unintended, adverse consequences on investment, planning and operations	• Incremental change, which is less likely to result in costly, unintended adverse consequences • Keeps capacity market consistent with neighbors • Waivers appropriately share asymmetric and non-diversifiable risks between resources and consumers

As I mentioned already, the ISO-NE PI Proposal involves a significant market change: it proposes to combine the definition of capacity with the real-time energy market. The proposed new performance obligations are severe and many generators would not have control over them. On this basis, it is questionable whether performance improvements are likely. Furthermore, I conclude that the way in which ISO-NE's PI Proposal intends to allocate risk is not only commercially unreasonable, but it is likely to result in inefficiencies with respect to the core goals of capacity markets – to ensure resource adequacy. The PI

[2] Analysis Group Report. p5.

Proposal is also discriminatory in principle between technology types and also between existing and new generation. This lack of a "level playing field" may undermine the competitive market dynamic. The projected costs of the ISO-NE PI are significant, although likely understated in the Analysis Group's calculations. The benefits remain unquantified. In summary, the ISO-NE PI Proposal has not been comprehensively tested against alternatives and may lead to unintended negative consequences for the New England power system, for some generators, and ultimately for consumers. I would therefore not recommend that FERC approve the ISO-NE PI Proposal.

The NEPOOL alternative Proposal seeks to make incremental refinements to the current FCM and energy market design. The NEPOOL Proposal is conceptually more efficient because it works to directly address the operational concerns raised by ISO-NE in real-time energy markets. The change in performance incentives put forward in the NEPOOL Proposal also reflects "pay for performance" objectives and aligns well with how ISO-NE projects the Installed Capacity Requirement ("ICR") which sets the quantity of capacity that it procures in the FCA. From a practical perspective, the NEPOOL Proposal is not complex and the real-time energy market change can be implemented fairly quickly to further address the deterioration of performance that concerns ISO-NE. In summary, the NEPOOL Proposal to modify capacity market performance incentives does not raise serious concerns about unintended negative consequences, while the increase in the scarcity price of reserves has good prospects for motivating additional generation and reserves, which would help ease real-time operational challenges. The incremental nature of the NEPOOL Proposal also complements the numerous improvements that have been recently made or are on-going in the

ISO-NE energy, reserves and capacity markets. I would therefore recommend that the Commission approve the NEPOOL Proposal.

III. WHAT IS CAPACITY?

Q. What is the conventional definition of capacity?

A. The conventional and generic definition of capacity is that it represents a resource's maximum capability to produce energy in a single moment in time. There is universal agreement that capacity should be measured in terms of megawatts ("MW").[3] In its own training materials, ISO-NE defines capacity as "the rated and continuous load-carrying ability, expressed in megawatts or megavolt-amperes, of generation, transmission, or other electrical equipment."[4] Put simply, capacity is the measure of what a power plant can produce.

Q. What are the key features of a capacity market?

A. A capacity market creates the institutional foundation for the purchase and sale of capacity. When markets are defined in economics, we consider four important dimensions of market definition – geography, time, product, and function. While most commonly used in market power discussions;[5] these dimensions are appropriate for broader economic analysis of markets.[6] The geographical dimension is defined by the physical boundaries of the market – in this case, the capacity market is defined by the geographical boundaries of ISO-NE (and the

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[3] FERC. *Energy Primer: A Handbook of Energy Market Basics.* July 2012. P37. http://www.ferc.gov/market-oversight/guide/energy-primer.pdf

[4] ISO-NE. "Glossary: capacity". Accessed January 27, 2014. http://www.iso-ne.com/support/training/glossary/

[5] "Market definition is often the most critical step in evaluating market power and determining whether business conduct has or likely will have anticompetitive effects." *See:* Baker, Jonathan B. *Market Definition: An Analytical Overview*. 74 ANTITRUST L.J. 129, 129 (2007). *See also:* Market Power Handbook: Competition Law and Economic Foundations, 54 American Bar Association, Section of Antitrust Law (2005)

[6] The New Palgrave: A Dictionary of Economics. Edited by John Eatwell, Murray Milgate, and Peter Newman. Volume 3, 1998. P336.

interconnected capacity of transmission with neighboring markets). The time dimension is defined by the timeframe for investment response, or the time horizon over which typical commercial arrangements take place. In the case of ISO-NE's FCM, the time dimension is at least three and a half years, given the time in between the FCA and the period when the capacity supply obligation begins. Practically, however, the time dimension of the FCM is even longer as new resources need to begin development in order to qualify to participate in the FCA. The product dimension classifies the nature and/or type of product or service that is being sold. Capacity is measured in MW terms, as I discussed briefly above, and represents the operational capability of a resource. Furthermore, capacity is conventionally considered a standalone product, distinct from real-time market products such as energy and reserves. The functional dimension of the market is wholesale, as it is the ISO that buys and uses capacity rather than final retail customers.

Q. What purposes is the "capacity" product then intended to serve?

A. Capacity markets evolved as a way to help ensure resource adequacy - the ability of a system to maintain sufficient capacity resources to meet peak load requirements plus a planning reserve margin.[7] They were specifically needed because of the nature of energy markets in the US, where there was and continues to be effective suppression of energy prices. When energy markets are capped through administratively set offer caps or other regulatory imposed mechanisms, capacity market institutions are needed to provide generators (both existing and

[7] FERC Staff. *Centralized Capacity Market Design Elements*. August 23. 2013. P1. http://www.ferc.gov/CalendarFiles/20130826142258-Staff%20Paper.pdf

new) with additional compensation for maintaining and investing in generating capacity.[8] In other words, capacity market revenues pay for part of the fixed costs of maintaining existing generation (and when relevant, incentivizing new generation) to meet projected demand in the long-term. In this way, capacity market revenues interact with the longer term operating decisions that investors make.[9] In a similar vein, capacity markets are used as a planning tool by system operators to improve their confidence that the necessary amount of physical resources could be available to meet future demand.

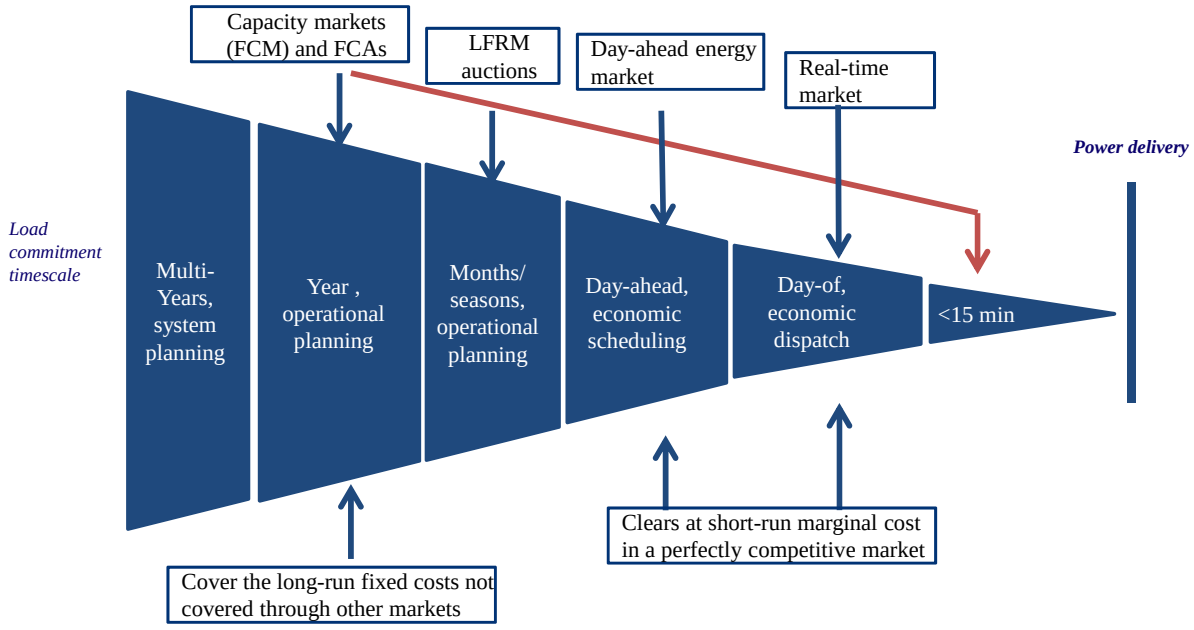
To accomplish their purposes, capacity markets occur "ahead" of real-time operations (see Figure 2 on the next page).

A critical part of the value provided by the capacity product is the predictability and general stability of capacity revenues so that longer term retirement and investment decisions can be made. Given the forward concept of most capacity markets, the capacity revenues are known in advance, which allows for the orderly planning of new entry and exit of generation and other capacity resources.

[8] In 2003, a FERC order directed ISO-NE to develop a locational capacity market to provide the appropriate locational price signals. *See:* FERC Docket No. ER03-563-000. *Devon Power LLC*. 2003.

[9] Another way to think about it is that capacity market payments are intended to cover fixed costs when there is insufficient profits from energy market operations. The need for capacity revenues is demonstrated through a stylized application of perfect competition, where all generators sell their energy production at their short-run marginal costs and energy prices are set at the short run marginal cost of the marginal or price-setting resource in the energy market. In this hypothetical, that marginal resource would not earn any profits above its short run marginal cost to cover fixed costs. It would therefore depend on the capacity market to cover its going forward fixed costs.

Figure 2. Market Timeline



Q. Are there any useful examples in other sectors that would help us better understand the capacity product and capacity market institution?

A. I like to describe capacity as akin to an insurance contract. A typical property insurance policy would insure an owner of a property for damages resulting from fire, theft and some weather damage. In buying insurance, a property owner does not typically expect that she would routinely make a claim and use the insurance. The insurance is meant to cover losses that are unlikely. But in the event that something unexpected happens (i.e., a fire or theft), the property owner would have recourse and be able to file a claim with the insurance company to provide financial support to repair the damage. Importantly, property insurance typically has exclusions for flood damage, hurricane damage – weather events with typically significant financial losses and a frequency of occurrence in a given area that can be predicted with some amount of accuracy. Because of the severity of these events, the companies providing the

insurance know that there is a strong likelihood that they will have to pay out for such an event over the life of the policy. As a result, these policies are relatively expensive.

Having insurance makes property owners comfortable in the knowledge that they can rely on the insurance company to help them fix their property if something beyond their control happens, for example, a tree falls down and damages the roof. Like a property insurance policy, capacity providers insure the system operator against insufficient supply across a wide variety of contingencies. In other words, the system operator employs the capacity product to "insure" that the system will have sufficient capacity available to meet expected peak demand plus a reserve margin. But as I noted above, a typical property insurance contract has exclusions – like flood protection if the property is in a flood zone. Reasonable exclusions allow the insurance company to be effective as a commercial enterprise. ISO-NE's PI Proposal – if viewed through the lens of an insurance product – would not carry any waivers or exemptions for generators and that is a key concern. Can generators really insure the ISO-NE up to the requirements it is demanding?

Of course, comparing property insurance to capacity is a simple, illustrative example. There are important distinctions between the two products. The most important one is that, unlike consumer products, electric energy is a unique commodity market - electricity must be produced in the same instant that it is consumed (and storage is not (yet) cost-effective at a mass commercial scale to cover market demand). As a result of this unique attribute, there are of course complications with the process by which system operators activate or call on the generators that are under a capacity supply obligation and therefore are providing "insurance". Indeed, the nature of the power sector is equivalent to "risking a fire" (or other "trigger" event

in the context of a property insurance example) during every minute of operation, and therefore access to commercially reasonable insurance becomes yet more critical.

Q. Let us get back to the intended purpose of capacity markets and the procurement of capacity. Does ISO-NE agree with the underlying purpose of capacity that you described above?

A. Yes, I believe ISO-NE would agree. As stated in its filing, ISO-NE believes that "the central purpose of the capacity market is to provide financial incentives for participants in New England's restructured electricity system to build and maintain the resources necessary to assure reliable service"[10] (emphasis added). Furthermore, ISO-NE has also stated in other documents that the purpose of capacity markets is "to ensure the long-term availability of sufficient generation capacity for the reliable operation of the bulk power grid"[11] (emphasis added).

Q. Do other markets rely on this conventional definition of capacity and specified purpose?

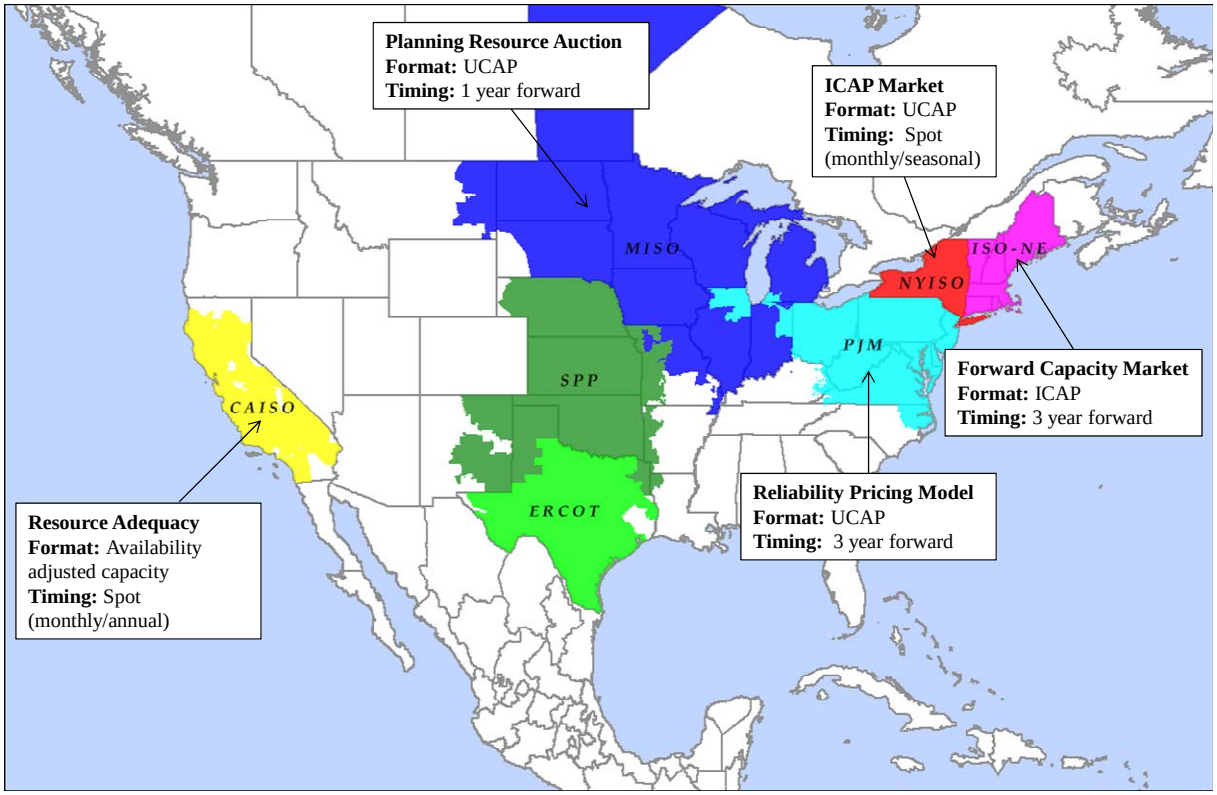
A. Yes. In fact, all other organized capacity markets in the US view capacity as a mechanism to support planning, resource adequacy, and provide market signals for investment (Figure 3 provides a map of the organized capacity markets to which I refer). Furthermore, other organized capacity markets in the US share a common definition of capacity - that is, the availability of resources to meet peak demand. So, although the procurement mechanisms

[10] ISO-NE Transmittal Letter. P4.

[11] ISO-NE. "Glossary: Capacity Market." Accessed January 27, 2014. <http://www.iso-ne.com/support/training/glossary/>

differ among the US organized markets, the definition of the capacity product is the same or very similar.[12]

Figure 3. Overview of capacity products procured in organized capacity markets across the US



The Pennsylvania-New Jersey-Maryland Interconnection's ("PJM") three-year forward capacity market, the Reliability Pricing Model ("RPM"), "is designed to ensure the adequate availability of resources that can be called upon to ensure the reliability of the

[12] Outside of the US, other markets define the capacity product using an "availability" metric. For example, many Latin American markets (including Chile and Peru, among others) use an "availability" metric for thermal generation, which is based on historical performance for existing plants and on assumed performance for new plants.

grid."[13] PJM uses an auction mechanism with a downward sloping demand curve to procure Unforced Capacity ("UCAP").[14] In the New York ISO ("NYISO"), the capacity market is more near-term, but the purpose of the capacity market is the same – to "ensure that sufficient resources are available to meet projected load on a long-term basis."[15] The product procured is also UCAP.[16] The Midcontinent ISO's ("MISO") voluntary capacity market – the Planning Resource Auction – allows MISO to procure UCAP from qualified resources to meet customer demand that has not been otherwise self-supplied.[17] Similarly, in California's Resource Adequacy market, available capacity is bought and sold in advance in order to support system planning. Load serving entities ("LSEs") in the state must also show that they have procured sufficient levels of capacity that is likely to be available to meet the LSEs' share of the system's peak demand forecast plus a reserve margin, plus the capacity needs in California ISO's ("CAISO") identified local constrained areas .[18]

It is noteworthy that in all other organized capacity markets, capacity resources are measured based on their unforced capacity value (or some derivation thereof), which accounts

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[13] PJM. *PJM Manual 18: PJM Capacity Market.* Rev 20, Effective: November 21, 2013. P3. http://www.pjm.com/~/media/documents/manuals/m18.ashx

[14] *Ibid.* p104.

[15] NYISO. "The Capacity Market." Accessed January 27, 2014. http://www.nyiso.com/public/about_nyiso/understanding_the_markets/capacity_market/index.jsp

[16] NYISO. "ICAP Data and Information." Accessed February 5, 2014. http://www.nyiso.com/public/markets_operations/market_data/icap/index.jsp

[17] MISO. *Business Practice Manual No. 011: Resource Adequacy.* August 1, 2013. P13.

[18] California Public Utilities Commission. "Resource Adequacy". Accessed January 28, 2014. http://www.cpuc.ca.gov/PUC/energy/Procurement/RA/

directly for "availability" of capacity. With NEPOOL's Proposal to measure and compensate performance on the basis of EFORp, the ISO-NE capacity market would actually have a definition of the capacity product closer to the UCAP product routinely procured in other markets.

Q. In your opinion, is ISO-NE's PI Proposal modifying the definition of capacity?

A. Yes, ISO-NE is proposing to move away from the common definition of capacity that relies on "availability" as the metric for measuring capacity.[19] ISO-NE, in its PI Proposal, is proposing to measure capacity using real-time energy output in 5-minute increments. In so doing, I believe that ISO-NE is in effect re-defining the market by forcing the fusion of capacity and the delivery of energy and real-time reserves. In the context of the market definitional approach I discussed earlier, ISO-NE's approach would eliminate the stand-alone capacity market definition.[20] Under ISO-NE's PI Proposal, the capacity supply obligation is amalgamated or integrated with the real-time energy and reserve markets. As a result, ISO-NE is in essence proposing a market redesign of not just the capacity market but also indirectly the real-time reserves and "capped" energy market.

The focus of the FCM under ISO-NE's PI Proposal shifts to energy and reserve markets, and specifically real-time operations. Most importantly, ISO-NE proposes

[19] In its filing, ISO-NE states that "the Pay For Performance design changes the definition of the capacity product." (see LaPlante Testimony. P65)

[20] Current capacity markets are linked to energy but only by way of an "availability" measure and the must offer requirement in the energy market. In other words, a capacity supply resource that is available must offer into the ISO's or RTO's energy market. ISO-NE proposes to fuse the capacity and energy markets more closely by foregoing consideration of "availability" and measuring capacity performance directly by reference to real-time energy production at any time and under any condition.

eliminating all exemptions or waivers for performance under its Proposal, even when "the non-performance is arguably not the fault of the supplier."[21] To relate this back to the insurance analogy – ISO-NE is effectively asking for an insurance policy with no triggers, waivers, or deductibles. Or put another way, a property insurance policy that covers all weather events, including floods and hurricanes. In the real world, this would be an expensive insurance policy with a very high premium, which most consumers would not be willing to pay for, without exhaustive consideration of alternatives.

[21] ISO-NE Transmittal Letter. P15.

IV. UNDERSTANDING THE TECHNICAL PROBLEMS

Q. What has led the ISO-NE to propose its changes to the capacity market?

A. It is my understanding that ISO-NE is experiencing operational challenges in the real-time energy market. In particular, ISO-NE has observed a below-perfect response rate of 71% to its requests for additional energy from units providing reserves during contingency events.[22]

Q. Does ISO-NE propose to change the mechanics of the FCA or other elements of resource planning at this time?

A. No, the changes ISO-NE is proposing in the "jump ball" filing are not related to the FCA or other aspects of the FCM (like the process for setting the ICR or the analysis of the qualifications of new resources). ISO-NE is changing how it measures "performance" and how it will pay capacity resources for their capacity supply obligation ("CSO").

However, separate from this "jump ball" filing, ISO-NE has made changes to FCA rules from time to time. Most recently in an "Exigent Circumstances" filing with FERC,[23] ISO-NE has asked the Commission to adjust certain rules related to clearing of the FCA. There are also plans to adjust other features of the FCA, like the introduction of a downward sloping demand curve in lieu of the current fixed (inelastic) ICR. Indeed, the Commission ordered ISO-NE to provide a Proposal for a downward-sloping demand curve by April 1,

[22] Specifically, 65% for online units, 81% for offline units. *See* Brandien Testimony. P38.

[23] In an Exigent Circumstances filing initiated in November 2013, ISO-NE sought rule revisions to address the range of circumstances in which the Insufficient Competition Rule is triggers, and to modify the administrative pricing established by the Insufficient Competition and Inadequate Supply Rules. FERC approved these revisions in an Order issued on January 24, 2014. *See:* FERC Docket No. ER14-463-00. *ISO-NE Exigent Circumstances Filing of Revisions to Forward Capacity Market Rules.*

2014, in time for use in FCA 9.[24] ISO-NE expects the downward sloping demand curve to improve the efficiency of the price signal for new investment and retirements.[25]

Generally speaking, ISO-NE has maintained that the FCM (and FCAs) have been achieving their stated goals of resource adequacy. In compliance filings for previous FCAs, ISO-NE had stated that the FCAs have been working as intended. Indeed, as of February 2013, ISO-NE noted that the FCM "continues to procure and retain the necessary resources to provide reliable capacity supply for New England."[26] In September 2013, at the FERC Technical Conference on Centralized Capacity Markets, Dr. Robert Ethier, ISO-NE's Vice President of Market Development, stated that "there is ample evidence that the capacity market in New England has been a success…we have obtained sufficient resources in each auction to meet capacity requirements and there have not been any outages due to lack of resources."[27] More information on the historical performance of the FCAs can be found in Appendix C.

[24] FERC Docket No. ER14-463-00. *ISO-NE Exigent Circumstances Filing of Revisions to Forward Capacity Market Rules.*

[25] *Ibid.* p4.

[26] FERC Docket No. ER13-000. *ISO New England - Forward Capacity Auction Results Filing.* February 26, 2013.

[27] The specific circumstances around the FCA 8 results have not yet been published. FERC Docket No. AD13-7-000. *Written Comments of Robert G. Ethier, Ph.D. Vice President of Market Development, ISO New England Inc.*

Q. Please summarize your understanding of the real-time operational challenges ISO-NE faces.

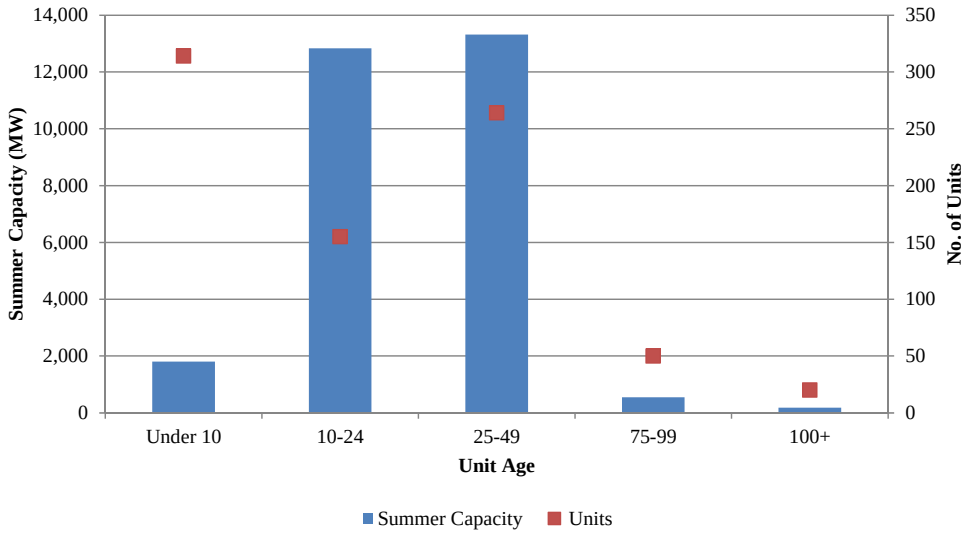
A. As discussed in the Testimony of Peter Brandien, submitted with the "jump ball" filing, ISO-NE is experiencing several real-time operational challenges. These operational challenges can be aggregated into two areas: (1) vulnerability of gas-fired generators to interruptions in gas supply, and (2) the inability of oil and coal units to "provide reliable backup when gas problems arise due to increased outage rates, start-up problems, and other operational difficulties."[28] In support of the demonstration of these challenges and the linkage to the FCM, ISO-NE further notes that it has observed increased outage rates across the generation fleet, slow response to contingencies, along with other issues such as failure to maintain secondary fuel (oil) inventory.

Q. Can you provide your perspective on the real-time operational challenges that ISO-NE describes in its filing?

A. In my opinion, one of the root causes of these real-time operating challenges is the "legacy" of infrastructure investments from prior decades. First, the New England generation fleet is relatively old - with over 34% of capacity having been built 40 years ago or longer (see Figure 4 below). However, other markets in the US rely on similarly mature plants for electricity generation, as evidenced in Figure 5, which presents the weighted average age of generation for New England, PJM, and NYISO.

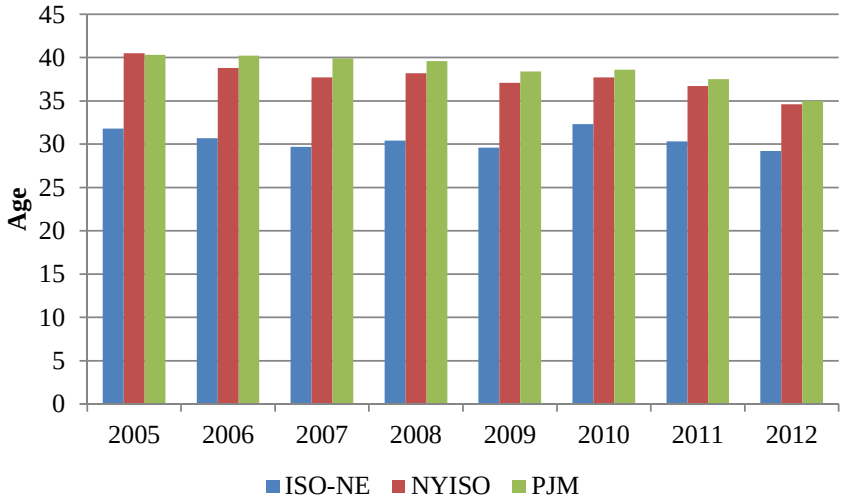
[28] ISO Transmittal Letter. P3.

Figure 4. Age distribution of ISO-NE power plants



Source: ISO-NE CELT Report

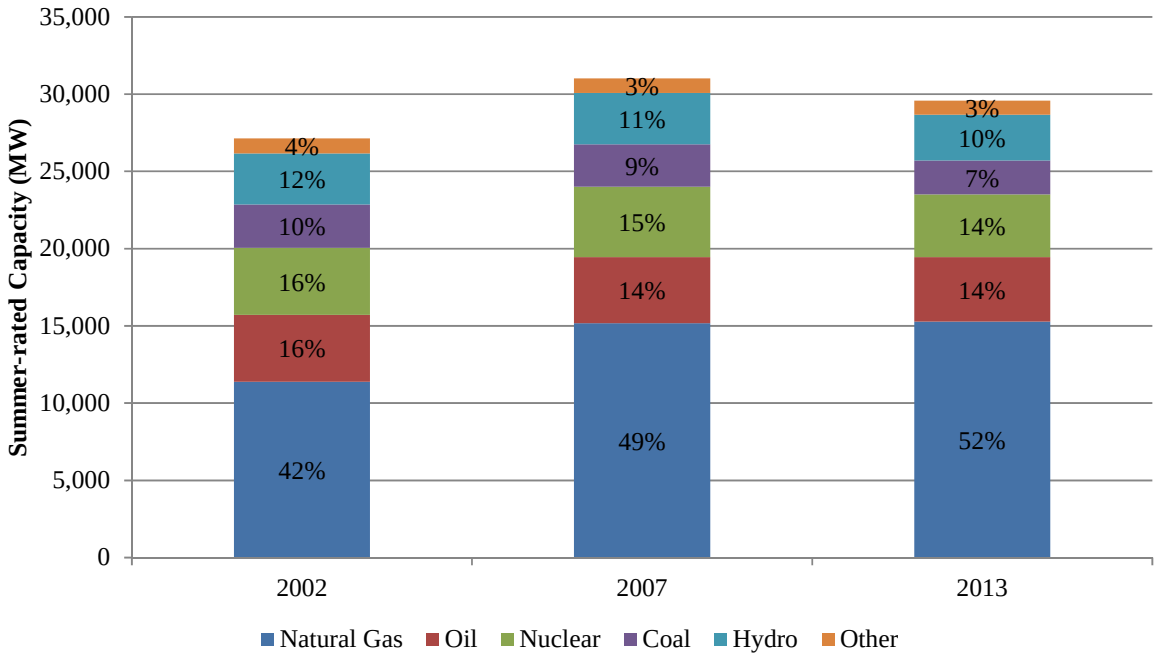
Figure 5. Generation-weighted age of power plants across several US power markets in the Northeast



Source: Energy Velocity.

The second issue also relates to legacy of natural endowments. The New England generation fleet is composed of mostly fossil fuel-fired resources, and as a result of the region's comparative advantages and global trends in generation technologies, 47% of the generation fleet in terms of summer-rated capacity is natural gas-fired (see Figure 6).

Figure 6. ISO-NE's generation capacity mix by fuel type



Note: Values may not sum to 100% due to rounding. "Other" includes wind, solar, and biomass
Source: ISO-NE CELT Reports

With the aging of the generation fleet, it is not surprising that EFORd rates are increasing. In fact, across the US, a similar trend has been observed (see Figure 7). The North American Electric Reliability Corporation's ("NERC") Generating Availability Data System ("GADS") data from 2007 through 2011[29] shows a strong positive relationship (85% correlation factor) between EFORd and age based on an aggregate analysis of all technologies. The year-specific estimates are affected by the number of hours during which a specific type of resource was actually in service. In 2011, coal and oil plants experienced fewer hours of forced outages (oil plants also experienced fewer planned outages). As a result,

[29] 2011 is the most recent year for which NERC Generating Availability Report data is available.

coal and oil-fired plants were typically more available during 2011 than previous years, which accounts for the decrease in the EFORd rate in 2011 relative to previous years.[30]

Figure 7. Average Fleet Age and EFORd Rates Reported by NERC (2007-2011)

	Coal Primary		Oil Primary		Gas Primary		Nuclear	
	Age	**EFORd**	**Age**	**EFORd**	**Age**	**EFORd**	**Age**	**EFORd**
2007	40.67	7.17	42.45	5.64	43.93	6.06	27.42	2.26
2008	41.48	7.64	43.41	10.27	44.91	7.95	28.38	2.17
2009	42.41	7.97	44.59	10.89	47.73	8.88	29.37	3.24
2010	43.22	8.06	46.02	9.15	47.02	10.2	30.37	3.78
2011	44.13	6.19	46.21	5.42	48.19	9.81	31.85	3.97

Source: NERC GADs Report

It is also important to note that between 2005-2012, approximately 15% of ISO-NE's generating capacity rarely generates power (i.e., has a load factor of less than 2%); lack of use exacerbates certain operational dynamics.[31] This trend has increased in recent years – for the last three years for which data is available (2010-2012), 19% of the fleet has operated with a load factor of less than 2%.[32]

Many other markets in the US have a large share of gas in their overall fleet (indeed, some markets have even higher market share of gas-fired capacity than ISO-NE).[33] The operating challenge is not simply related to the MWs of capacity that is gas-fired but also due

[30] NERC GADs Report.

[31] Energy Velocity.

[32] Energy Velocity.

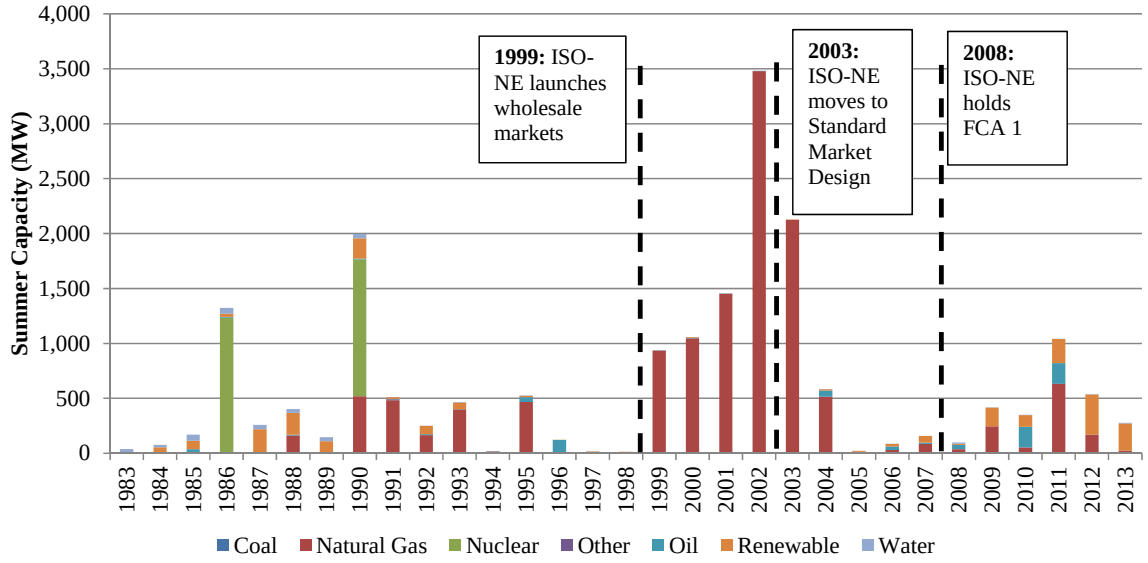
[33] Other RTOs with large shares of natural gas-fired capacity include California (58%), NYISO (53%, including dual fuel capacity), and ERCOT (54%). *Source:* Energy Velocity.

to the gas delivery infrastructure and competing demands for natural gas. For example, natural gas is also used for heating in the Northeast, and the local distribution companies ("LDCs") compete for the gas supply such that gas pipeline infrastructure is constrained. This results in a higher cost of gas but also can lead to potential scarcity of gas due to outright unavailability of pipelines to deliver the fuel to (some) gas generators during especially cold weather events when preferred customers (LDCs) are using up the system capacity.

Lastly, one must also consider some of the operational challenges that ISO-NE is facing in context of the very long investment cycles in this industry. As can be seen in Figure 8 on the following page, ISO-NE experienced a tremendous growth in capacity following market restructuring in the late 1990s/early 2000s. Then investment tapered off in the mid 2000s. Investment cycles are influenced by market dynamics, but are also a natural outcome of the economies of scale of generation investment relative to peak demand growth and the long economic and technical life of the assets.[34]

[34] Peak demand in New England has grown an average of 420 MW per year since 2000 while the size of a typical CCGT built in ISO-NE in recent years (2000-2013) is over 500 MW.

Figure 8. Annual generation capacity additions in ISO-NE



Source: Energy Velocity.

Q. Do you agree that there is a technical operating "problem"?

A. Yes, there is no question that operating the ISO-NE system is getting more challenging given (1) an aging thermal generation fleet, (2) more energy constrained resources (such as wind and demand response), (3) retirements of various thermal generation, and (4) a tendency to build gas-fired generation because of technology and economic advantages, while also facing (5) an increasingly constrained regional natural gas pipeline network. At the same time, ISO-NE has access to new technologies that could help with real-time operations, such as real-time demand response and smart grid technologies.

Q. Are these problems unique to ISO-NE?

A. No. The drivers behind the operating challenges that ISO-NE is facing are also present in varying degrees in other regions of the US. According to reported data to the Energy Information Administration ("EIA"), the capacity-weighted average age of natural gas fleets in PJM, CAISO and NYISO is actually older than that of ISO-NE. The weighted average age

of oil capacity in NYISO and MISO is also older than that of ISO-NE, and the weighted average age of coal generation in both PJM and NYISO is also both over 40 years old.

Figure 9. Weighted average of generating capacity by region and fuel

	Biomass	Coal	Gas CC	Gas ST	Gas CT	Gas other*	Nuclear	Oil ST	Oil Other*	Solar	Water	Wind
CAISO	21	39	11	48	18	11	27	N/A	32	8	49	9
ERCOT	5	28	13	44	20	13	23	N/A	29	2	63	6
ISO-NE	28	50	13	38	11	13	32	42	29	2	53	3
MISO	26	37	12	39	17	13	35	66	32	5	55	5
NYISO	20	45	13	46	28	13	36	43	36	2	52	5
PJM	22	41	13	56	15	13	33	38	37	2	44	4
SPP	32	30	12	46	16	14	32	N/A	37	2	49	4
Non ISO/RTO	28	39	11	46	17	12	33	41	34	2	49	5
Total	**25**	**37**	**12**	**45**	**16**	**11**	**32**	**41**	**32**	**5**	**49**	**5**

**Gas Other is largely comprised of internal combustion technologies. Oil other excludes CC technologies but includes various technology types such as CT and IC*
Source: SNL Financial (taken from EIA Form 860)

Other ISOs/RTOs have recognized the risks in terms of responsiveness posed by an aging fleet and the lack of fuel diversity, but have not chosen to redefine the capacity product in their capacity markets.

For example, in NYISO, the New York City ("NYC") zone has presented many challenges to system operators. It is an import-constrained transmission zone that relies on imports from other parts of New York to meet internal load. NYC, like ISO-NE, is also very dependent on natural gas. To combat some of the operational risks with these dependencies, NYISO has a set of operating and planning rules to help maintain operational viability in the face of such infrastructure constraints. The NYISO procures a specified level of local resources in its spot capacity market that is keyed off recent actual performance of

generators.[35] In addition, generation in the NYC load pocket is subject to the Minimum Oil Burn ("MOB") rule, which has been in place in NYC for over 20 years. The MOB rule includes trigger provisions for requiring certain generators to switch from gas to oil-fired generation (and those generators are then compensated for the change in fuel) when forecasted electrical demand exceeds pre-set levels.[36] More recently, NYISO and its Market Monitoring Unit[37] have also recognized prospective resource adequacy problems posed by an aging fleet. They have proposed to provide a more refined market signal for new investment through the creation of a new capacity zone, partially encompassing the New York City area and Lower Hudson Valley.[38]

The California market offers parallels to New England's situation, as well. Its supply mix is dominated by (older) natural gas plants. In light of the unexpected outage and consequential retirement of the San Onofre Nuclear Generating Station ("SONGS") in 2013,

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[35] In NYISO, Locational Minimum Installed Capacity Requirements ("LCRs") are determined in part based on generator EFORd. *See:* NYISO. *2013 Locational Capacity Requirements Study*. January 17, 2013. http://www.nysrc.org/pdf/MeetingMaterial/RCMSMeetingMaterial/RCMS%20Agenda%20159/2013%20RCMS_A_M2_report%20V4.pdf

[36] The Minimum Oil Burn rule was implemented by New York State in 1989, before NYISO began operations. *See:* NYISO. *Power Trends 2007*. https://www.npcc.org/RAPA/relGovReg/Documents/nyiso_ptrends07_final.pdf. *See also:* ConEdison System Operation Procedures. http://www.nysrc.org/pdf/MeetingMaterial/RCMSMeetingMaterial/RCMS_Agenda%20131/IR-3%20Evidence%20SO03-17-21%20MINIMUM%20OIL%20BURN_AUTOMATIC%20FUEL%20SWAPPING%20CAPABILITY.pdf

[37] Memorandum Regarding the Market Monitoring Unit Review of the NYISO's 2012 Comprehensive Reliability Plan. March 7 2013. http://www.potomaceconomics.com/uploads/nyiso_reports/Market_Monitoring_Unit_Review_of_2012_CRP_030713.pdf

[38] Power Trends 2013: Alternating Currents. NYISO. http://nyssmartgrid.com/wp-content/uploads/2013/05/Power_Trends_2013_May_2013_FINAL.pdf

natural gas plants in the region have had to increase electricity production to meet regional electricity demand.[39] Furthermore, the loss of the nuclear capacity and longer term planning analysis in response has highlighted the risk of inadequate gas pipelines and related infrastructure in the region to meet demand from new gas generation[40] As an immediate step to address the reliability concerns, both San Diego Gas and Electric ("SDGE") and Southern California Edison ("SCE") have proposed significant transmission reinforcements.[41]

Q. Are you suggesting that ISO-NE should institute a minimum oil usage rule like in NYC or procure additional reserves?

A. No, I am not making specific recommendations for ISO-NE to implement the solutions used in other markets. My discussion of the experiences of other markets is meant to simply highlight that the operational challenges that ISO-NE is facing are not unique to New England. These challenges do not imply a fundamental flaw in the FCM.

However, in my review of the various analyses and reports that ISO-NE has produced since 2011 with respect to identifying solutions to the real-time operational challenges, I have not seen the ISO-NE consider any alternatives to the PI. Analogous to how system planners

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[39] CAISO. *2012 Annual Report on Market Issues & Performance.* April 2013. P211. http://www.caiso.com/Documents/2012AnnualReport-MarketIssue-Performance.pdf. *See also:* Energy Information Administration. "San Onofre nuclear outage contributes to Southern California's changing generation profile." November 14, 2012. http://www.eia.gov/todayinenergy/detail.cfm?id=8770

[40] As a result, the Western Gas Electric Taskforce comprising of experts in the gas and electric industries, in collaboration with the California Public Utilities Commission, the California Energy Commission and the California Independent System Operator has been investigating the adequacy of natural gas infrastructure. For more information, please see http://www.westgov.org/ngei/index.htm.

[41] California Public Utilities Commission, California Energy Commission and CAISO. *Preliminary Reliability Plan for LA Basin and San Diego.* August 30, 2013.

consider the prospect for non-transmission solutions to a reliability problem, or multiple routes for a planned transmission line, it would have been valuable for ISO-NE to have comprehensively examined other potential solutions to its real-time operational challenges. For example, could adjustments to the calculation of the ICR and/or procurement of additional capacity (i.e., through the downward sloping demand curve) solve the operational challenges? Would uncapped or unconstrained energy and reserve price signals help? Or, since ISO-NE is trying to improve performance during real-time reserve shortages, perhaps it would have been more cost-effective to procure additional locational forward reserves through the Forward Reserve Market ("FRM") as proposed in a 2012 study by the Analysis Group?[42] Unfortunately, answering such questions requires analysis that has not been presented by ISO-NE or any other party at this time.

Q. So, according to ISO-NE's analysis of the PI Proposal, what would improve real-time market operations in New England?

A. Ultimately, I think ISO-NE would like to see resources responding to its dispatch instructions during scarcity conditions more quickly and more dependably.

This is a challenge that is not easily overcome with additional, incremental operations and maintenance ("O&M") spending or capital expenditure on existing units. For example, a fossil-fired steam unit that is turned off because it was not committed to operate in the day-

[42] In its analysis of reserve resources on behalf of ISO-NE in 2012, the Analysis Group found that units with FRM assignments typically performed better during contingency events than units without an FRM assignment. The Analysis Group further noted that one way to improve reserve performance is to adjust the MW procured so that the "effective" (i.e., reflecting actual performance) capacity meets the reserve requirements. *See:* Analysis Group. *Analysis of Reserve Resources: Activation Response following Contingency Events.* May 29, 2012. P27.

ahead market cannot turn on and achieve stable generation levels on a few minutes' notice, or even an hour's notice. A gas-fired combustion turbine may not be able to purchase and schedule gas on short notice, outside the established nomination cycles. A generator cannot simply pull gas supply off the pipeline without first nominating the gas, as such actions could cause pressure-related problems on the gas pipeline, endangering fuel supply to other generators and users. So for existing generators, the ISO-NE PI Proposal pre-supposes major operational changes by market participants that may, in fact, not be realistic.

Q. Would new generation resources solve the operating challenges?

A. In theory, new generation resources with certain characteristics could help, although they would not be "perfect" performers as they would also face unexpected outages. But to fully address ISO-NE's concerns, these new resources would need to remedy the operational challenges related to ramping capability and the operational challenges related to fuel supply. For illustration,

- a new gas-fired combined cycle plant ("CCGT") would need to be so efficient that it would essentially be economic all hours and committed routinely day-ahead to operate in all hours; such a new CCGT would also need to have uninterruptible access to fuel supplies;
- a new peaker would need to have sufficiently fast ramp rates to start from a cold start with just a few minutes; and to address the fuel supply problem, the peaker would also need to have "state-of-the-art", real-time fuel switching

capability to use gas or oil (and the requisite permits to run on oil and on-site storage).[43]

The value of such "high-tech" generation to system operations is unquestionable, but it is not reasonable to expect all resources to perform like such new resources. It would surely be impractical, not to mention uneconomic and unnecessary, to replace all existing fossil fuel fired generation overnight, and the cost of replacing even 34% or more of the existing fleet with such high-performance resources would be substantial. And it is questionable whether a "high-tech" generation fleet is the most cost-effective solution.

Q. In your opinion, would ISO-NE's PI solve the real-time operational challenges that ISO-NE has reported?

A. I am not confident that ISO-NE's PI Proposal would lead to improved performance. ISO-NE believes that its PI Proposal would solve real-time operational challenges, but it presupposes a specific set of reactions to the new performance requirements, and that existing generators can improve their performance in the specific ways that ISO-NE demands. However, the problem lies with the performance "ask" of capacity resources. ISO-NE is asking all capacity providers to take on risks for all operational challenges, which in many circumstances are beyond their control. Given this lack of control, the PI Proposal would not necessarily lead to improved real-time operational performance among existing resources, but it would penalize them, possibly leading to other problems. Many existing generators, as I discuss in the next section of my testimony, would expect penalties that would undercut the capacity revenues they

[43] Or they would have to have physical or financial agreements to draw on natural gas outside the normal daily nomination cycle.

received as a result of the FCA. ISO-NE PI may force retirements, which ISO-NE would want replaced with new generation. However, I have practical concerns about whether new generation will be developed in a timely and cost-effective manner in response under PI, as I discuss in more detail in Section VI of my testimony.

Q. Given your observations above and your review of the "jump ball" filing, is ISO-NE proposing a reform to a specific element of the FCM or a reform of the FCM?

A. In spite of ISO-NE's previous observations that the FCM is working as intended, I believe that ISO-NE is effectively proposing to change the market concept of capacity. Notably, ISO-NE refers to the FCM as the "current flawed capacity market design"[44] and that it is "failing to meet its most basic objectives – ensuring reliability in a cost effective manner."[45] And although it may appear that ISO-NE's proposed changes to the Market Rules are limited, and that the FCAs will remain unaffected, the ISO-NE is intending to dramatically change market participant conduct in the FCM and the scope of risk allocation, in a fashion that may neither ensure reliability nor be cost effective.

[44] ISO-NE Transmittal Letter. P17.

[45] ISO-NE Transmittal Letter. P2.

V. UNDERSTANDING THE ISO-NE AND NEPOOL PROPOSALS

ISO-NE PI Proposal

Q. Please describe your understanding of ISO-NE's Proposal.

A. ISO-NE is proposing to redefine the measurement of performance for capacity market resources. And as such, ISO-NE has proposed a fundamental change in the compensation that resources would expect from the FCM.

First, ISO-NE is proposing to change the metric against which compliance is measured from "available" capacity (currently measured in effective "MW" terms and delivered through the "energy market must offer" requirement) to actual generation in real-time, measured in MWh of energy and reserves delivered in five-minute increments. In addition, all exemptions would be removed, and capacity resource providers would be exposed to penalties. Second, ISO-NE proposes to change the capacity revenue stream. Under the PI, resources in the capacity markets would be paid a base payment (i.e., FCA clearing price multiplied by the capacity supply obligation ("CSO"), similar to the capacity payments under the existing FCM), and will also receive (or pay) a performance payment (or penalty) based on their energy market operations during five-minute intervals of scarcity conditions. Intentionally, ISO-NE has designed the PI such that resources may face penalties that exceed the base payment. Indeed, some capacity providers will likely see net losses (rather than revenues) from their CSO in the FCM.

The performance payment (penalty) is calculated based on actual generation (including provision of reserves) of a resource in real-time markets (at five-minute increments) relative to a benchmark known as the Balancing Ratio. In order to set to the monetary value of the performance payment, ISO-NE has proposed an administratively

determined, pre-set dollar amount that is meant to represent the marginal value of capacity or the Capacity Performance Payment Rate ("CPPR") – it is set at $5,455 per MWh in the longer term in ISO-E's PI Proposal.[46]

Q. What are scarcity conditions?

A. As ISO-NE has proposed, a scarcity condition can occur in any five minute increment[47] when the real-time energy price incorporates a scarcity price adder (indicating the supply of reserves is less than the required level of reserves) for one or more of the following reserve requirements: the system thirty minute operating reserve requirement, the system ten minute non-spinning reserve requirement (i.e., contingency reserves), or the zonal thirty minute operating reserve requirement.[48]

Q. Doesn't the ISO-NE already have performance incentives in the current FCM design that are keyed off contingency events that are similar to this concept of "scarcity condition" under PI?

A. Yes, under the current FCM design, performance incentives are provided principally through penalties for failure to be available during periods of reserve shortage. Currently, ISO-NE

[46] ISO-NE acknowledges the uncertainty of market impacts as a result of the magnitude of this administrative penalty amount. IO-NE therefore proposes to initially set this CPPR value at $2,000/MWh for the Capacity Commitment Periods beginning June 1, 2018 and ending May 31, 2021. For the subsequent three Capacity Periods (June 2021-May 2024), the payment rate will be $3,500/MWh. For all following periods (from June 2024 and thereafter), the payment rate will be $5,455/MWh. *See:* Testimony of Marc Montolvo. P22.

[47] Although scarcity conditions are measured in 5 minute increments, they are often converted to scarcity hours for ease of calculation.

[48] Based on the rules, when scarcity pricing occurs in the reserve market only, due to resource ramping limitations that are not binding on energy dispatch, this will not count as a scarcity condition.

measures performance during Shortage Events - a period of 30 or more contiguous minutes of a reserve shortage or deficiency.[49] Shortage Events include shortages at the zonal level as well as the system level.[50] With PI, ISO-NE proposes to expand the granularity of the monitoring to five–minute increments, whereas it is done currently on a 30-minute basis. Therefore, ISO-NE is proposing to make its requirement for "performance" even more time-specific. However, a key difference between the current design and what ISO-NE is proposing under PI lies in the characterization of the incentive payment rather than the frequency of monitoring. ISO-NE's plan should really be viewed as a penalty plan for most capacity providers, because of the 'measurement' approach that ISO-NE proposes and the potential magnitude of the losses. This has adverse consequences for its success, as I discuss below.

Q, Please compare and contrast the 'measurement' approach under the current FCM and PI.

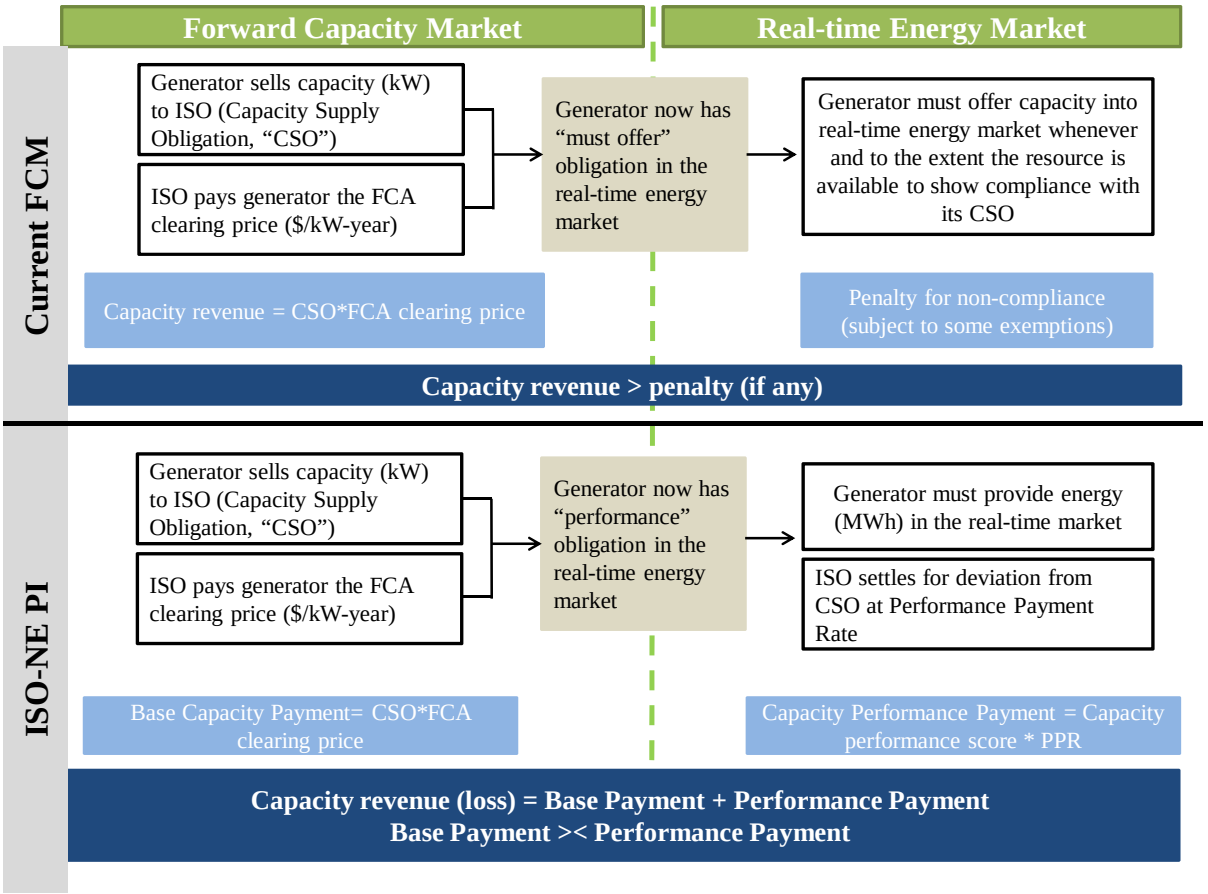
A. Currently, ISO-NE monitors performance during events of reserve shortfall, but resource performance is measured based on available capacity offered into the energy market, subject to reasonable waivers. As illustrated in Figure 10, under the current FCM design, capacity resources are required to offer capacity into the energy market whenever and to the extent the

[49] FERC Docket No. ER13-2313-000

[50] Until recently, ISO-NE interpreted the definition of a Shortage Event to be only when the system was short on ten-minute non-spinning reserves ("TMNSR") for 30 minutes or more. ISO-NE made the recent change as it felt that the old definition of Shortage Events (i.e., shortages of TMNSR) was "overly restrictive" – since TMNSR is relatively more valuable than TMOR, system operators would work to preserve TMNSR, making a sustained 30 minute violation rare. In its FERC filing, ISO-NE stated that it requested the change to "incent better performance during periods of system stress, thus helping to ensure that reserve requirements are met and system reliability is protected." *See:* FERC Docket No. ER13-2313-000

resource is available, subject to certain exemptions.[51] Under PI, performance of the CSO can only be satisfied in terms of metered energy or reserves produced during scarcity conditions.[52]

Figure 10. Measurement of performance and obligations of capacity providers under Current FCM compared to ISO-NE PI



[51] For example, if a resource is not committed because of transmission equipment outages, or is denied a self-schedule request by the ISO and therefore was not available in the Real-Time Energy Market then the resource is not penalized. *See* ISO-NE Market Rules Section III.13.7.1.1.3

[52] Critically to ISO-NE's PI, there will be no exemptions or exceptions applicable to avoidance of a potential performance penalty, even if a generator is offline for ISO-NE approved maintenance or is off-line because ISO-NE's day-ahead energy market algorithms did not commit the resource to start-up, etc.

Q. In addition to the focus on energy and reserve production in real-time, what are other important aspects of the measurement of "performance" under ISO-NE's PI?

A. The other key difference is that there would be no exceptions for calculation of the performance payment. Capacity resources are exposed to the risk of incurring financial losses as a result of taking on a CSO under all possible market conditions. Although the ISO-NE has proposed a stop loss mechanism, a capacity resource could be exposed to a penalty for its CSO that is three times the value of the base payment (i.e., the revenues it earns based on the clearing capacity price in the FCA).

Q. Can you please explain how you estimated this loss exposure?

A. This loss exposure is based on formula that ISO-NE proposes for the stop-loss mechanism. For purposes of illustration, Figure 11 below shows the calculation of maximum potential losses under PI over the course of one year for a generator that is not performing according to ISO-NE's PI criteria. The illustrative calculations assume a 100 MW generator with a CSO of 100 MW. I assume a FCA starting price of $15/kW-month and then I tested a range of FCA clearing prices from $1/kW-month to $10/kW-month.

Based on this range of clearing prices, I first calculated the annual base payment – recall, the base payment is FCA clearing price multiplied by the CSO, similar to the capacity payments under the existing FCM. I then calculated the annual maximum penalty (or loss) by applying annual stop-loss formula described in Matthew White's Testimony (page 204). Implied in this calculation, there are a number of scarcity conditions, as well as some level of poor performance relative to the CSO obligation.

As Figure 11 shows, there is a maximum loss that ranges from $1.5 to $4.2 million per annum. Depending on the capacity clearing price, annual maximum penalties per the stop-loss

formula range from $5.4 million to $13.5 million, which is 113% to 450% of the associated base payment.

The relative sizes of the losses are material. Because of the significance of the maximum losses, and the "no exemption" rule, I believe that most New England generators will generally associate PI with "penalties" rather than performance payments (bonuses).

Figure 11. Estimates of Minimum Annual Revenue under PI

FCA Pricing ($/kW-month)		Annual Base Payment	Annual Maximum Penalty	Penalty relative to Base Payment (%)	Annual Minimum Revenue
FCA Start Price	15				
FCA Clearing Price	10	12,000,000	(13,500,000)	113%	(1,500,000)
	9	10,800,000	(12,600,000)	117%	(1,800,000)
	8	9,600,000	(11,700,000)	122%	(2,100,000)
	7	8,400,000	(10,800,000)	129%	(2,400,000)
	6	7,200,000	(9,900,000)	138%	(2,700,000)
	5	6,000,000	(9,000,000)	150%	(3,000,000)
	4	4,800,000	(8,100,000)	169%	(3,300,000)
	3	3,600,000	(7,200,000)	200%	(3,600,000)
	2	2,400,000	(6,300,000)	263%	(3,900,000)
	1	1,200,000	(5,400,000)	450%	(4,200,000)

Note: Assumes a Capacity Supply Obligation of 100 MW

Q. Can you provide an example of how this penalty (reward) is calculated for a generic capacity resource?

A. Yes. Using the information provided in the Analysis Group Report, submitted in support of ISO-NE's PI Proposal in this "jump ball" filing, I determined illustrative outcomes for various technologies. For simplicity, I have assigned a 100 MW CSO to all resources, and have

assumed 3.85 shortage hours per month, the largest number of shortage hours ISO-NE has experienced in a single month based on historical data.[53] As I will discuss in more detail later in my testimony, I believe that using historical averages to assess unit performance is not an appropriate assumption for a comprehensive cost-benefit analysis, but it is the only information that is available at this time and is sufficient for illustration purposes.

Figure 12 on the following page shows the expected monthly performance payments by technology type based on the historical average technology performance reported by the Analysis Group, in combination with the 3.85 hours of scarcity conditions. The historical performance rates were calculated by the Analysis Group based on actual performance data for the 2010-2012 period. We can see that the expected performance payments are highly variable by technology – some technologies see a performance payment while others are penalized.

[53] On July 22, 2011, ISO-NE experienced 3.85 shortage hours occurring during peak afternoon hours. *See:* ISO-NE. "RCPF Activation Data". http://www.iso-ne.com/committees/comm_wkgrps/mrkts_comm/mrkts/mtrls/2013/mar11122013/a14_iso_rcpf_activation_data_03_05_13.xlsx

Figure 12. Illustrative calculation for performance payments by technology

	Variable	Value/Calculation	Source
A	**CSO**	100 MW	*Assumption*
B	**FCA Clearing Price**	$3,150/MW-month	*Assumption (FCA 7 Clearing Price)*
C	**FCA Starting Price**	$15,000/MW-month	*Assumption (FCA 7 Starting Price)*
D	**Balancing Ratio**	0.75	*Analysis Group (all months average)*
E	**Shortage Hours (monthly)**	3.85	*ISO-NE (scarcity hours observed in July 2011)*
F	**Performance**	varies by technology	*Analysis Group (all months average)*
G	**Capacity Performance Payment Rate**	$5,455/MWh	*ISO-NE*
H	**Monthly Base Payment**	A*B	
I	**Capacity Performance Score**	(A*E)-(A*C)	
J	**Capacity Performance Payment**	H*F*D	
K	**Monthly Capacity Payment**	H + I	
L	**Monthly Stop-loss Limit**	$1,500,000 (A*C)	

	Average Performance (F)	Monthly Base Payment (H)	Capacity Performance Score (I)	Capacity Performance Payment (J)	Monthly Capacity Payment (K)
CCGT	0.6	$315,000	(15)	($315,026)	**($26)**
CT Oil	0.84	$315,000	9	$189,016	**$504,016**
CT NG	0.74	$315,000	(1)	($21,002)	**$293,998**
CT other	0.98	$315,000	23	$483,040	**$798,040**
Coal	0.64	$315,000	(11)	($231,019)	**$83,981**
Steam NG	0.45	$315,000	(30)	($630,053)	**($315,053)**
Nuclear	0.91	$315,000	16	$336,028	**$651,028**
Steam Oil	0.22	$315,000	(53)	($1,113,093)	**($798,093)**
Steam other	0.83	$315,000	8	$168,014	**$483,014**
IC	0.57	$315,000	(18)	($378,032)	**($63,032)**
Hydro	0.59	$315,000	(16)	($336,028)	**($21,028)**
Wind	2.12	$315,000	137	$2,877,240	**$3,192,240**

Note: Balancing Ratio and Average Performance ratings taken from Analysis Group Report, p59.

Q. Are there other important observations from the above illustrative calculation of performance payments?

A. There are two key takeaways. First, based on historical performance, there are clear winners and losers under PI. For example, fossil fuel-fired steam plants incur net losses. On the other

hand, wind and nuclear plants receive positive payments.[54] It is interesting to note that CCGTs (which would likely be the technology of choice for new entrants) also face a slightly negative net capacity revenue stream under the PI Proposal due to the expected performance penalty. If new CCGTs perform similar to their peers historically, the potential for penalties should materially raise the cost of new entry, which I discuss further in Section VI of my testimony.

A second takeaway relates to the observations regarding capacity revenue variability. ISO-NE's PI Proposal increases the variability of the total capacity revenues. Indeed, even after base revenues are known, actual resource performance would still be uncertain until after real-time energy markets take place, and therefore there is a heightened uncertainty regarding total capacity revenues. To the extent that "performance" as measured by PI deviates from expectations, generators may be facing a net loss.[55] To better understand the magnitude of the variability of total revenues to uncertain performance, I used the inputs and calculations from Figure 12 to further evaluate the total capacity revenues for a hypothetical CCGT, using a range of expected performance ratios (but keeping constant the base payments).[56] As shown in Figure 13, the total monthly capacity revenues range from a net loss of $1,260/MW-month to a gain of $1,260/MW-month. In the "Better Performance" Case, I assumed that a CCGT's average performance increased by 10% to 0.66, while in the "Lower Performance" Case I

[54] However, these two resources contribute least to peak reliability.

[55] Given that many of the events that create the performance payment (penalty) are not easy to predict, and "performance" as measured under PI is not truly under the control of generators, the risk of losses may be even further amplified than implied by historical analysis.

[56] The same assumptions detailed in Figure 13 were used, including the $3,150/MW-month capacity clearing price.

assumed that average performance dropped by 10% to 0.54. It is important to note that this illustrative example only considers small variability in performance, whereas in any given month, much more substantial variations may be possible due to the absolute requirement of "performance" with no exemptions and the fact that the timing of scarcity conditions is uncertain.

Figure 13. Estimated performance payments – sensitivity to performance assumptions for hypothetical CCGT

	Average Performance (F)	Monthly Base Payment (H)	Capacity Performance Score (I)	Capacity Performance Payment (J)	Monthly Capacity Payment (K)	Monthly Capacity Payment ($/MW)
Historical (Base)	0.6	$315,000	-15	($315,026)	($26)	**($0.3)**
Better Performance	0.54	$315,000	-21	($441,037)	($126,037)	**($1,260)**
Lower Performance	0.66	$315,000	-9	($189,016)	$125,984	**$1,260**

Q. How often have scarcity conditions occurred in ISO-NE?

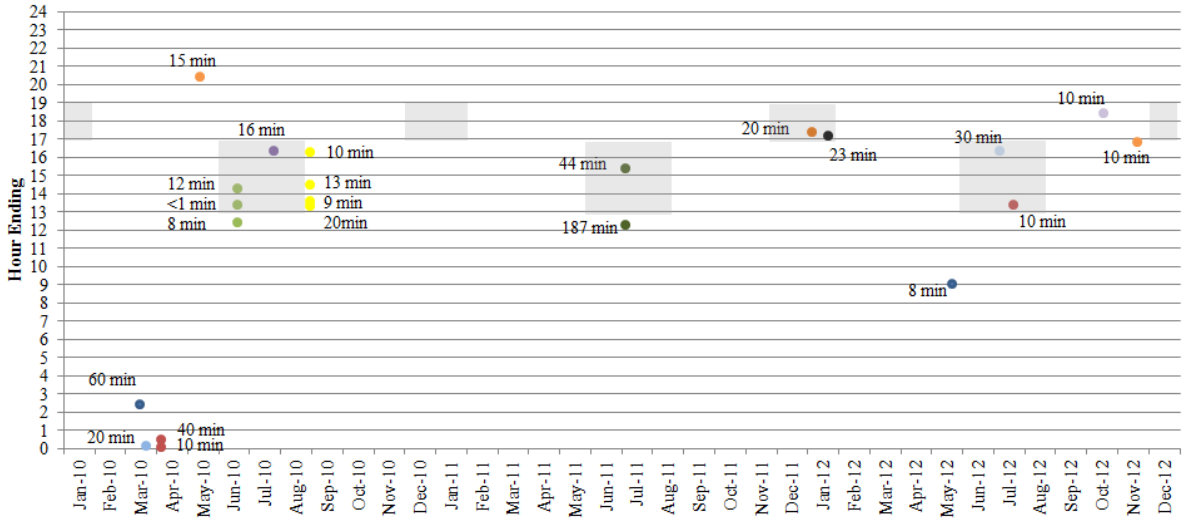
A. According to ISO-NE market data, during the 2010-2012 period, there were on average 3.2 scarcity hours (where reserve shortages occurred) each year.[57] However, this multi-year average masks the impact a possible scarcity condition. There have been months where the scarcity hours in a single month exceeded the multi-year average – for example, there were 3.85 scarcity hours in July 2011. Figure 14 below plots the occurrence of the scarcity conditions reported by ISO-NE for the 2010-2012 period, based on historical data published by ISO-NE.[58] The duration of each event is noted; events that occurred in the same day are the

[57] ISO-NE. "RCPF Activation Data". http://www.iso-ne.com/committees/comm_wkgrps/mrkts_comm/mrkts/mtrls/2013/mar11122013/a14_iso_rcpf_activation_data_03_05_13.xlsx

[58] In March 2013, ISO-NE presented the results of a simulation in which it backcast the scarcity conditions that would have occurred under an RCPF of $500/MWh.

same color. The grey boxes indicate the peak hours as defined under NEPOOL's EFORp Proposal.

Figure 14. Historical record of scarcity conditions in New England based on ISO-NE's proposed definition under PI



Source: ISO-NE. "RCPF Activation Data".

Q. When could we expect to see the impact of ISO-NE's PI Proposal?

A. It is my understanding that, at the earliest, the PI Proposal could be implemented for FCA 9 (for the 2018/2019 Commitment Period). However, the magnitude of the performance payments would not be known until the end of the Commitment Period. This implies that the impacts would not be seen for another five years (until the completion of the real-time markets for the 2018/2019 delivery period), and perhaps longer as capacity providers respond to the rising CPPR in future years and the accompanying rising exposure to penalties and FCM losses.

Analysis Group Report

Q. What quantitative analysis of the PI has ISO-NE submitted?

A. I understand that ISO-NE retained The Analysis Group to perform an impact assessment of the proposed PI. The results of this analysis are contained within a report entitled *Assessment of the Impact of ISO-NE's Proposed Forward Capacity Market Performance Incentives* ("Analysis Group Report"), dated September 2013 and filed as Attachment I-1g under the "jump ball" filing.

Q. What analysis is presented in the Analysis Group Report?

A. The Analysis Group performed an impact assessment of the PI by using a quantitative model simulating bidding in the FCA for the 2018/2019 Commitment Period (FCA 9). It is important to note that the Analysis Group did not simulate outcomes in the real-time energy or reserve markets.

Q. Can the quantitative analysis in the Analysis Group Report be used to assess the efficacy of the ISO-NE Proposal?

A. No, it cannot be used to pass judgment on the efficacy of the ISO-NE PI. First, as the Analysis Group states in the report, its analysis does not "provide a systematic evaluation of costs and benefits of the proposed rule, nor is it a forecast of FCM market outcomes."[59] The nature of the analysis conducted – considering bidding in a single future FCA – does not allow for meaningful conclusions to be made about the long-term impacts of the PI, either in terms of the auction clearing prices (for 'base' payments), or on the real-time energy market

[59] The Analysis Group Report. p3.

operations, which ISO-NE has stated is its key challenge and impetus for reforming the FCM. Furthermore, I would also note that the Analysis Group's evaluation had several shortcomings that may lead one to overlook potential critical impacts of the PI.

Q. Please identify the shortcomings you observed in the Analysis Group Report.

A. In addition to the most obvious concern regarding the lack of real-time energy market modeling, I have several concerns:

1. The Analysis Group only considers uncertainty in the level of scarcity conditions, not uncertainty in resource performance;
2. The Analysis Group assumes that all revenues earned under the PI will be put toward investments;
3. The Analysis Group estimation of the risk factor of the PI is under-stating the risks that generators are likely to face; and
4. The Analysis Group fails to consider the risk and resulting financing issues faced by new entry under PI.

Q. Why are you concerned with the lack of energy market modeling in the Analysis Group Report?

A. Under the proposed PI, ISO-NE is seeking to measure real-time performance in the energy market, so by definition one would want to demonstrate the impact of the PI's incentives on performance in the energy market. The Analysis Group Report discusses the potential impact of PI on the energy market only though *qualitative extensions* of the simulation analysis of a single FCA. The *qualitative* discussion, in my opinion, is incomplete and lacking factual foundation. Therefore the conclusions that the Analysis Group draws regarding improvement in real-time energy market performance cannot be relied upon.

Q. Can you give a more detailed example of your concerns regarding the energy market assessment in the Analysis Group Report?

A. Yes, I can. In concluding that there will be performance improvements in the real-time energy market, the Analysis Group makes an assumption that the higher clearing prices in the FCA under PI would be used to finance incremental capital investment to improve real-time performance. This is an unrealistic assumption. The Analysis Group recognizes that the higher capacity clearing prices are due to the increased risk of the PI due to the performance obligations in real-time energy markets, and the expectation of performance penalties in real-time. To the extent that performance is not certain or controllable, a rational generator would earmark and set aside the base capacity revenues to self-insure against performance penalties, and would therefore not use the base capacity revenues to fund incremental capital improvements or increased O&M spending until after actual performance (and penalties) are known. In order to build up an adequate self-insurance fund and because scarcity conditions are difficult to predict and the magnitude can be significant, a rational, risk-averse resource may decide not to "release" capacity revenues for other uses for several capacity delivery periods. Or put another way, the increased risk increases the expected return, meaning the required free cash flow increases; resources are only likely to reinvest if the perceived return is sufficient, and this return will rise to reflect risk – however, there is no guarantee that the administrated market will result in such an outcome.

Q. Can you comment on the other shortcomings you outlined above?

A. Resource performance is uncertain, and that is the problem ISO is trying to address. Therefore, Analysis Group's assumption that resources will perform at a consistent level, a level which is based on past performance, structures the analysis in such a way that it does not

consider precisely the issue ISO-NE seeks to address – performance in the real-time markets. In my opinion, in order for the Commission to have confidence in approving such a significant change in the capacity market design, at least some analysis of the uncertainty of performance levels to future scarcity conditions should have been completed, and the impact on real-time energy market performance estimated, along with expected effects on operating and retirement decisions, and future FCA costs.

I am also concerned that simplifying assumptions were made to measure the increased risk of PI and that the results are ultimately under-stating the risk.[60] My concern originates with the fact that the Analysis Group shows that only a small fraction of generation capacity in New England would apply a positive risk premium to their FCA bid under the simulations they performed (approximately 1,000 MW out of a total of over 30,000 MW).[61] Furthermore, I do not believe that Analysis Group reflected the risk-averse nature of generators under the biased performance scheme of the PI, especially given the sensitivity of monthly revenues to a generator's expected performance. The issue of risk is also an important one to consider from the perspective of new gas-fired generators, as these resources are not likely to completely avoid penalties under the PI. The probability and magnitude of penalties will be taken into account by investors. As a result, they may no longer be able to rely on the capacity revenues established by a new project's participation in the FCA, as those would no longer be secure under the PI given the volatile nature of the performance payment. Therefore, a more risky

[60] Indeed, the Analysis Group concedes that its risk estimation understates real risks of PI. *See:* Analysis Group Report. p28.

[61] Analysis Group Report. p29.

capacity revenue stream would raise the costs of financing. I will discuss this further below in Section VI of my testimony.

Q. How could an adequate quantitative analysis be performed to show more completely and robustly the impacts of the PI?

A. I would recommend a comprehensive, dynamic analysis that analyzes behavior and outcomes of the FCM and the energy and reserve markets. The analysis should capture long-term investment and going forward operating decisions that are made in the FCAs, followed by outage planning, day-ahead commitment, and then real-time system operations. The modeling should capture the rational generator's decision-making as it moves through all of the markets. In addition, the analysis should extend over multiple years in order to represent the cycle of long-term investment decisions and short-term operating decisions that the ISO-NE's PI Proposal is attempting to influence.

To test the robustness of the proposed PI design, the analysis should be repeated over many plausible future market conditions. This would allow the analysis to demonstrate how capacity providers, existing and new, would respond to a variety of market uncertainties, including the uncertainty of performance and the uncertainty of when and how frequently scarcity conditions occur.

Finally, a comprehensive analysis should include consideration of alternatives to ISO-NE's PI Proposal, including a consideration of other possible changes to the FCM, as well as modifications to the energy market or to the reserve market.[62]

NEPOOL's Proposal

Q. Please describe your understanding of NEPOOL's alternative Proposal.

A. NEPOOL's Proposal consists of two changes to the energy market and the FCM. With regards to the energy market, NEPOOL proposes to increase the current system-wide Reserve Constraint Penalty Factor ("RCPF") values for the thirty minute operating reserve ("TMOR") product from $500/MWh to $1,000/MWh and for the ten minute non-spinning reserve ("TMNSR") product from $850/MWh to $1,500/MWh.[63] In addition, NEPOOL proposes to replace the Shortage Event mechanism with a performance mechanism based on an availability metric referred to as the Peak Equivalent Forced Outage Rate, or ("EFORp").

Q. What would be the impact of NEPOOL's proposed changes to the RCPF?

A. The proposed changes to the RCPF would provide some additional incentives to generators to be available and provide energy and reserves during reserve Shortage Events. Increasing the RCPF increases the revenue opportunities for generators in the real-time markets. Experience has shown that the incentive of higher revenues is a strong motivator for improved performance, as I will discuss later in my testimony in the context of efficiency of the proposed changes.

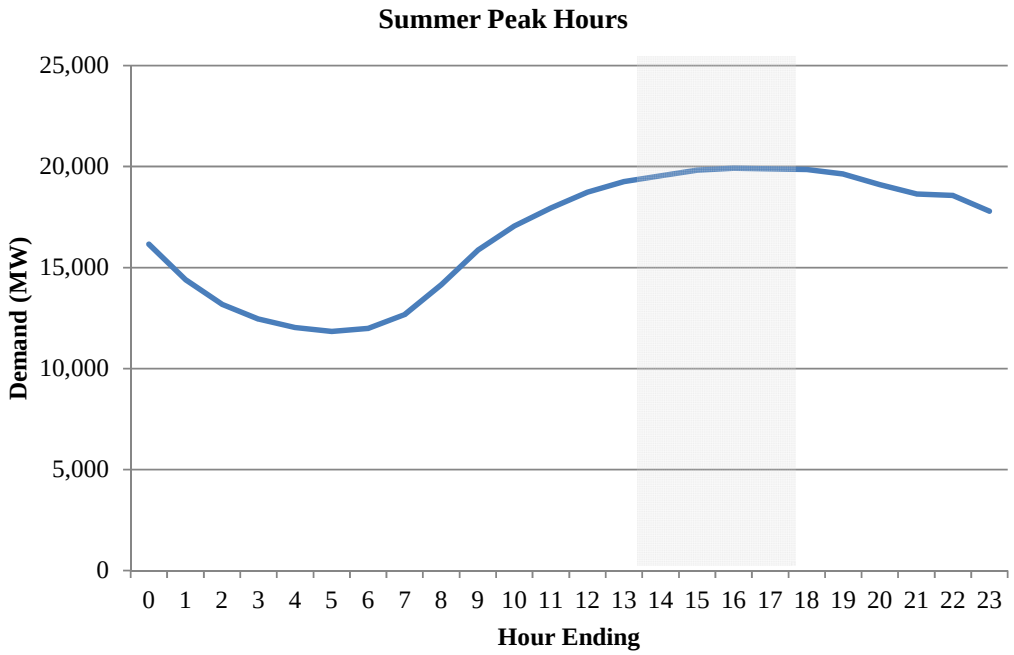
[62] The Analysis Group did not model the NEPOOL Proposal. The Analysis Group Report included only a qualitative commentary on an earlier version of the NEPOOL Proposal.

[63] NEPOOL Transmittal Letter. P9.

Q. Why does NEPOOL's Proposal change the performance metric in the FCM?

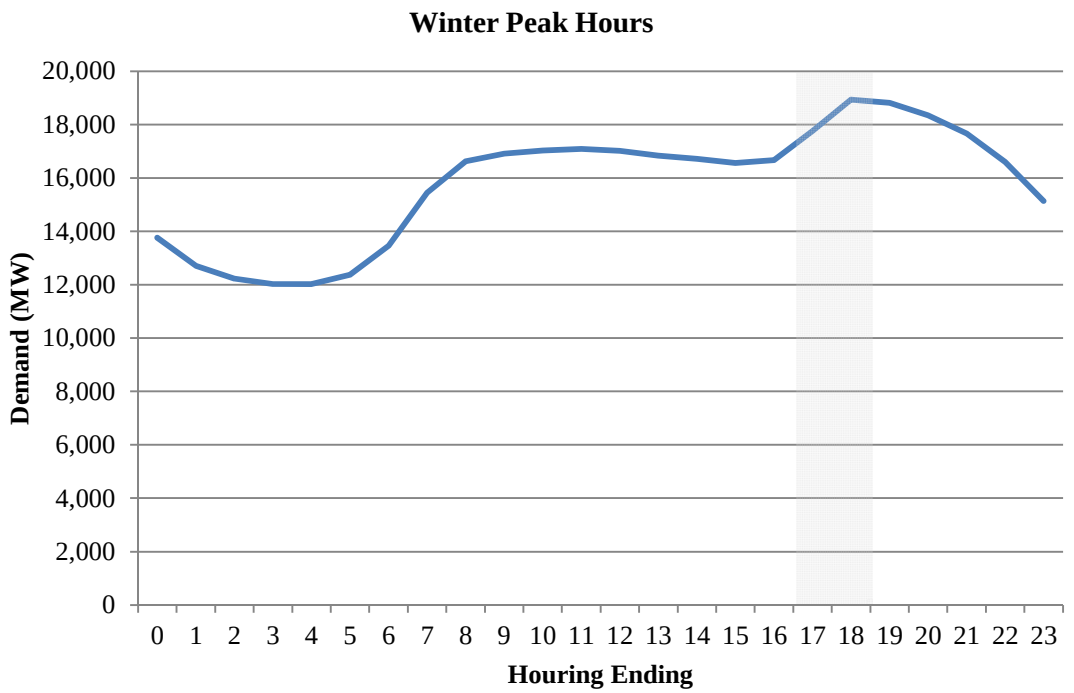
A. The current performance metric does not explicitly measure "availability" on a consistent and predictable basis (available capacity is monitored during unpredictable Shortage Events). NEPOOL's Proposal for refining the performance incentives in the FCM introduces an availability-based approach to monitor delivery of capacity on a more predictable basis, which creates an opportunity for generators to monitor and improve their performance. Under NEPOOL's Proposal, resources would be rewarded or penalized based on their availability in pre-specified hours, relative to historical availability in those hours. The EFORp intentionally measures availability during peak hours, when ISO-NE typically faces the highest demand on its system (see Figure 15).

Figure 15. ISO-NE historical load and EFORp hours during a typical summer day



Note: average non-holiday, weekday load in June, July and August for the period 2008-2013
Source: Energy Velocity

Figure 16. ISO-NE historical load and EFORp hours during a typical winter day



Note: average non-holiday, weekday load in December and January for the period 2008-2013
Source: Energy Velocity

Q. How would the rewards/penalties be calculated?

A. Each resource would receive an EFORp Availability Score during the Capacity Commitment Period based on its actual availability during all EFORp hours in the Commitment Period. This score would then be compared to the resource's average EFORp Hour Availability Score during the historical five-year period. Any deviations would be paid/charged at 150% of the FCA Clearing Price. There are two limits to the penalties that a generator can receive. First, similar to current market rules, a resource cannot lose more than its annualized FCM

revenues. Second, in the event of Force Majeure,[64] a resource's penalties will be limited to 20% of its prospective annualized FCM revenue. However, the Force Majeure limitation is prospective in nature to prevent resources from "clawing back" revenues they may have already lost due to poor performance. In addition, NEPOOL proposes to shorten the review period for poorly performing resources to accelerate the financial impact on and potential retirement of these resources.[65] Notably the historical EFORp Availability Score would be closely related to the performance that ISO-NE assumes when establishing the ICR.[66]

Q. When could we expect to see the impact of NEPOOL's Proposal?

A. The impacts of the RCPF changes could be observed almost immediately after it becomes effective as this modification impacts the real-time energy and reserve markets. However, the impact of the proposed change to the FCM would not be seen before the end of 2018/2019 delivery period for the same reasons I mentioned earlier with regard to the ISO-NE Proposal.

[64] Force Majeure is a common and recognized element of agreements in this sector. It presents a form of risk sharing between sellers and buyers that has been shown to benefit buyers as I discuss later in my testimony.

[65] As described in more detail in the Testimony of Peter Fuller (p16-17), NEPOOL proposes to assess resource performance by considering performance over the most recent three Commitment Periods, rather than the most recent four Commitment Periods.

[66] When calculating the ICR, ISO-NE considers unit level EFORd and maintenance weeks when estimating existing generation. *See:* ISO-NE. Proposed Installed Capacity Requirement (ICR) & Related Values for the 2017/18 Forward Capacity Auction (FCA8). August 22, 2013. http://www.iso-ne.com/committees/comm_wkgrps/relblty_comm/pwrsuppln_comm/mtrls/2013/aug222013/2017_18_fca_icr_values.pdf

Q. Is it true that the NEPOOL alternative Proposal is really a refinement of the existing capacity market design?

A. Yes, the NEPOOL Proposal is a refinement on the existing market design. The NEPOOL Proposal retains the conventional, availability-based definition of capacity used in New England to date and also in other organized capacity markets around the US. The NEPOOL Proposal intends to improve the performance incentives in the capacity market through an introduction of a performance scheme that tracks availability during peak hours. NEPOOL's Proposal also increases the real-time price signal to attract more generation to real-time markets when there are reserve shortfalls, which addresses head-on ISO-NE's operational challenges.

VI. COMPARATIVE ANALYSIS OF THE PROPOSALS

Q. How did you evaluate the relative merits of the ISO-NE PI Proposal and NEPOOL Proposal?

A. My evaluation was grounded in the best practices of any regulatory policy decision – is this good change? What are costs and benefits? Who is affected? And as an economist, the first question (i.e., "is it good?") is usually addressed in the context of whether the proposed change signifies an efficiency improvement? Or does the proposed change meet the objectives or solve the problem it sets out to solve?

My evaluation also recognizes that efficiency is not the only relevant metric for evaluation of a regulatory or market design change. In market design, it is also important to consider the existence or impact on the competitive dynamic of the underlying "market." With respect to competition and markets, the concept of non-discriminatory market design is critical. Moreover, as with any regulatory or market rule change, it is important to consider cost-effectiveness and practicality. In summary, I considered the two Proposals "side by side" using four objective metrics: efficiency, non-discrimination, cost-effectiveness, and practicality.

Furthermore, when considering these metrics, I examined them from the perspective of affected parties – generators (capacity resources), ISO-NE (as system operator), and consumers (ultimately, the entities that are buying the "resource adequacy" insurance). In my opinion, considering these four metrics from the perspectives of these parties, including consumers, is consistent with the principles of sound regulatory decision-making. Capacity markets and the concept of a capacity product would not exist but for regulatory

determination and therefore the best practice principles of regulatory policymaking also guide sound capacity market design.

Efficiency

Q. Please describe the importance of the first metric – efficiency relative to the objectives and market definition.

A. I had laid out the definition of capacity and the objectives of selling and buying capacity through capacity markets earlier on in Section III of this testimony. Capacity is a product with a long time dimension as the underlying purpose is to impact operating and investment decisions that take place over years – not hours. Therefore, when considering the efficiency metric, we cannot focus on narrow "snapshot" definitions of efficiency that only relate it to the least cost production of energy in real-time.[67] Rather, we need to look at a longer term definition of efficiency that is consistent with capacity market objectives. In addition, I consider Pareto efficiency – a situation in which no one can be made better off without someone else being made worse off.

Therefore, in my evaluation of the ISO-NE's PI Proposal and NEPOOL's alternative Proposal, I focused primarily on whether the proposed changes could be expected to attract new investment and rationalize the 'going-forward' operating decision of existing generation in a timely and orderly (predictable) manner. If the decision-making is not predictable and orderly, it will then detract from efficiency as there will be additional costs for system

[67] In economics, efficiency is typically defined as satisfying, as far as possible, wants within resource and technological constraints. Specifically, a situation in which no one can be made better off without someone being made worse off is known as Pareto optimal. *See:* Bishop, Matthew. *Economics: An A-Z Guide*. The Economist in association with Profile Books Ltd. 2009. P101, 238.

operators to implement stop-gaps and/or uncertainty that could also increase the effective long-run cost of investment.

Since ISO-NE's Proposal is also meant to address energy market operational challenges, I also considered whether the Proposal will meet the goal of improving energy market performance. To relate this back to Pareto efficiency, I considered whether the Proposal will improve the energy market without hurting or undercutting the objectives of the capacity market.

Q. Is ISO-NE's Proposal efficient?

A. I am not confident that the PI Proposal would be an efficient market change, especially in the context of the goals of a capacity market to maintain resource adequacy and attract new investment. I have three areas of concern with respect to resource adequacy and new investment under the proposed PI:

1. The Analysis Group has argued that PI may result in surplus supply[68] (at least in the first auction). If this transpires (and I have reservations on the logic that underpins the surplus capacity argument which I discuss further below), then the existence of surplus capacity would mute the market signal for new investment.
2. There may be a 'chilling' effect on new investment in response to the increased risks posed by the PI; at the very least, new investment may be more costly

[68] I disagree with the premise that leads the Analysis Group to conclude that there will be surplus capacity; nevertheless, if one were to accept their position, then the surplus capacity would delay new investment.

under PI. ISO-NE has also shown, through the review of historical data, that plants using CCGT technology are likely to face performance penalties under the proposed PI (see Figure 17), and CCGTs are the primary technology of choice for new investment. Given that there are no waivers or exemptions for real-time energy market performance under ISO-NE's PI, and it is reasonable to expect that new CCGTs would face the same gas supply challenges that are a concern for existing CCGTs, and would also face other operational risks of performance (for example, with fast ramp response, if they are not being committed around the clock), the probability of incurring performance penalties is material for new CCGTs. Expected performance penalties would reduce base capacity payments and would be viewed as a material incremental risk in the financing of new generation projects as they would reduce the capacity revenue stream that had been set in advance through the FCA. Investors – equity and debt – would need to consider the impact of the reduced security of capacity revenues and performance risks and associated penalties in advance committing to the market. Some developers may abandon their proposed investment in New England, in preference for other markets, while others will want to be remunerated for the increased risk. The implementation of PI could delay new investment and could raise the long-run cost of generation.

3. More generally, ISO-NE has framed PI as driving retirements of certain existing resources that are poor "performers", followed by new investment in better performing technologies. However, if there are too many retirements in a

short timeframe, the New England power system may not be able to practically accommodate new entry given the additional infrastructure investment needed to resolve gas pipeline resource constraints and local transmission security issues, as well as the risk profile for new investment noted above, which would affect the willingness of new capital to take part in this new 'market'.

ISO-NE has stated that it would like to also improve real-time energy markets. And in this regard, I am also skeptical that PI would improve real-time energy market performance. As I discussed in Section IV, the performance challenges that the ISO-NE is concerned with are driven by factors that are in many ways outside of the generators' day-to-day control. ISO-NE's PI has no exceptions for circumstances that influence real-time dispatch – circumstances that ISO-NE may actually have more control and better visibility over than any single generator (i.e., because of the ISO's knowledge of transmission outages, its overall knowledge of day-ahead commitment, and monitoring of weather-driven contingencies, etc.). So, it is hard to imagine how a generator could modify its operations to be producing more energy during scarcity conditions that it cannot easily predict, and during which it may not be able to control all of the factors impacting its operation. Furthermore, given the increased uncertainty around capacity revenues under the PI, it is unlikely that generators will use the base payments from the FCA to fund investments that may improve performance in real-time markets. There is nothing in the new market rules under ISO-NE's PI Proposal that ensures that performance payments will be used directly by gas-fired generators to secure firm gas contracts.

In summary, I am not confident that ISO-NE's Proposal would improve the long-run efficiency of the capacity market, nor am I confident that it would improve real-time energy market operations.

Q. Has ISO-NE already taken steps to address the operational challenges identified prior to this Proposal?

A. Yes, ISO-NE has taken many steps to address the technical and operational issues identified. In addition to numerous efforts to better coordinate electric market operations with natural gas market options, ISO-NE has also taken the following steps:[69]

(1) ISO-NE removed the price floor in the FCA;

(2) ISO-NE changed the definition of Shortage Events in the FCM to include thirty minute operating reserves, and to apply a more granular geographic focus (for example, at the Capacity Zone level in addition to system-wide), effective November 2013;

(3) ISO-NE increased the RCPF for system-wide TMOR from $100/MWh to $500/MWh as of June 1, 2012;

(4) ISO-NE proposed to change its offer rules to allow generators to change their real-time energy offers to reflect changes in fuel prices, which reduces the risk for generators,

[69] The states in New England are coordinating on other efforts to address the pipeline challenge. *See:* New England States Committee on Electricity. "Request for ISO-NE technical support and assistance with tariff filings related to electric and natural gas infrastructure in New England." January 21, 2014. http://www.governor.ct.gov/malloy/lib/malloy/2014.01.23_iso_letter.pdf

making them more willing and able to provide real-time energy and reserves. The flexible offer rules will become effective on December 3, 2014.[70]

(5) ISO-NE changed its Generator Audit Revisions, and now uses a performance factor adjustment that is designed to reflect the historical ability of a resource to reach the reserve target value, effective June 1, 2013;[71] and

(6) ISO-NE has begun the process of considering a downward sloping demand curve to replace the vertical ICR in time for the next FCA (e.g., FCA 9, scheduled for February 2015).

Q. Have these or will these changes address the operating challenges that ISO-NE has documented in this proceeding?

A. Many of these changes are either pending or quite recent, so it is too soon to tell to what extent they resolve the real-time operational challenges. Preliminary indications show that these changes are indeed having a positive impact.

For example, with the removal of the price floor, we have seen an increase in decision-making activity to retire resources that are not economic – and this has occurred without the proposed PI.[72]

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[70] FERC Docket No. ER13-1877-000. *Order Conditionally Accepting Tariff Revisions.* October 3, 2012. http://www.iso-ne.com/regulatory/ferc/orders/2013/oct/er13-1877-000_10-3-13_order_condition_accept_flex_rev.pdf

[71] Resources participating in the Forward Reserve Market are audited on their ability to meet requested output within ten or thirty minutes. Currently, resources that fail to meet their target level at least 60% of the time must submit a restoration plan to the ISO. *See:* ISO Market Rules Section III.9.5; FERC Docket No. ER13-323-000. *Order on Proposed Tariff Revisions.* January 9, 2013. http://www.ferc.gov/EventCalendar/Files/20130109143157-ER13-323-000.pdf

Furthermore, New England's Internal Market Monitor noted that prior increases to the RCPF have resulted in an "improvement in the ISO's ability to maintain adequate operating reserves and reliability during real-time."[73] New England's External Market Monitor also came to similar conclusions, noting that operating reserve shortages occurred rarely after the RCPF was raised in June 2012, and that "the new RCPF provides more efficient price signals during reserve shortages, which will provide better incentives for resources to be available and perform reliably under high load conditions."[74]

The energy offer rule revisions that ISO-NE will implement by December 2014 will help generators adjust their energy market offers to represent actual opportunity costs, and specifically the changes in opportunity costs that arise due to short-term fuel arrangements and volatile fuel prices. The changes will result in more flexibility in both day-ahead and real-time energy offers. In the day-ahead market, generators will be able to submit offers that vary by hour, while in the energy market, generators will be able to modify their offer up to thirty minutes before the operating hour. ISO-NE expects that these changes will improve real-time performance and reliability by making it "more likely that market participants' financial incentives and the requirement for resources to follow dispatch instructions are aligned."[75]

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[72] Once the price floor was removed, the risk of low prices led some assets to submit non-price retirement requests because they could not effectively signal their minimum going forward fixed costs under the low delist threshold of $1/kw-month.

[73] ISO-NE. *Annual Market Report 2012*. P53.

[74] Potomac Economics. *2012 Assessment of the ISO New England Electricity Markets.* P74.

[75] FERC Docket No. ER13-1877-000. *Order Conditionally Accepting Tariff Revisions.* October 3, 2012. http://www.iso-ne.com/regulatory/ferc/orders/2013/oct/er13-1877-000_10-3-13_order_condition_accept_flex_rev.pdf

The Generator Audit Revisions were made by ISO-NE in June 2013 as a result of ISO's observation that generator response to contingency events during 2012-2012 was well below the amount requested. The revisions change the methodology used to calculate a resource's ten and thirty minute reserve capability values (known as "CLAIM10" and "CLAIM30", respectively). Previously, the CLAIM10 and CLAIM30 values were determined based on performance during an audit. However, now the values are set using historical performance, which improves the ISO's 'visibility' of how much quick-start capacity it actually has available, thereby facilitating efficient real-time operational decisions. In addition, these revisions will also help verify a resource's actual ability to meet (and the resource's success in meeting) its capacity commitments for which it is paid. In approving these changes, FERC found that "it is undisputed that, in furtherance of these purposes, the Generator Audit Revisions ultimately will help ensure reliability."[76]

Based on the experience using downward sloping demand curves in other markets, a downward sloping demand curve in ISO-NE may help provide an anticipatory signal to new investment and would help make the going forward operating decision/retirement decision and new investment decision even more predictable. It will be very important for ISO-NE stakeholders to study and understand interactions between the downward sloping demand curve and any future performance incentives. For example, the reference price on a demand curve will need to take into account expected real-time energy market dynamics and accurately estimate revenues that a hypothetical resource could expect to receive. More

[76] FERC Docket No. ER13-323-000. *Order on Proposed Tariff Revisions.* January 9, 2013. P13 http://www.ferc.gov/EventCalendar/Files/20130109143157-ER13-323-000.pdf

generally, the downward sloping demand curve should improve the predictability of capacity revenues as well as the level of capacity revenues under oversupply conditions, which generators could use to finance incremental investments (provided those revenues would not have to be earmarked for offsetting penalties.) In concert with other on-going changes, ISO-NE is proposing too many changes with its PI Proposal, and we do not know the consequences of these changes either individually or as a whole.

Q. Will ISO-NE's PI Proposal efficiently meet its objective of improving real-time performance of existing generators?

A. No, I do not believe the PI will lead to a marked improvement in performance of existing generation. The penalty-centric PI may not produce the necessary financial funding for incremental investments to improve real-time performance. Although the base capacity price is predicted to increase under ISO-NE's PI, those revenues would likely not be "earmarked" for investment before the end of the capacity delivery period. Given the uncertainty surrounding the occurrence of scarcity conditions, and the high level of risk borne by resources (i.e., all operating and system risks under the PI Proposal), rational capacity providers would be more likely to set aside those funds as self-insurance against possible penalties – at least through the end of the CSO cycle and perhaps even longer (in order to build up a sufficient cushion in working capital to self-insure against performance penalties).

Insurance firms use deductibles to avoid frivolous claims and to incent the consumer to exercise some care. ISO-NE's PI Proposal effectively results in a situation akin to a 'moral

hazard' problem[77] – ISO-NE would lack the incentive to guard against risk because it would be is protected from its consequences, e.g., through the "no exemption" insurance policy is it asking generators to provide. Given this "no exemption" policy, how is it possible to ensure that ISO-NE also carefully considers transmission and generation outages and effectively manages resource procurement?

Q. Will ISO-NE's PI Proposal efficiently meet the objectives of the FCM to attract new investment?

A. ISO-NE's PI Proposal will likely cause more retirements and therefore exacerbate (or speed up) the "need" for new investment. However, I question whether this is an efficiency improvement relative to the current design, especially as other market reforms could address real-time energy market challenges, without as much upheaval. ISO-NE is not proposing changes to its FCA or the calculation of the ICR at this time; however, I am not sure whether the performance requirements under the PI Proposal are in fact consistent with expected performance as modeled in the ICR or the risk dynamic that existing generators need to now consider when they offer into the FCA.[78]

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[77] "Moral hazard may be defined as actions of economic agents in maximizing their own utility to the detriment of others, in situations where they do not bear the full consequences or, equivalently, do not enjoy the full benefits of their actions *due to uncertainty and incomplete or restricted contracts* which prevent the assignment of *full* damages (benefits) to the agent responsible." *See: The New Palgrave: A Dictionary of Economics.* Edited by John Eatwell, Murray Milgate, and Peter Newman. Volume 3, 1998. P549.

[78] For example, the success of the PI depends on the manageability of the risks under PI. The ISO-NE has proposed new rules for the Internal Market Monitor ("IMM") to review delists for existing generators for the FCA. The new rules are not vague by design. The successful realization of the new rules will depend on the IMM's willingness to be reasonable in authorizing different delist thresholds for segments of the same generation plant. If the IMM does not permit an existing generator to delist some portion of his maximum capacity, it may undermine the existing generator's ability to effectively manage the risk exposure of PI for too large a CSO.

I also have reservations about the success of the PI in attracting new investment cost-effectively. PI represents a significant change to the market, one which may have unintended, adverse consequences for new investment and overall resource adequacy, as I will discuss later in my testimony when I examine the practicality of each Proposal.

Q. On page 22 of its Transmittal Letter, ISO-NE likens its PI Proposal and market redefinition of capacity product to a forward market construct. Do you agree with the analogy to the forward markets and the implication that the PI is an efficient extension of the proven economic concept of forward markets?

A. No, I do not believe that PI Proposal creates a capacity market that can be described as a forward market pursuant to basic economic facts. A key factor in any forward market is the "expectation regarding the future value of the spot rate at the date of maturity…the equilibrium forward rate reflects both expectations of the future spot rate and a risk premium."[79] I have added emphasis on the spot rate as that is the missing component in the ISO-NE PI Proposal.

A functional forward market requires a liquid spot market to settle deviations. Using ISO-NE's example, "if a grain supplier agreed to deliver ten tons of grain in six months, and then only delivered eight, its underperformance would be settled at the spot price."[80] That is, the supplier would have to purchase two tons of grain at spot market prices to complete the promised delivery of ten tons. In New England, there is currently no spot market for capacity,

[79] *The New Palgrave – a Dictionary of Economics.* Volume 4, p442-443.

[80] ISO-NE Transmittal Letter. P24.

nor are there plans to create a centralized spot market for capacity.[81] ISO-NE recognizes the missing link, stating "as there is no spot market for capacity, under Pay for Performance, deviations are settled at an administratively-determined rate specified in the Tariff called the Capacity Performance Payment Rate."[82]

Q. Does the CPPR function as a spot market price?

A. ISO-NE has approximated the spot market price using the CPPR, but that is not a true spot market price for capacity, as it is fixed in advance and determined using a formulaic consideration of costs (and it does not reflect consumer's willingness to pay for energy, nor the ISO's expectations about the need for capacity closer to real-time). A true spot market price would reflect resources' expectations about being able to deliver capacity, consumers' valuation of capacity (perhaps represented by ISO's views on capacity "needs"), and incorporate more up-to-date information from the ISO about the "need" for capacity in real-time, based on expected real-time energy supply and demand.

Q. Matthew While also likens capacity to a "call option" on page 168 of his testimony. Do you agree that capacity can be thought of as a call option on the energy?

A. Yes, I think a capacity obligation can be likened to a call option on the energy production capability of a resource. In practice, call options have a strike price at which they are exercised – which would be set by the resource providing the energy based on its short-run

[81] As suggested on page 160 of Matthew White's Testimony, ISO-NE expects bilateral capacity transactions to occur under PI closer to real-time, but those bilateral transactions are not a substitute for a spot market for capacity, nor do they justify the use of the administrative rate of $5,455/MWh that ISO-NE plans to apply as the performance payment (penalty) on all CSOs.

[82] ISO-NE Transmittal Letter. P24.

marginal cost. In addition, it is not uncommon for call options to contain other elements that would likely differ by resource types, fuel, and technological capabilities - for example, the timing of exercise.

So, in the real-world application of a call option design, given varying capacity resource traits, one would need to define multiple call options with different strike prices for the New England marketplace. However, under its PI Proposal, ISO-NE's "call option" is uniform across all capacity suppliers and generation technologies (as well as demand-side providers). ISO's PI Proposal would entitle ISO-NE to assume that the energy would be there at any time and under any condition from all capacity providers. The ISO-NE's proposed PI analogy to the call option therefore lacks several practical elements of call option design.

Q. Is NEPOOL's Proposal efficient?

A. Yes, I believe the NEPOOL Proposal is an efficiency improvement, both in terms of refinement of the performance incentives for capacity (to focus on availability when demand is highest which is when generation is most likely going to be needed) and in terms of improved incentives for generators to provide real-time reserves through the adjustment of the RCPFs. Existing generators have an opportunity to improve their performance as a result of the higher expected energy prices under NEPOOL's Proposal. The refined metric for monitoring performance in the capacity market – tied to EFORp – should also improve resource adequacy by ensuring that availability of capacity during specified peak hours (and within management's control) is rewarded, while significantly under-performing resources are eventually removed from the capacity market. Most importantly, perhaps, the NEPOOL Proposal is a refinement on an existing market design and therefore, there is less of risk of

inefficient outcomes with respect to overly ambitious amounts of retirements or risk-averse new entry than there is with ISO-NE's PI.

Q. Are performance incentives an efficient way to address the challenges faced by ISO-NE?

A. Performance incentives are an important element of any market design. Performance standards in capacity markets can be an effective way to help ensure that capacity markets meet their resource adequacy goals. Both ISO-NE and NEPOOL agree that better incentives are needed in New England markets to attract new investment. Currently, the FCM measures performance based on availability during defined (but somewhat random) Shortage Events, and that performance is based on availability within the resource owner's control. The penalties incurred by a generator under the current FCM measures cannot exceed its capacity payment. However, there are no incentives for over-performance. ISO-NE feels that this performance standard is not effectively incentivizing resources to perform when most needed. On the other hand, ISO-NE's PI Proposal is penalty-centric, and would expose generators to potential net losses (i.e., penalties exceeding revenues) in the capacity market. The PI Proposal does not add additional incentives to the energy market. NEPOOL's Proposal would change the concept of penalties with respect to capacity, but would not expose a resource to penalties greater than its annual base capacity revenues; therefore, balancing the positive incentive properties with the risks. Importantly, NEPOOL's Proposal incorporates more incentives for performance in real-time energy market operations. It has been shown, not just

in the energy sector but in other industries as well, that incentive schemes that reward tend to yield better results than incentive schemes that penalize.[83]

One of the operational challenges ISO-NE is trying to address is the increasing EFORd rates it has observed across the fleet. It is noteworthy that generators' capacity compensation today has not been tied to EFORd rates (unlike the UCAP measurement in other US capacity markets). ISO-NE procures and pays for capacity based on maximum summer rating of capacity, but incorporates availability of generation indirectly into its calculations of performance and how it set the overall ICR. In NEPOOL's Proposal, generators would be effectively paid on the basis of their effective unforced capacity (during peak demand conditions) since performance payments will be based on EFORp, which will require that generators perform in high demand periods. Holding generators accountable for their effective unforced capacity during pre-specified periods where demand is likely to be highest provides a viable path for generators to improve EFORd rates. Improving EFORd (or EFORp) rates is possible for generators because the measurement periods are predictable and generators can use best efforts to be most available in advance for these periods. On the other hand, ISO-NE

[83] The economics of incentives have been studied extensively in context of contracts and regulation design. *See* Laffont, Jean Jacques and Jean Tirole in their 1993 book *A Theory of Incentives in Procurement and Regulation* (1993). In this seminal text, Laffont and Tirole discuss the design of incentive schemes, noting that incentive schemes that provide a reward (rather than penalizing) are more effective in motivating improved performance. In the field of behavioral economics, there is a growing body of evidence regarding the enhancing value properties of bonuses and rewards. *See:* Gibbons, Robert. "Incentives and Careers in Organizations*." Advances in Economic Theory and Econometrics.* 1993; Lazear, Edward. "Performance Pay and Productivity." *American Economics Review.* 2000.

PI's procedures relying on scarcity conditions are not predictable and therefore generators cannot as easily make themselves maximally available for scarcity conditions.

Q. Why do you believe that NEPOOL's Proposal is efficient while ISO-NE's PI Proposal is unlikely to be efficient?

A. NEPOOL's Proposal is efficient because the performance it seeks to measure (EFORp) is within management's control. ISO-NE's PI Proposal, on the other hand, measures a resource on performance that is partially outside of management's control. As a result, under ISO-NE's Proposal, resources have no practical way of ensuring their performance. Measuring capacity in such a way could cause inefficiencies in the market. For example, an existing generator may decide to retire early when faced with such revenue uncertainty, and new generation may be more expensive as the revenue volatility risk may lead to higher financing costs. I will discuss revenue volatility in more detail when I discuss the practicality of each Proposal.

Q. ISO-NE has commented that NEPOOL's scarcity adder is too small and therefore would not improve real-time operations. Do you agree?

A. No, I do not agree with the ISO-NE commentary. The RCPF influences revenues that generators may receive only when contingencies occur, so the probability-weighted revenues derived from the higher RCPFs are more modest than what is implied by the overall magnitude of the RCPF change. However, the higher RCPFs would nevertheless be a welcome improvement on the market value of generation during periods of scarcity. Furthermore, the success of prior increases to the RCPF indicate that the adders proposed by NEPOOL – increasing system-wide RCPF values for the TMOR product from $500/MWh to $1,000/MWh and for the TMNSR product from $850/MWh to $1,500/MWh – would be

appropriate. As the External Market Monitor noted, "operating reserve shortages [in 2012] occurred very rarely after the increase in the RCPF" to $500/MWh.[84]

An increase in RCPF is also efficient in directly focusing on the underlying problem of real-time performance. A higher RCPF translates into higher market price when reserves are short - exactly the same periods that ISO-NE is most concerned with in its PI. Another benefit of the NEPOOL Proposal is that for performance to improve there is no need to rely on fundamentally different operations and market behavior from all generation. Finally, similar to ISO-NE PI's stated intent to pay for performance, higher RCPFs pay those entities that solve the real-time market performance problem.

It is also incorrect to directly compare the RCPF increase to the proposed CPPR $5,455/MWh in ISO-NE's PI Proposal. ISO-NE states that NEPOOL's proposed RCPF adder is "an order of magnitude too small" and that the rate of $5,455/MWh is the level of incentive "necessary during periods of scarcity."[85] This is a misleading comparison because the CPPR is applied in a specific manner that is different than the manner in which the RCPF is applied. The RCPF is a revenue adder, which the CPPR can be a penalty or reduction in the capacity revenue that a generator may otherwise have earned. More importantly, because CPPR is applied to the differential between actual performance and the performance target, it is only applied to a fraction of the capacity provider's total output. On the other hand, if RCPF is

[84] Potomac Economics. *2012 Assessment of the ISO New England Electricity Markets.* P73.

[85] ISO-NE Transmittal Letter. P27

triggered, it produces higher real-time prices that apply to a qualified generator's entire output.

Q. ISO-NE has also noted that the performance incentives under NEPOOL's Proposal are weak as they are similar to the otherwise unsuccessful "Shortage Event" concept used in the current FCM design. What are your views on the performance incentive in NEPOOL's Proposal?

A. ISO-NE's criticism of the EFORp-based performance incentive is misleading. The performance incentive that is most valuable for meeting the objectives of improving real-time operations is embodied in the higher RCPF and not in the EFORp. The EFORp mechanism and NEPOOL's changes to the FCM address performance incentives that are appropriate for the longer-term objectives of resource adequacy and investment signaling. EFORp measures availability when the ISO needs it most – during peak periods when demand is highest. Furthermore, the relatively short three-year performance review window[86] under the "Poorly Performing Resources" provision in NEPOOL's Proposal balances the need to "pay for performance" against the need to allow generators some time to remedy performance before they are permanently removed from the FCM. In other words, the use of EFORp combined with the two year window moves the system to the remuneration of resources that are performing as intended, while avoiding upheavals in the generation sector that could lead to

[86] Poorly performing resources are assessed based on worst performance in two of the three most recent capacity commitment periods.

periods of resource inadequacy. The EFORp-based performance incentive is also consistent with how the ISO-NE plans for the FCM in its ICR determinations.

Q. What do you mean by your statement that NEPOOL's Proposal is consistent with how ISO-NE plans for the FCM?

A. The NEPOOL Proposal is consistent with resource planning models that ISO-NE uses to set the ICR. ICR takes into account historical performance by establishing the future system's capacity requirements based on an expectation that resource maintenance and availability in the future period will be similar to the five-year historical outage and availability characteristics of the current fleet. Under NEPOOL's proposed plan, generators are held accountable for that performance.[87] Furthermore, the "loss of load" modeling that ISO-NE performs for setting the ICR is done against peak load conditions (in fact, '90/10' demand projects), so it is sensible that the capacity availability metric (EFORp) focuses on periods when we would expect peak load to occur.

Non-discrimination

Q. Please describe the importance of the second metric, non-discrimination.

A. Non-discrimination has many purposes in regulatory design, but from a market design perspective, non-discrimination is vital to ensuring a level playing field and competitive

[87] When calculating the ICR, ISO-NE considers unit level EFORd and maintenance weeks when estimating how much generation is needed to meet peak demand. Specifically, ISO-NE evaluates the ICR probabilistically based on a 1 in 10 Loss of Load Expectation using the GE Multi-Area Reliability Simulation program ("GE MARS"). *See:* ISO-NE Market Rules Section III.12.1; ISO-NE. Proposed Installed Capacity Requirement (ICR) & Related Values for the 2017/18 Forward Capacity Auction (FCA8). August 22, 2013. http://www.iso-ne.com/committees/comm_wkgrps/relblty_comm/pwrsuppln_comm/mtrls/2013/aug222013/2017_18_fca_icr_values.pdf

market outcomes. It is also related to the efficiency metric that I just discussed. In competitive markets, undue discrimination between market participants can distort competition and thereby undermine an efficient outcome for the market. Therefore, in order to ensure efficiency in a market-based setting, I believe that any proposed capacity market rule change must be non-discriminatory in its application to capacity suppliers. The rules can allow for suppliers to demonstrate that they are better performers on an *ex post* basis, but the rules themselves cannot dictate who may be a better performer *ex ante*.

Q. Is ISO-NE's Proposal non-discriminatory?

A. No. Although ISO-NE claims that its Proposal is "resource neutral" since it provides the same compensation to any resource that is providing energy during scarcity conditions, it is in fact discriminatory by design. The ISO-NE PI Proposal is intended to discriminate between existing and new generation, and even more worrisome, there is embedded discrimination in the PI between different technologies. In addition, PI may actually distort the timing of new entry that may otherwise have occurred.

Under the PI Proposal, older existing suppliers are disadvantaged relative to new suppliers, who will be more efficient because they are new and therefore more likely to be committed day-ahead and running in real-time. The *ex ante* discrimination arises because of the basic operating characteristics of various technologies relative to the real-time energy market performance that ISO-NE's PI is eliciting. For example, peaking thermal generators (oil-fired steam units) will be disadvantaged relative to baseload thermal generators (nuclear), as I discuss below.

Furthermore, as discussed in the Report of Richard Tabors submitted on behalf of NEPOOL in the January 17th "jump ball" filing, the ISO-NE Proposal effectively provides

remuneration in the form of a performance payment to resources that are not improving (or otherwise) changing their performance. For example, under ISO-NE's PI Proposal, a performance payment is likely to be paid to nuclear plants, even if they did not change their real-time performance in any way. The PI is therefore rewarding generators for performance that they already deliver under the current FCM rules, while penalizing other units by requiring performance that they cannot deliver given their operational capabilities.[88]

Q. Why do you think ISO-NE's Proposal is discriminatory?

A. The discrimination arises as a consequence of the risks that ISO-NE wants to allocate to generators and its Proposal to define the performance of the capacity product in terms of real-time energy and reserve delivery. Under PI, ISO-NE will not make any exemptions for risks that may occur, and those risks vary by technology as they pertain to being penalized given the performance standard. In other words, not all suppliers have the same opportunity to improve their performance.

Q. Does ISO-NE recognize that its Proposal creates winners and losers?

A. Implicitly, yes. In its Report dated September 2013, the Analysis Group used historical performance data to determine the average expected performance of different technologies under different types of shortage conditions (i.e., average performance over all shortage hours, during summer shortage hours, and during winter outage hours).[89] As can be seen in Figure 17 (which reproduces a chart from the Analysis Group Report), certain technologies, such as

[88] Tabors. P9.

[89] As described in the Analysis Group Report, performance was based on actual performance during scarcity conditions occurring during the 2010-2012 period.

fossil-fired steam plants, are always "losers", while other technologies such as wind and nuclear, are always "winners". As I mentioned, this discrimination results from the different basic operating characteristics of each technology. For example, natural gas CCGTs and gas steam units may not be economic and so they are not committed day-ahead. Then, when they are asked to dispatch in real-time, they cannot comply as quickly and effectively as other units. On the flip side, nuclear is always running and therefore would not have a problem satisfying its CSO with real-time energy production. However, nuclear (and wind) contribute least to peak reliability.

Q. Is NEPOOL's Proposal non-discriminatory?

A. Yes, the performance incentive that NEPOOL is proposing is non-discriminatory in application. Under the EFORp mechanism of the NEPOOL Proposal, and given the waivers suggested for circumstances outside management control, all suppliers are held to the same standard that is developed based on each plant's actual historical performance. And although there is an inherent technology preference for capturing the higher RCPF-based real-time market prices, there is no offsetting risk obligation (as there is under ISO-NE's PI because of the performance payment). Indeed, in its review of the NEPOOL Proposal in April 2013, ISO-NE noted that the high RCPF was non-discriminatory, as it provides "incentives that are similarly applicable to all resources, without exceptions and regardless of technology type."[90]

[90] ISO-NE. *Feedback on NRG's Proposals for Performance Incentives.* April 2, 2013. P2. < http://www.iso-ne.com/committees/comm_wkgrps/mrkts_comm/mrkts/mtrls/2013/apr9102013/a17d_iso_memo_feedback_on_nrg_Proposal_04_02_13.pdf>

Figure 17. Expected performance payments by technology – excerpted from the Analysis Group Report

Source: the Analysis Group Report. p59.

Cost-effectiveness

Q. Please describe the importance of the third metric – cost-effectiveness.

A. The cost-effectiveness metric is intended to evaluate whether the expected gains from the market rule changes under each Proposal outweigh the expected costs. From a Pareto efficiency standpoint, it is preferable if the improvements being made do "no harm" to others, for example if the costs incurred by consumers, or losses by market participants have offsetting benefits. This metric needs to be evaluated not only from the perspective of actors involved in the FCM (e.g., capacity suppliers and the ISO), but also electricity consumers that pay for capacity.

Q. Who bears the costs under the ISO-NE and NEPOOL Proposals?

A. Under both Proposals, electricity consumers ultimately bear the cost of the capacity product. As ISO-NE notes, consumers effectively pay for capacity by paying the capacity clearing price determined in the FCA.[91] Although the ISO-NE positions the performance payments as transfers between capacity providers (i.e., generators), the additional risk of potential performance payments (penalties) would be reflected already in the capacity clearing price. So, ultimately, consumers will pay for the real-time energy market performance obligations that ISO-NE is introducing in the PI.

Cost-effectiveness should also consider benefits. For example, the increased costs of the FCA could be offset by market benefits (reduced energy market costs). In theory, consumers should see a benefit if the intended performance improvements are realized.

[91] White Testimony. P67.

However, the ISO-NE has not monetized those benefits. And, as I discussed already, I have concerns about whether the PI Proposal would in fact deliver improvements in real-time market operations and lower energy market costs. In fact, the ISO-NE PI could result in higher energy market costs, as well as possible resource adequacy shortfalls, if there are adverse consequences. Even if customers are still served electricity, there are nonetheless negative consequences. For example, in 2013, ISO-NE was fined a penalty of $5,000 for violation of certain reliability criteria resulting from a shortfall in reserves.[92]

Q. Has ISO-NE examined the cost impacts to consumers?

A. ISO-NE does not reflect on the costs to consumers in its direct testimony in the filing, but indirectly, ISO-NE expects higher costs because of higher risks of operation and the risk of penalties under the PI. Although ISO-NE is allocating all the performance risks to generators, ultimately, it must be recognized that the cost of risk embedded in the marginal generator's capacity offer will be passed on to consumers.

Q. What does the Analysis Group conclude about the cost impact of ISO-NE's PI?

A. The Analysis Group did not conduct a comprehensive cost-benefit analysis. However, based on their analysis of FCA bidding, the Analysis Group concludes that the PI would likely raise FCA prices nearly threefold from $1.31/kW-month under current market rules to as high as $4.49/kW-month under PI in the next FCA.[93] The Analysis Group concedes that the PI will have a variety of cost impacts, with "ambiguous" near- and long-term aggregate impacts. I am

[92] FERC Docket No. NP13-52.

[93] The Analysis Group Report. p5.

concerned that the Analysis Group's simplifying assumptions underlying the risk factor calculation actually understate the risk factor, leading to understated cost outcomes. I am also concerned that the calculations they performed to estimate the offers of new entrants understate the expected increase in financing costs in the face of a more risky capacity market and uncertain capacity revenues.

Q. Is ISO-NE's Proposal cost-effective?

A. As described above, the expected costs to consumers are greater under ISO-NE's Proposal. Analysis Group estimates that total FCM payments could increase by up to $1.32 billion under the PI.[94] There is no corollary analysis to demonstrate the expected market benefits to consumers. ISO-NE assumes that PI would result in more reliable system operation, but the logic is questionable. As I have already discussed, existing resources may not be able to use the additional base capacity revenues to fund incremental investment. Furthermore, the assumption that PI would result in surplus capacity (which in turn will result in fewer scarcity conditions) is flawed, as I will discuss in more detail when I examine the practicality of each Proposal.

Q. You mention above that the ISO-NE's PI Proposal is more expensive because of the increased risk to generators. Please discuss how generators' risk profile changes under the ISO-NE Proposal?

A. Under ISO-NE's Proposal, generators will need to bear new performance risks that are not naturally associated with either capacity, as conventionally designed, or energy market

[94] Analysis Group Report. p5.

operations to date. According to ISO-NE, "it is sound market design for suppliers to bear the risks of non-performance, regardless of fault."[95] The ISO-NE would therefore agree that the risks under the PI Proposal will be very different from those under the current FCM design. But is it reasonable to assign those risks only to generators? To answer this question, it is important to examine the underlying characteristics of the new risks assigned to generators.

For a generator, the risks of performance under ISO-NE's PI are not symmetric and they are not diversifiable. The new performance risks are not diversifiable (also known as "market risks") because they are inherent to the entire market[96] – that is, performance penalties arise out of market events beyond the generator's control. These events could include, among others: transmission outages that prevent a resource from producing; scarcity conditions occurring during ISO-NE-approved planned maintenance outages; following ISO-NE dispatch instructions that may result in limited production during a scarcity condition. The performance risks are not symmetric because the probability that a generator is rewarded or penalized is not the same for most generators due to the unpredictability of when Scarcity conditions occur and a generator's ability to perform on demand, which is limited by technology.

[95] ISO-NE Transmittal Letter. P15.

[96] Non-diversifiable risk is the "risk that cannot be eliminated because the returns on all risky assets are relative to each other." In other words, it is the risk that remains after diversification – for example, the returns on a well-diversified portfolio will vary due to market or economy-wide factors such as changes in interest rates or commodity prices. *See:* McGraw-Hill. *Business Finance*. P183.

Q. But the need for real-time energy markets to have sufficient energy and reserves is not a "new" concept?

A. Yes, that is true. The underlying real-time energy market construct has always been there. However, the current FCM design effectively allocated some of the operational risks of the real-time energy market to consumers.

Q. So some of the risks that ISO-NE is now proposing to transfer to generators are currently borne by consumers. Are generators better able to manage these risks than consumers?

A. The PI Proposal applies these risks to each generator individually. And as noted above, these are asymmetric, non-diversifiable risks from the perspective of generators.

I do not believe that generators individually are better equipped to manage these risks than consumers as a whole.[97] Economic theory and industry practice have shown that risk allocation between consumers and suppliers can and should be shared.[98] Indeed sharing such asymmetric and non-diversifiable risks between consumers and suppliers may result in a more optimal outcome for all parties involved.[99] In economic terms, the improved social outcome

[97] Consumers would not individually manage these risks. ISO-NE is effectively the agent for consumers as a whole.

[98] For example, Force Majeure clauses in commercial arrangements are a common form of this risk allocation/sharing. Best practices in utility regulation also support the sharing of risks between consumers and suppliers.

[99] The mutualization of risk can improve welfare. *See:* Pirrong, Craig. *The Economics of Central Clearing: Theory and Practice.* May 2011.

from a shared allocation of risks is another example of Pareto improvement against the alternative (provided it does no harm to consumers).[100]

Q. Please explain how consumers' (or their agent, ISO-NE) are better able to manage these asymmetric and non-diversifiable risks.

A. Theory of risk management predicts that exposure to risk can be reduced by aggregating the risks and then spreading exposure across many parties (also known as "risk mutualization"). It has long been recognized that utilities bear many asymmetric risks (i.e., the risk of a substantial loss without an offsetting possibility of substantial gain). An example would be political risk, which tends to be asymmetric because of the higher propensity for political intervention in response to high prices to override market outcomes and claw back economic profits (for some sellers). In order to compensate for political risk, where it exists, it has been acknowledged that the "rate of return allowed by regulators must be in excess of the cost of capital in the presence of asymmetrical regulatory risk."[101] In other words, utilities apply an adder to cost of capital measures based on market benchmarks to compensate for the political risks they bear that are not otherwise systematic to the market. In a traditionally regulated utility setting, these adders ultimately flow through to rates that consumers pay for service.

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[100] A Pareto optimal or Pareto efficient outcome is one in which no one can be made better off without someone being made worse off. *See:* Bishop, Matthew. *Economics: An A-Z Guide*. The Economist in association with Profile Books Ltd. 2009. P101, 238

[101] Kobe, A. Lawrence and Tye, William B. "The Fair Allowed Rate of Return with Regulatory Risk." Research in Law and Economics. P129. 1992. *See also:* William J. Baumol, Paul L. Joskow, and Alfred E. Kahn, "The Challenge for Federal and State Regulators: Transition from Regulation to Efficient Competition in Electric Power," December 9, 1994, filed as Appendix A with the Edison Electric Institute's comments on the FERC 1994 Stranded Cost NOPR. *See also:* Rose, Kenneth, PhD. *An Economic and Legal Perspective on Electric Utility Transition Costs.* The National Regulatory Research Institute NRRI 86-16 July 1996 Pgs. 75-76 <http://www.ipu.msu.edu/library/pdfs/nrri/Rose-Electric-Utility-Transition-Costs-96-15-July-96.pdf>

Another way to think about this is that consumers can be considered as a broad-based mutual insurance society, which may make them better suited than individual generators to bear certain risks associated with real-time market operations. Under the PI Proposal, each and every generator or capacity provider must take on all risks and costs with his performance, even those elements beyond his control – effectively requiring that he "self-insure" his performance. Indeed, if the cumulative penalties from anomalous scarcity conditions force a generator out of business, the value of the "insurance" provided by the generator is meaningless. If, as is proposed in PI, generators take on all risks and cost of capital increases, we may well see a particular type of highly flexible, highly reliable plant favored, but this would be neither an efficient system overall nor likely affordable. Generators may not be able to bear such costs, which could lead to a vicious, repetitive circle of bankruptcies and failures following anomalous scarcity conditions.

Q. Has ISO-NE considered the risk premium of its PI Proposal?

A. Yes, ISO-NE has acknowledged that risk premiums could increase for some resources, resulting in significantly higher FCA clearing prices. Indeed, under the Analysis Group's simulation analysis of the PI, FCA clearing prices range from $1.93/kW-month to as high as $4.49/kW-month, while without the PI, clearing prices are forecasted to be $1.31/kW-month.[102]

[102] Analysis Group Report. p4.

Q. How does the Analysis Group determine the risk factor?

A. As described in its Report, the Analysis Group uses a Value at Risk ("VaR") approach to calculate the risk factor. In this instance, "for each resource, the risk factor equals the increase in a resource's offer needed to ensure, with a 95% probability, that it earns positive expected net revenues across all ISO-NE markets."[103] As a result of its analysis, the Analysis Group assumes that only approximately 1,000 MW of resources would have a positive (i.e., increased) risk factor under PI. However, the Analysis Group only accounted for uncertainty in the scarcity condition hours, not in resource performance. That is, it assumes that resources have certainty about the level of their performance, which removes much of the uncertainty actually associated with the PI Proposal – how can a resource be certain of its performance during any five- minute interval three years in the future, especially when it is liable for its performance under all market conditions and circumstances? Since, as I demonstrated earlier, revenues under the PI are particularly sensitive to performance, failure to consider performance uncertainty likely leads to a significant understatement of the risk premium under PI.

Q. Do you have concerns with the risk factors presented in the Analysis Group Report?

A. I do. First, I am concerned that the Analysis Group significantly understates the risk factors that are likely under the PI. Based on its VaR calculations, the details of which were not provided, the Analysis Group concludes that only about 1,000 MW of capacity out of a total

[103] The Analysis Group Report. p26.

of over 39,000 MW of capacity in New England will have increased risk factors as a result of PI. This estimate of 1,000 MW does not reconcile with the performance data they presented that showed that the majority of fleet has experienced historical performance that would result in penalties (that is, expected performance levels are lower than the Balancing Ratio). Furthermore, the Analysis Group reported that the capacity clearing prices show no sensitivity to risk factors.[104] This observation also raises concerns, because in practice, I would expect higher risk factors to translate to higher clearing prices.

Q. How could generators avoid risks under the PI?

A. The only way to avoid the risk of penalties is to delist in the FCA. However, then a generator will likely not have adequate certainty that it can cover its going forward fixed costs. The Analysis Group Report, on the other hand, concludes that there are generators who will stay in the energy market even without a CSO because, based on performance expectations, they expect to capture sufficient revenues through their energy market revenues and future performance payment(s) to cover fixed costs. In my opinion, the logic underpinning this assumption is flawed, as I will discuss in more detail when I evaluate the commercial reasonableness and practicality of each Proposal.

Q. In the Analysis Group report, new entrants are projected to actually offer capacity at a lower cost with PI. How does that occur given the higher risk of performance with PI?

A. The Analysis Group estimated offers of new entrants by considering how expected performance relates to the Balancing Ratio. In particular, the Analysis Group examined a

[104] "Elimination of the risk factor results in no change in outcomes for the Equilibrium: No Gas Scenario." *See:* Analysis Group Report. p45.

group of CCGTs and CT generation facilities that were recently developed in ISO-NE. Based on historical performance during scarcity conditions, the expected performance of these resources was better than the Balancing Ratio, leading the Analysis Group to conclude that these resources would reduce their FCA offers because of the expectation that the PI would garner them performance payments. In the new entry offer calculations, the Analysis Group did not consider uncertainty in performance levels. Nor did they consider how the uncertainty and relative risks of the PI Proposal would impact investment decision-making and the cost of financing. As a result, the risk factors calculated by the Analysis Group likely understate the actual risk premiums new entry would have, especially when one considers how this uncertainty will impact new entry's ability to secure financing, which I will discuss in detail in the following section on practicality and commercial reasonableness.

Q. Does the ISO-NE PI Proposal affect other costs of doing business in the New England power market?

A. Yes. The ISO-NE PI Proposal includes increases to financial assurances to provide "collateral" to avoid default on the performance payments (penalties).[105] Although all resources participating in the capacity market will need to post this, it will ultimately be paid for by consumers as these incremental costs of doing business will be reflected in the capacity clearing prices.

[105] ISO-NE Transmittal Letter. P66.

Q. Is NEPOOL's Proposal cost-effective?

A. There is no cost-benefit analysis of the NEPOOL Proposal. However, from a qualitative perspective, the NEPOOL Proposal does not dramatically change risks, so I would not expect a significant change to FCA clearing prices or material increase in the costs to consumers.

NEPOOL's Proposal would, however, increase prices in certain periods in the real time markets. As I discussed previously, the increase in market prices is likely to be modest overall and therefore not a significant cost burden on consumers. Moreover, the benefits associated with improved real-time energy market performance, such as reduced reserve shortfalls, are also more likely. That is, we can expect more resources to make themselves available in pursuit of higher RCPFs, which would then lead to more efficient and lower cost real-time energy market outcomes.

Q. ISO-NE has raised the concern that NEPOOL's Proposal may expose consumers to price volatility. Do you have a response?

A. In its report, the Analysis Group concluded that "in aggregate, the "NRG Alternative" results in greater volatility in payments by load and to suppliers."[106] However, the Analysis Group studied a formulation of the NEPOOL Proposal (i.e., the original NRG Alternative) that is now outdated. Moreover, the Analysis Group did not dynamically model energy market outcomes, which would be needed to properly determine an estimate of the cost impact of NEPOOL's Proposal. Modeling energy market outcomes is particularly critical when

[106] Note that the NRG Alternative served as the foundation for NEPOOL's Proposal. The Analysis Group Report. p50.

assessing the NEPOOL Proposal, which makes important changes in the real-time scarcity premium in order to influence real-time performance. Furthermore, it is important to note that efficient outcomes in the market should also involve consumption decisions. Increasing the RCPF improves real-time price signals for demand-side resources, which have the ability to participate in some of ISO-NE's real time markets and directly impact scarcity conditions.[107] That is, if real-time energy prices are allowed to rise to reflect actual marginal costs of consumption during scarcity, it may be economic for demand-side resources that otherwise may not have participated in the market to participate and provide reserves and relief from scarcity. Under ISO-NE's PI Proposal, however, there is no market signal to motivate demand-side resources, other than those that are qualified to provide capacity, to commercialize on the opportunity. As a result, ISO-NE's PI Proposal may not take full advantage of involving demand-side resources.

Q. ISO-NE has previously asserted that NEPOOL's Proposal may actually increase the volatility of revenues to generators, which could undermine financeability and therefore reduce the effectiveness of the NEPOOL Proposal in motivating new investment. Do you agree?

A. No, I do not agree. Under NEPOOL's Proposal, capacity revenues are expected to be relatively stable and, importantly, are well within the generator's control for purposes of performance monitoring given the proposed EFORp metric and reasonable waivers. The

[107] Demand-side resources will be fully integrated into ISO-NE's energy markets by 2017. They currently participate in ISO-NE markets under an interim set of compensation rules. *See:* FERC Docket No. ER12-1627-000. *Order on Proposed Tariff Revisions.* January 14, 2013.

capacity revenues, given their forward looking nature, serve as a foundation for financing and investment planning. Although NEPOOL's Proposal may lead to more volatility in energy revenues, that component can be managed by equity investors. The ISO-NE PI Proposal, on the other hand, undermines financeability by increasing volatility and uncertainty in capacity revenues. Despite a probably higher base capacity payment, generators would have to hold back those base capacity revenues, as I mentioned earlier, to self-insure or hedge against potential performance penalties.

Practicality

Q. Please describe the importance of the fourth metric – practicality.

A. There are two elements to this metric – practical simplicity from an implementation perspective and also commercial reasonableness.[108] On the first element, there may be many ways to achieve the same goal, but we should strive to do it in the simplest fashion, as complexity tends to create unintended, adverse consequences. The second element is perhaps even more important. Both ISO-NE and NEPOOL are proposing rules changes to a commercial market, and there are adverse consequences from not being reasonable in a commercial setting.

Q. Is the ISO-NE PI Proposal practical?

A. It is important to keep in mind that the FCM is already complex (with over 200 pages of associated market rules) – ISO-NE's PI Proposal would increase the complexity of the market

[108] "Reasonableness" is defined as being "appropriate or fair; based on good sense; not too expensive." By commercial reasonableness I consider what terms two parties would consider appropriate or fair when agreeing to them. *See:* Oxford English Dictionary.

rules both in terms of administration and in terms of generator behavior around those rules. Although testimony submitted on behalf of ISO-NE states that removing exemptions "is a critical feature in simplifying and improving the market,"[109] it is making the operational decisions of generators and even investors looking to make an investment decision in the ISO-NE power market more complicated. There are also several practical concerns with the ISO-NE's Proposal from a conceptual perspective. The ISO-NE PI Proposal is a significant change – in effect, a market redesign – that is untested and has not been piloted (or even comprehensively analyzed). With no experience to rely on, and no practical way to test the design on a small scale, there is a risk of unintended, adverse consequences on investment, planning and operations. Indeed, many of the conclusions made by ISO-NE and the Analysis Group regarding performance improvements under PI stem from the extension of their hypothesis and not from any quantitative proof.

Q. What do you mean when you say that ISO-NE's Proposal is "untested"?

A. As I mentioned earlier, no other market in the US measures capacity in the way in which ISO-NE is proposing to – the delivery of energy in discrete five-minute intervals and under any conditions. ISO-NE is proposing a change in the definition of capacity with the goal of modifying how capacity suppliers would behave (in both the FCAs and in the real-time energy market). It is a market redesign, which I am not convinced is appropriate. As I mentioned in Section IV, many other markets in the US face similar operational challenges

[109] Testimony of Peter Crampton. P7.

(gas dependence, aging fleet), but no other ISO/RTO is proposing a capacity market redesign of the magnitude that ISO-NE is proposing in the PI plan.

Q. Please describe how such a large change could impact market activity.

A. Large market changes (including redesigns efforts) that create new risks or re-allocate risks can "chill" the motivation for investment as developers and investors struggle to understand the new risk exposure. In the presence of significant uncertainty, such as the impact of untested market design changes, investors will wait to invest until the uncertainty is largely reduced and the risk to future cash flows is priced accurately. Furthermore, as a novel, untested approach with no safeguards, ISO-NE's Proposal may be naturally more "prone to error" – there are no experiences or lessons learned from other markets that can be leveraged to mitigate unintended consequences. Indeed, the Commission has already expressed concerns that "overly onerous performance obligations may chill interest in new resources participating in the capacity market, if a capacity resource perceives that the risk of non-performance outweighs the benefit of participation in the capacity market."[110]

Q. Please provide an example of how the Proposal may actually increase risk in ISO's planning environment.

A. Let's suppose the ISO-NE PI Proposal works as planned in terms of retirement, and that when faced with the PI design, a number of generation resources decide to delist from the capacity market. The Analysis Group suggests that some delisted resources may actually continue to operate – in the hopes of earning some profits from energy market and a positive performance

[110] FERC Staff. *Centralized Capacity Market Design Elements.* August 23, 2013. P22.

payment if they happen to be producing energy during a scarcity condition. This is a highly unlikely outcome, as most generators in such a situation would view such revenue potential with a high level of uncertainty. Moreover, lenders would be reticent to extend credit to cover ongoing fixed costs for such generators. A rational decision in the face of such uncertainty would be to mothball the plant. Therefore, the likelihood of an oversupply under the PI is low.

Moreover, retirements are not always a positive development for system planning. Based on ISO-NE's own analysis, absent new resources, less than 1,000 MW of resources can retire across the New England system without causing reliability problems.[111] Indeed, ISO-NE has rejected delist bids in the recent past for reliability reasons.[112]

Q. But wouldn't new investment come in to replace the retiring units?

A. In theory, delists and retirements should raise the FCA clearing prices and signal the need for new investment. And that is the logic that ISO-NE relies on in drawing its conclusions. But practically speaking, it may be too late to start a development project today to qualify for FCA 9, as the initial qualification deadline for new capacity in FCA 9 is March 4, 2014 and the requirements are not immaterial.[113] Currently, ISO-NE has just under 5,000 MW of nameplate

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[111] ISO New England's Strategic Transmission Analysis. P.14 http://www.iso-ne.com/pubs/pubcomm/pres_spchs/2013/final_rourke_raab_06141.pdf

[112] Most recently, ISO-NE offered Brayton Point, a 1,535 MW coal-fired plant, a cost plus arrangement under its FERC-approved tariff in order to retain the plant online, as its request for retirement would have adverse impacts on reliability. The owners of Brayton Point turned down the offer from ISO-NE, leaving ISO-NE to address the reliability concern in some other fashion. Source: SNL Financial. "Mass. coal plant to retire despite reliability concerns." January 27, 2014. http://www.snl.com/interactivex/article.aspx?id=26654942&KPLT=6

[113] For a new resource to qualify in a capacity action, it would first need to submit a show-of-interest application to ISO-NE, which includes information indicating the resource's ability to operate at a specific MW during the Capacity Commitment Period, expected commercial operation date, description of the proposed project. In addition, applicants ISO-NE requires that applicants demonstrate site ownership, and submit a Critical Path

capacity in its interconnection queue[114] – 40% of which comprises wind and solar resources (and certain proposed projects have not been able to qualify as new capacity resources to date for lack of transmission and "deliverability").[115] In addition, as of today, there is limited firm pipeline capacity available for purchase (and there are no new gas pipeline projects under construction in the region).[116] This means that even if a new gas-fired plant were able to get financing and be constructed, the underlying operational challenges resulting from gas pipeline capacity constraints during cold snaps and fuel supply uncertainties would remain.

Furthermore, investors require stable, long-term revenue streams for financing of commercial-scale generation. The ISO-NE presumes that new investment will step in when needed, but fails to acknowledge that the riskiness of the PI Proposal may in fact delay such new investment, as developers and lenders reconsider the risks of the capacity market

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Schedule that sets out a timetable for achieving critical milestones, including expected financial close, major permits, equipment purchases, and testing. ISO-NE will confirm and evaluate this information for project feasibility. There are also costs to submitting an application; a project sponsor must reimburse ISO-NE for the costs incurred by ISO-NE and its consultants associated with the qualification process and the critical path schedule monitoring. So project sponsors would not typically submit a show-of-interest application that was not well prepared and aimed at achieving ISO-NE qualification. ISO-NE. *Master Forward Capacity Auction #9 Schedule.* http://www.iso-ne.com/markets/othrmkts_data/fcm/auction_cal/2018-2019-master-forward-capacity-auction-9.pdf

[114] ISO-NE Interconnection Queue. January 2014.

[115] For example, in 2012, the Meriden Facility, a 510 MW combined cycle plant, was not able to qualify for FCA 6 as it failed ISO-NE's Overlapping Impact test (performed as part of the FCA Qualification process). *See:* FERC Docket No. ER12-757-000. *Order Accepting Informational Filing.* March 15, 2012. http://www.iso-ne.com/regulatory/ferc/orders/2012/mar/er12-757_3-15-12_order_accept_6th_fca_info.pdf More recently, CPV Towantic, a 699 MW CCGT, and the 195 MW Exelon Everett Peaker failed to qualify for FCA 8 as both failed the Overlapping Impact test. *See:* ISO-NE. *Informational Filing for Qualification in the Forward Capacity Market.* November 5, 2013. http://www.iso-ne.com/regulatory/ferc/filings/2013/nov/er14-329-000_11-5-13_fca8_info_filing_public.pdf

[116] According to data published by the EIA, there are currently two pipeline projects announced for the Northeast region. However, neither of these projects has filed its siting application with FERC. *See:* Energy Information Administration. "US natural gas pipeline projects." January 16, 2014. http://www.eia.gov/naturalgas/data.cfm

revenues under the new PI structure. Although there is some possibility of additional capacity revenues with the performance payment under PI, there is also the undeniable additional risk of penalties – even for newer generation. And the existence of this risk may undermine the ability of new entry to secure financing, or at the minimum raise those costs of financing.

Q. Please explain how PI Proposal would make financing more difficult for new investment?

A. When evaluating any credit application and specifically a project financing request, lenders will consider the level and certainty of future cash flows generated by the project. Contract revenues with credit-worthy counterparties are more valuable than spot market revenues. Therefore, lenders would put more emphasis on the revenues secured in the FCAs from ISO-NE. Because ISO-NE's PI Proposal demands that generators perform at any time, under any condition (with no waivers or exceptions), and under a performance payment structure that allows for potentially significant losses (which can exceed the base capacity revenues awarded in the FCA), I would expect that the credit value that has typically been provided by capacity revenues for financing purposes is eroded. Capacity revenues under the current FCM were known in advance of operations given the timing of the FCAs and new entrants - under certain conditions – were able to lock-in the favorable "first year" prices for a few years. The modifications proposed by ISO-NE introduce significant uncertainty on the capacity revenues that a resource can earn. Therefore, the ISO-NE PI Proposal would make financing more difficult to secure, and more costly if it is secured.

As an illustrative example, I considered how the performance payment would impact the capacity revenues of a generic 500 MW CCGT plant over the first three years of its operation under the ISO-NE PI Proposal. In this simple example, I assumed that this new

CCGT would face scarcity conditions each year corresponding to the scarcity conditions observed in ISO-NE during 2010-2012 and its performance would mimic the average performance of the general CCGT technology class (i.e., in Year 1 the same scarcity conditions occur as observed in 2010, and so on). In my calculations, I assumed that this new entrant would clear the FCA and therefore I assumed a capacity price of $8/kW-month. I began with a calculation of the capacity revenue based on the base capacity payment only. I then calculated how much interest expense coverage (i.e., the project's ability to pay interest on its loans) the base capacity revenues provide. To determine the impact of the performance payments, I then calculated the impact the performance payment has on total capacity revenues, and how much interest expense coverage the total capacity revenues (with performance payments and penalties) would provide annually.

As shown in Figure 18 on the following page, once I took into account the expected penalties under ISO-NE's PI, the interest coverage provided for with capacity revenues declines. This is an illustrative analysis – lenders may be even more risk-averse in the real world and may require project sponsors for a new CCGT to test more downside cases with a higher incidence of scarcity conditions.

The interest coverage ratio is important to lenders, as it provides a measurement of a project's financial stability. Lenders view the interest coverage ratio as an important indicator of financeability. A higher coverage ratio implies that project can cover a larger portion of its debt obligations. Lenders stress test this metric with varying conditions in the market and market revenues to also understand the robustness of the projects' repayment capability. A higher coverage ratio implies a safer opportunity for lenders. Moreover, a safer opportunity would garner a higher credit rating (suggesting bankruptcy is more remote), which will mean

that lenders will be satisfied with a lower debt premium to undertake the financing. In this way, the interest coverage ratio will impact the terms of financing lenders will offer.

Figure 18. Illustrative Capacity Revenues of a generic new CCGT under ISO-NE's PI Proposal

[$000]			Year 1	Year 2	Year 3
A		Capacity Base Payment	48,000	48,000	48,000
B		Performance Payment	(1,675)	(1,470)	(248)
C	A+B	Total Capacity Revenue*	46,325	46,530	47,752
D		Debt Interest**	(16,620)	(16,620)	(16,620)
E	A/D	**Interest Coverage Provided by Base Capacity Revenue**	2.89	2.89	2.89
F	C/D	**Interest Coverage Provided by Total Capacity Revenue (Base + Performance)**	2.79	2.80	2.87

*Capacity revenue analysis assumes a capacity clearing price of $8/kW-month. Historical balancing ratios and performance are taken directly from the Analysis Group Report (p59). Analysis uses winter balancing ratios and performance for winter months (December, January); summer balancing ratios and performance for summer months (June, July, August); and average balancing ratios and performance for all other months.

**Debt interest analysis assumes a capital cost of $1,108 and 50% leverage, in line with assumptions use by ISO-NE in its Offer Review Trigger Price Calculation. I assumed a borrowing rate of 6% and a 20-year loan.

Capital markets data shows a strong relationship between interest coverage ratios and yields (as the coverage ratio decreases, there is a corresponding increase in the cost of debt).[117] Given the observed relationship, volatility in capacity revenues (which impact a project's coverage ratio) will likely lead to an increase in the cost of debt. In addition to increasing the cost of debt, the expected return on equity may also increase to under ISO-NE's PI Proposal, in order to incorporate a higher risk premium for equity investors.

Increases in the cost of debt and cost of equity have a material impact on the overall levelized cost of new entry ("CONE"), which will ultimately be reflected in capacity prices. I

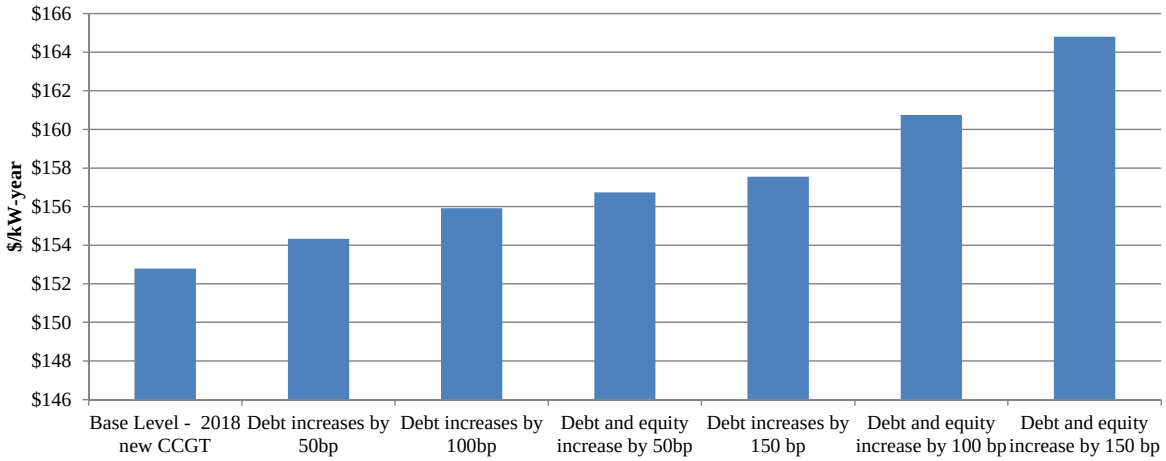
[117] Data compiled to relate the interest coverage ratio of non-financial service firms to their credit rating and the default spread that goes with that rating shows high correlation between the interest coverage ratio and the default spread. *See:* Damodaran, Aswath. "Ratings, Interest Coverage Ratios and Default Spread." January 2014. http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ratings.htm

have provided an illustrative example of how risk premiums that raise the cost of debt and cost of equity could potentially impact CONE for a generic new CCGT (Figure 19). For illustration, I assumed that the increased volatility in capacity revenues would lead to a potential increase in the cost of debt and equity in a range of 50 to 150 basis points ("bp"). As shown in Figure 19, these increases to the cost of debt and equity results in an increase in the all-in fixed cost of a new CCGT, which could increase by as much as 8% from $153/kW-year to $165/kW-year.

The increases to all-in fixed costs from higher cost of debt and cost of equity could lead to increases of up to $12/kW-year in all-in fixed costs. A new entrant would seek to recover such higher financing costs through its offer in the FCA. Keeping in mind that capacity prices are effectively paid for by consumers, this could represent over $400 million in increased annual costs of capacity to consumers.[118] Importantly, these increased costs only reflect increased financing costs, and do not consider any additional risk premiums.

[118] Assuming an ICR of 34,923 MW based on the ICR values published for FCA 8, and the change in the capacity offer of $12/kW-year, that would be equal to $12/kW-year multiplied by 34,923,000 kW, or $419 million.

Figure 19. Illustrative Example of the Impact of Changes to Debt and Equity Costs on the Cost of New Entry



Source: Assumptions are taken from ISO-NE's Offer Review Trigger Price Calculation, as available. These include capital costs ($1,108/kW), leverage (50%), construction time (36 months), nominal variable O&M ($2.34/MWh); and nominal fixed O&M ($27.96/kW-year). I assumed debt financing and equity recovery terms of 20 years. In addition, a tax rate of 40% is assumed. The base case assumes a 6% debt interest rate and an after-tax equity return of 13.5%.

In summary, ISO-NE's PI Proposal increases the uncertainty of capacity revenues over the longer term. For a conventional CCGT, those capacity revenues can contribute significantly to total revenue – between 40% to 60%, depending on market conditions. Capacity revenues to date have been relatively predictable and stable (once the FCA results were known) under the current FCM design and will remain generally stable under NEPOOL's Proposal. In contrast, ISO-NE's PI Proposal would create significant uncertainty, which would likely increase the premium both lenders and equity investors would expect over the tenure of their offering. Changes to the cost of debt and equity can have a material impact on the CONE. Even if new entrants can earn performance payments in some years, in the upfront investment decision, such opportunities will be highly discounted until there is sufficient operating history to predict such outcomes; therefore, at least in the near future,

lenders and equity investors will focus on the downside risk of penalties. So it is likely that under the PI Proposal the costs of new entry would increase.

Q. What about the practicality of ISO-NE's PI Proposal for real-time operations?

A. As I mentioned earlier, PI may lead to a significant amount of retirements that are not replaced by new investment. In terms of real-time operations, the Analysis Group concludes that PI would improve real-time operations because it will increase the amount of surplus capacity in the market or because the higher capacity price (base capacity revenue) would provide the financial means for incremental capital investment and O&M spending to improve performance. Analysis Group is wrong on both counts. I have already discussed the latter issue. On the former issue, I have also touched upon the flaws in the hypothesis, but it is worth re-emphasizing.

As I discussed earlier, the surplus capacity scenario is based on a very unlikely assumption that a resource that has not cleared the FCA would risk staying operational for the sake of garnering a performance payment. A rational generator would stay operating without a CSO only if its expected energy market profit margins are significantly large enough to cover fixed operating costs. ISO-NE's proposed increase to the dynamic delist bid threshold indicates that older units will indeed require some level of capacity payments to cover fixed costs.[119]

[119] The delist threshold reflects the competitive bid (taking into consideration the impact of expected performance payments) of the marginal unit, which ISO-NE has assumed will be a fossil-fired steam unit. Under PI, ISO-NE proposes to increase the delist threshold nearly fourfold, from $1/kW-month to $3.94/kW-month.

However, if that was the case, then that resource would not have left the capacity market in the first place, as it would have been very competitive in the FCA and essentially "infra-marginal". The ISO-NE assumption regarding generators' going forward operating or retirement decisions are not in line with the practical realities. The capacity market serves as the litmus test for retirement decisions. The rational behavior of a generator that does not clear the capacity market would be to mothball or retire, rather than run the risk of financial losses when energy profits are insufficient to cover fixed operating costs.

Q. You mentioned in Section III of your testimony that New York has an availability-based capacity market design. Are there potential for negative consequences with respect to new investment and different capacity market designs, specifically as ISO-NE's capacity product is more risky?

A. Yes, this is a very important issue. Relative market design consistency between neighboring markets can either support or prevent efficient outcomes. Capacity suppliers will naturally gravitate to market designs that offer them the highest risk-adjusted returns. Market designs that are consistent between neighboring markets can reinforce the trading of capacity that supports long-run efficiency. However, when market designs are systematically different and create varying opportunities, I would expect the trading of capacity and energy to take advantage of the differences, which could undermine longer term goals of resource adequacy.

I am concerned that ISO-NE's novel capacity product definition will back-fire and lead to the export of capacity (and energy) to other markets. For example, let us assume that new generation is built in southern New England as there is no distinct locational advantage to siting in eastern New York or southern New England. However, under implementation of the PI Proposal, ISO-NE's capacity market design could be viewed by some investors as more

risky than the current capacity market design in New York. And, subject to supply-demand dynamics and the market price opportunities in New York's capacity (and energy) markets, it may be feasible and advantageous for the new generator to choose to sell its capacity into the New York capacity market. In order to fulfill its obligations of capacity supply in that other market, this exporting capacity resource needs to offer its energy into NYISO's energy markets and therefore ISO-NE system operators will not be able to rely on the energy production from this new generator. Although this is a hypothetical example, the logical pathway is consistent with actual dynamics we have seen in capacity market for example in respect of capacity imports into the PJM market.[120]

Q. Is the NEPOOL Proposal commercially reasonable and practical?

A. Yes, NEPOOL's Proposal is both commercially reasonable and practical, because it is simple and the modifications are limited (it effectively builds on the current market design). The NEPOOL Proposal makes only incremental changes to the New England capacity and energy markets based on proven, established practices, limiting the downside consequences. First, NEPOOL's proposed changes to the RCPF represent an incremental increase, building on successful changes already implemented by ISO-NE, as I have previously discussed. Second, NEPOOL's Proposal to use an EFORp mechanism and to monitor and incentivize the availability of capacity during pre-set peak demand hours promotes positive performance

[120] The PJM RTO capacity price decreased 57% in the most recent BRA auction, from $136/MW-day in the 2015/16 BRA to $59.37/MW-day in the 2016/2017 auction. The low clearing prices in the 2016/2017 auction were driven largely by an increase in imports (90% increase in imports since the 2015/2016 auction, mostly from capacity sales by resources located in MISO). PJM operators are now increasingly concerned that they cannot rely fully on such levels of capacity imports for resource adequacy. As a result, PJM is considering imposing a limit to the amount of capacity from external resources that can import into the PJM region.

because it allows generators to control their performance. Finally, NEPOOL's Proposal to allow for waivers when the failure to perform is a result of circumstances beyond the generator's control is in line both with economic theory and best practices.

As a result of these factors, NEPOOL's Proposal addresses the operational challenges observed by ISO-NE while maintaining close proximity to the current risk-adjusted value of the capacity product. This should aid in financing new entry as capacity revenues under NEPOOL's Proposal will remain stable, and this stability will allow new entrants to secure financing.

Q. Can you demonstrate that is the NEPOOL Proposal is practical?

A. The NEPOOL Proposal is practical for several reasons. First, the waivers under the NEPOOL Proposal appropriately share asymmetric and non-diversifiable risks (i.e., those risks beyond a generator's control) between generators and consumers. Again, if we liken capacity to insurance, NEPOOL's Proposal provides a good insurance policy that includes triggers – it doesn't try to write an insurance policy that covers any and everything like the ISO-NE Proposal. For example, a property insurance premium will be lower if the buyer of the insurance is willing to bear some risk (i.e., pay a deductible). An insurance policy with no deductible and payments required regardless of fault, like the one ISO-NE is proposing, is very expensive if it can be bought at all. Furthermore, the NEPOOL Proposal is an incremental change, which from a practical standpoint is less likely to result in costly, unintended adverse consequences.

Q. ISO-NE commented that waivers as proposed in NEPOOL's plan for improving the FCM are not consistent with sound market design. Would you have a response?

A. The waivers proposed by NEPOOL are intended to make the market commercially reasonable, and on that basis, waivers are appropriate as part of any market design. Well-written commercial contracts normally include Force Majeure clauses, which acknowledge that some risks are outside of the control of the parties and therefore neither party should bear all the costs associated with such asymmetric risks.

VII. CONCLUDING REMARKS

Q. Based on your analysis, what do you conclude about the ISO-NE and NEPOOL Proposals?

A. After evaluating both Proposals against an objective set of criteria, and against the overarching goal of capacity markets and in light of the operational challenges that ISO-NE is facing**,** I conclude that the NEPOOL Proposal is the better option of the two. It does not require a fundamental change to the capacity market, but instead preserves the current, industry-accepted definition of capacity, which other centralized capacity markets in the US employ. The NEPOOL Proposal does not create new risks that require significant operational changes for generators to handle, making it less likely to lead to the unnecessary adverse consequences of the ISO PI Proposal. Furthermore, the NEPOOL Proposal addresses the operational challenges in the real-time energy market directly. And because of the more modest, incremental approach to changes in the FCM, the NEPOOL Proposal is not likely to create substantial new risks for generators such as to undermine the resource adequacy goals of capacity market institutions. The NEPOOL Proposal has the support of market participants, some of whom are the very investors that one would want entering the FCM with new resources.[121]

The ISO-NE PI Proposal is redefining the capacity product, and is fusing the conventional stand-alone capacity market into the real-time energy and reserve markets. A forward market construct for capacity is a tempting analogy, but the ISO-NE PI Proposal is

[121] In the joint cover letter to this filing, ISO-NE and NEPOOL acknowledge that NEPOOL's stakeholder process resulted in a vote of 80.28% in support of the NEPOOL Proposal.

not such a forward market because it lacks a spot market for capacity. I appreciate there is value to consumers and system operators for implementing a market change that results in better performance, but the ISO-NE has not sufficiently demonstrated that the value proposition of the PI Proposal is guaranteed, or even very probable. The potential market impacts under ISO-NE's PI Proposal include an increase in capacity clearing prices in the FCA, but then the follow-on effects over time are ambiguous and may be detrimental to resource adequacy. The ISO-NE PI Proposal discriminates both between existing and new resources, and between technologies; it is not cost-effective, nor is it practical.

Q. In your opinion, will ISO-NE's Proposal resolve the technical challenges it set out to address?

A. I do not believe it will solve the real-time operational challenges concerning system operators. ISO-NE's PI Proposal does not change anything directly in the real-time energy market or in the reserve markets. Furthermore, I am concerned that ISO-NE's novel definition of capacity will undermine the value the capacity markets provide. Capacity markets will support resource adequacy and new investment only as long as they can be counted on to provide stable, longer-term revenue streams that allow generators to cover fixed costs and costs of investment. Based on our analysis, the new definition of capacity under the PI will result in volatile capacity revenue streams, which will in turn introduce an element of disorder (and risk) in new entry and retirement decision-making – likely spurring retirement in the near-term while failing to provide appropriate price signals to incent new entry – which may ultimately undermine resource adequacy in New England.

Q. Is ISO-NE's Proposal based on "sound market design"?

A. No, it is not. ISO-NE's proposed "two-settlement system" is not a true forward market nor a commercially reasonable call option – the Proposal is missing key elements of all these economic designs. There is no spot market for capacity against which forward contracts can be settled, nor does ISO-NE's Proposal provide a reasonable strike price and other terms for capacity providers under the "call option" concept.

The "no exemptions" policy under the PI Proposal is not based on sound market design. By placing all risk, including asymmetric and non-diversifiable risks, on generators, the Proposal goes against what economic theory and best practices in regulation have shown – that some risks are best shared among larger groups (such as consumers).

Finally, "sound market design" should consider the impacts to all affected parties – including consumers. ISO-NE's Proposal has the potential for significant unintended and adverse consequences that could potentially place an undue cost burden on consumers.

Q. Has ISO-NE demonstrated a positive benefit to consumers from its Proposal?

A. No. ISO-NE's PI Proposal has shown that it will increase costs to consumers but has not demonstrated a corresponding increase in reliability. Given the magnitude of the change ISO-NE is proposing – a novel, untested market redefinition – a full cost-benefit analysis is required to demonstrate any net benefit to consumers.

Q. Can the quantitative analysis provided by ISO-NE be used to demonstrate the efficacy of the PI Proposal?

A. No, it cannot. In brief, the Analysis Group Report does not consider the impact of the PI on performance in the energy market – which is the very metric ISO-NE is trying to improve. The static, single-period analysis completed by the Analysis Group has many shortcomings

that limit the usefulness of the quantitative results. Furthermore, many of the conclusions reached by the Analysis Group are not based directly on the modeling and quantitative analysis, but are loosely informed by extensions of the hypothesis underlying the analysis.

Q. In your opinion, will NEPOOL's Proposal resolve the operational challenges ISO-NE seeks to resolve?

A. NEPOOL's Proposal is well placed to address the operational challenges identified by ISO-NE while maintaining the overall new entry signal and "pay for performance" discipline. NEPOOL's Proposal to evolve performance in the FCM represents a market evolution (compared to the PI, which is in effect a market revolution). Although the improved performance from generators to the EFORp–based performance benchmark may take time, the NEPOOL Proposal would also motivate performance improvements directly in the real-time energy market through an increased scarcity adder, which could be implemented quickly.

Q. Based on your conclusions, what is your recommendation?

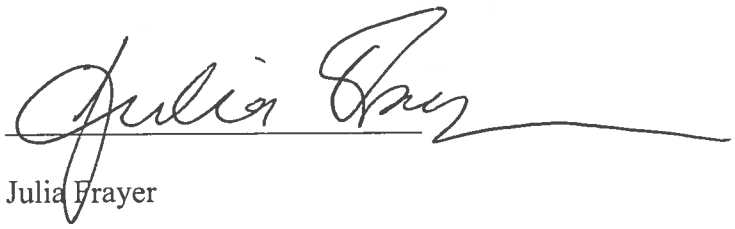
A. I understand that under the terms of the "jump ball" filing, FERC may choose to adopt any or all of either ISO-NE or NEPOOL's Proposal that it finds to be just and reasonable and preferable. With this in mind, I recommend that the Commission accept the NEPOOL Proposal. The NEPOOL Proposal represents an incremental change that addresses directly the real-time performance concerns raised by ISO-NE, while maintaining the important role of capacity markets in providing for an orderly and predictable pathway to retirement and an efficient market signal for new investment. Furthermore, the incremental changes under the NEPOOL Proposal are likely to complement the numerous other changes that have been or are currently being made to ISO-NE markets. It is important to allow appropriate time for the full impact of these recent and on-going changes to be realized.

If the Commission is interested in exploring the ISO-NE PI Proposal, I would then recommend a more comprehensive analysis of the advantages and disadvantages of the ISO-NE PI Proposal, including more detailed simulation modeling, an assessment of alternatives, and a complete cost-benefit analysis.

Q. Does this conclude your testimony?

A. Yes, it does.

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



Julia Frayer

Executed on: February 12, 2014

VIII. APPENDIX A. CURRICULUM VITAE OF JULIA FRAYER

Julia Frayer

Managing Director, London Economics International LLC

KEY QUALIFICATIONS:
Julia Frayer is a Managing Director at London Economics International LLC ("LEI"), with more than 15 years of experience providing expert insights and consulting services in the power and infrastructure industries. Julia specializes in the analysis and evaluation of infrastructure assets; she has worked extensively in the US, Canada, Europe, and Asia in valuing electricity generation and wires assets, water and wastewater networks, as well as gas transportation assets. Julia manages LEI's quantitative, financial and business practice areas, and has built an in-house competency in issues related to market design, competitive market and auction design, capacity market analyses and strategic analysis of investment in wholesale power markets.

Julia manages LEI's quantitative financial and business practice area, and also specializes in market and organizational design issues related to electricity. In addition to electric generation sector market power and anti-trust analysis, sample projects include cost of capital estimation; rate-setting analysis; short- and long-term forecasting of wholesale power prices; valuation of generators and vertically-integrated utilities; assessment of retail market design including provider-of-last resort portfolios and contracts; advice on and design of energy sales agreements; and advisory on structuring request for Proposals and sale processes for energy assets and derivative contracts. As part of these analyses, Julia and her team of economists and consultants have developed and applied proprietary real-options based valuation tools, portfolio risk analytics, models of strategic bidding behavior, and sophisticated power system simulation tools, as well as customized econometric models. Julia also leads many of the firm's regulatory economics projects, spanning such diverse issues as cost-benefit analysis, market power mitigation, tariff ratemaking, auction design (including competitive solicitations for procurement), wholesale market rules design, productivity analysis and efficiency benchmarking.

Prior to joining LEI, Julia was working as an Investment Banker with Merrill Lynch in New York.

EDUCATION:

Institution	Graduate School of Arts & Sciences, Boston University
Degree(s) or Diploma(s) obtained:	MA in Economics

Institution	School of Arts and Sciences, Boston University
Degree(s) or Diploma(s) obtained:	BA in Economics and International Affairs

EMPLOYMENT RECORD:

Date:	February 1998-Present
Location:	Boston, MA
Company:	London Economics International

MOST RECENT PROJECT EXPERIENCE

Date:	2013
Location:	Northeast USA
Company:	Private investor
Description:	Julia worked with private equity investor on an M&A due diligence review of a combined heat and power generation unit in New England. LEI provided market analysis, price forecasting services, and supported the investor in its valuation of the asset. For the same firm, Julia then reviewed due diligence materials for the client's potential acquisition of a portfolio of hydro facilities in Maine.

Date:	2013
Location:	California, USA
Company:	Private Investor
Description:	Julia and led team was retained to assist the client in conducting a due diligence for its potential transmission investment in California.

Date:	2013
Location:	Northeast USA
Company:	Private Investor
Description:	Julia and her team prepared a 10-year energy market price outlook for the New England wholesale power market and forecast the impact of a proposed project on New England market prices. The project proposes to build a 1,000 MW DC-based transmission line that between Quebec and Vermont and import energy into Vermont. LEI modeled the long-term price forecast for Vermont and the rest of ISO-NE over the 2019-2028 period, and examined the price differentials. Two cases were modeled: a Base Case (without the HVDC project), and the Project Case (with the HVDC project). Analysis was done under the assumption that the transmission capacity on the project will accommodate low-cost hydro imports from Quebec. LEI was also engaged to determine the benefits of the proposed transmission project on employment, economic activity, and tax revenues in New England. The final deliverables include a report of the study findings and a summary presentation to the clients.

Date:	2013
Location:	Northeast USA
Company:	Private Investor
Description:	Julia led an LEI team engaged by a utility to prepare 10-year (2014-2023) energy and capacity markets price outlooks for the New England market. This report presents results of a base case and low case long term price forecasts for the New England market using updated market information, as well as underlying assumptions, methodology, and a brief overview of the market along with a review of relevant regulatory considerations.

Date:	2013
Location:	Ontario, Canada
Company:	Enbridge

Description:	Julia led an the LEI team in a review and analysis of rate making approaches applied to Enbridge's capital expenditure profile including demonstration of the negative potential impact of "I-X" rate making approaches on a utility's ability to earn a fair return. The objective of this engagement will be to demonstrate to stakeholders and the Ontario Energy Board the reasonableness of the revenue cap per customer model that Enbridge has previously relied upon and is currently planning to propose in its next ratemaking review in March 2013. Furthermore, the secondary objective is to conceptualize the insufficiency of the "I-X" regime, even with a revenue cap per customer model, in consideration of the fair return standard and given Enbridge's business is operating in an environment where substantial capital expenditure needs are projected over the next Incentive Regulation Plan ("IRP") period.

Date:	2013
Location:	USA
Company:	CREIPI
Description:	LEI was engaged by a Japanese research institute to research the environment for investment and financing of new generation in the US competitive electricity markets as well as the types of approaches used to manage investment risk. The LEI team researched the impact of market restructuring in the US on generation investment, methods for financing new generation, and analyzed policies promoting generation investment. LEI also performed four case studies on projects that were successfully financed and built in recent years, including assets in California (CAISO), Maryland (PJM), New York (NYISO) and Texas (ERCOT).

Date:	2013
Location:	New York, USA
Company:	NRG
Description:	Julia led the LEI which was engaged by NRG to provide an independent review of the economic analysis in two reports: "Report and recommendations comparing repowering of Dunkirk Power LLC and transmission system reinforcements", published by National Grid ("NG") on May 17, 2013, and "NRG Dunkirk Repowering Project Economic Impact Analysis", published by Longwood Energy Group LLC ("LEG") on March 20, 2013. Both reports forecasted market benefits, production cost savings and macroeconomic benefits. LEI's review compared methodologies and assumptions used by each report, and how these may have affected their results; LEI's review was subsequently submitted by NRG to Case 12-E-0577 at the New York Public Service Commission (the "Commission").

Date:	2013
Location:	United States
Company:	Entergy, Inc./Public Utility Commission of Texas
Description:	Julia and her team of economists were engaged by Entergy, Inc. to provide independent review and assessment of cost-benefit analysis related to termination of certain PPAs between Entergy Texas Inc. and Entergy Louisiana. LEI's assessment was requested by the Public Utility Commission of Texas, as follow on to previous consultative services that LEI has provided.

Date:	2013
Location:	United States
Company:	Pacific Gas & Electric

Description:	LEI served as Independent Evaluator ("IE") for Pacific Gas & Electric Company ("PG&E") for PG&E Electric Fuels Department's Natural Gas Storage Services Request for Offer ("RFO"). Specifically, LEI worked with PG&E to ensure that Offers were evaluated consistently and appropriately in accordance with the solicitation protocol and in accordance with applicable rules and processes of the California Public Utilities Commission ("CPUC"). The following activities were perform by LEI team: 1. Review and comment on the fairness and appropriateness of PG&E's evaluation methodology. 2. Review and report on whether PG&E fairly administered and implemented its evaluation methodology. 3. Review and report on whether the outreach that PG&E conducted to potential natural gas storage industry participants (Participant) was adequate and whether the solicitation was robust. 4. Identify whether any Participant in the RFO received undue information or failed to receive due information, that advantaged or disadvantaged a Participant unfairly. 5. Provide to PG&E, PG&E's Procurement Review Group ("PRG"), and the Energy Division of the CPUC presentations of the IE's findings. Participate as needed in any PRG and/or supplier meetings or teleconferences concerning this solicitation. 6. Prepare the IE report for inclusion in any Advice Letter filings. 7. Be available to testify as an expert witness in any CPUC proceeding regarding review of potential natural gas supply transactions arising from the RFO; if appropriate, prepare direct and rebuttal testimony, respond to data requests, and perform other activities required to testify as an expert witness.

Date:	2013
Location:	Canada
Company:	Private client
Description:	LEI was engaged to provide an analysis of building block incentive ratemaking approaches used in Australia and the UK, and how they would apply to the client's circumstances in Ontario. LEI's report supported the client's distribution tariff Proposal submission to the Ontario Energy Board for a second-generation Customized Incentive Regulation ("IR") plan for the period of five years (2014-2018). The testimony set out the theory behind as well as the practical experience of using the building blocks approach in incentive regulation regimes. Julia will provide the testimony for this project.

Date:	2013
Location:	United States
Company:	The New Mexico Express
Description:	Julia testified in front of the New Mexico Finance Authority Oversight Committee regarding the potential economic benefits of new investment in transmission in the state of New Mexico; Julia considered the impacts of local spending during construction of the proposed HVDC project on the state economy, using BEA RIMS multipliers to estimate the boost to economic activity. Julia also employed the DOE's JEDI model to estimate the potential for new jobs and GDP growth as a result of new renewables development in state (wind and solar) as a result of the transmission access that would be provided by the HVDC project.

Date:	2013
Location:	United States
Company:	ERCOT
Description:	Julia prepared a study of the Value of Lost Load ("VoLL") in ERCOT and evaluated current utility practices for manual load shedding. LEI's report on VoLL was filed with the PUCT in June 2013 under Docket 40000.

Date:	2013
Location:	United States
Company:	NRG
Description:	LEI was engaged by NRG to provide an independent review of the economic analysis in two reports: "Report and recommendations comparing repowering of Dunkirk Power LLC and transmission system reinforcements", published by National Grid ("NG") on May 17, 2013, and "NRG Dunkirk Repowering Project Economic Impact Analysis", published by Longwood Energy Group LLC ("LEG") on March 20, 2013. Both reports forecasted market benefits, production cost savings and macroeconomic benefits. LEI's review compared methodologies and assumptions used by each report, and how these may have affected their results; LEI's review was subsequently submitted by NRG to Case 12-E-0577 at the New York Public Service Commission (the "Commission").

Date:	2013
Location:	United States
Company:	Brookfield Renewable Energy Marketing
Description:	Julia and her team of economists supported the client in preparation of a merger application to the Federal Energy Regulatory Commission ("FERC") under Section 203 of the Federal Power Act, in conjunction with the client's acquisition of a Maine-based hydroelectric generation portfolio. LEI performed a full Delivered Price test analysis for the ISO New England control area. LEI's analysis was filed with FERC and the Merger Application was approved in February 2013.

Date:	2013
Location:	United States and Canada
Company:	Private client
Description:	London Economics International LLC ("LEI") performed economic advisory in a matter relating to market design strategy for a large incumbent generator in Alberta. LEI performed a case study-oriented comparative review of energy-only and energy and capacity markets in North America and abroad, and take stock of lessons learned from other jurisdictions. LEI's work plan called for the simulation modeling of three forms of market design: an energy-only market, an energy and capacity market akin to Eastern US RTO markets, and a hybrid market with long term contracts and a spot market for capacity. The third phase involved the creation of a customized tool for future analysis, based on the simulation modeling results.

Date:	2013
Location:	United States
Company:	Private client
Description:	LEI was engaged by a Japanese research institute to research the environment for investment and financing of new generation in the US competitive electricity markets as well as the types of approaches used to manage investment risk. The LEI team researched the impact of market restructuring in the US on generation investment, methods for financing new generation, and analyzed policies promoting generation investment. LEI also performed four case studies on projects that were successfully financed and built in recent years, including assets in California (CAISO), Maryland (PJM), New York (NYISO) and Texas (ERCOT).

Date:	2013
Location:	United States
Company:	Duke-American Transmission Company
Description:	Julia was part of a team of economists that performed a macroeconomic analysis to estimate the local economic benefits accruing to taxpayers, residents, and businesses along the 800+mile route during construction of the Zephyr HVDC project, which runs from Wyoming to Colorado, Utah, and Nevada. LEI performed the analysis using the REMI P1+ model.

Date:	2013
Location:	United States
Company:	Private client
Description:	Julia led the preparation of a market study to support financing of a renewable generation portfolio in New England. The market analysis supported a successful multi-million dollar debt raise for the client.

Date:	2013
Location:	United States
Company:	Private client
Description:	LEI was hired to review regulatory and market drivers of energy and capacity prices in PJM, and forecast prospective revenues of a portfolio of pumped storage and conventional hydro generation facilities offered by FirstEnergy, over a 20 year horizon.

Date:	2012-2013
Location:	Alberta, Canada
Company:	FortisAlberta, Inc.
Description:	Julia provided support to FortisAlberta Inc. ("FAI"), a Canadian electricity utility, in its filing for its capital tracker application. LEI also reviewed the submissions of the intervenors and advised FAI on how to address the issues raised by these intervenors.

Date:	2012
Location:	United States
Company:	Morgan Stanley Capital Group
Description:	Julia provided testimony in support of transmission operating rules and curtailment protocols for interties into Alberta, as proposed by the Alberta Electricity System Operator ("AESO"), in order to support a fair, efficient and openly competitive power market. The testimony was made in front of the Alberta Utilities Commission ("AUC"), on behalf of Morgan Stanley Capital Group ("MSCG"), a customer of the Montana-Alberta Transmission Line. Julia's analysis considered commercial as well as operating protocols in deregulated power markets and considers how market rules incentivize new entry and produce dynamic efficiency gains related to more intense competition The AUC issued a favorable decision to MSCG in early 2013.

Date:	2012
Location:	United States
Company:	Public Utility Commission of Texas
Description:	Julia served as testifying witness and lead author in evaluating Entergy's decision to join the Midwest Independent Transmission System Operator ("MISO") Regional Transmission Organization ("RTO") on the behalf of the Public Utility Commission of Texas. LEI is evaluating several existing cost/benefit studies related to Entergy's decision to join MISO over the Southwest Power Pool ("SPP") and will be providing quantitative and qualitative analysis of specific costs/benefits attributable to ETI and its consumers following membership in either MISO or SPP, including but not limited to net trade benefits, transmission cost allocation, governance issues, and continued participation in the Entergy Service Agreement following RTO membership.

Date:	2012-2013
Location:	United States
Company:	Pacific Gas & Electric

Description:	Julia and the LEI team served as the Independent Evaluator for PG&E Request for Offers for natural gas storage which was successfully concluded in January 2013. Julia reported on the RFO process and selection of winning bidder to the Peer Review Group and Energy Division staff at the California Public Utilities Commission ("CPUC").

Date:	2012-2013
Location:	United States/Europe
Company:	Private Client
Description:	Julia and the LEI team prepared a white paper outlining the concept of a Virtual Power Plant product and auction format, as part of a multi-consultant engagement in support of restructuring of the Greek power sector.

Date:	2012 (ongoing)
Location:	Japan/United States
Company:	Private Client
Description:	For a Japanese client, Julia is leading a team to assess market opportunities for industry-scale battery storage technology in the US and selected European jurisdictions for energy arbitrage and ancillary services provision. Under this assignment, LEI modeled the operation regime of a battery operating in energy and ancillary services markets in order to monetize added revenues for a wind and solar generators. Findings and modeling results were analyzed and presented before the client's management team and were then deployed to develop strategy for marketing battery technology to renewable developers and utilities. Another objective of the project was to identify most suitable markets and products to optimize the strategy of the battery's market entry.

Date:	2012 (ongoing)
Location:	United States
Company:	Private company
Description:	Julia led a comprehensive ratepayer-focused cost-benefit study of integrating a remote service territory into a Northeast RTO's footprint. The cost-benefit analysis looked that at the long-run the benefits of joining an RTO versus the costs of new infrastructure that would be needed to accomplish the integration. Julia's analysis will be used with regulators and state policymakers to pursue integration and investment.

Date:	2012
Location:	United States
Company:	Private company
Description:	Julia managed a market study reviewing historical electric rates (and projecting forward electric rates) for large commercial consumers in the New England market. The electric rates analysis was composed of a number of components, such as the commodity costs of electricity, compliance costs for certain state programs (like RPS), delivery charge for delivering electricity, and ancillary services and administrative supply charges. LEI created projection for each of these components and considered state retail sales requirements for renewables, etc.

Date:	2012
Location:	United States
Company:	NRG, Inc.
Description:	Julia led a team of economists to assess the wholesale power market impacts of the merger of NRG, Inc. and GenOn. LEI staff, under Julia's direction and guidance, performed Delivered Price Tests analysis for the Federal Energy Regulatory Commission ("FERC") under Section 203 of the Federal Power Act and submitted extensive analysis to FERC in the summer of 2012. The Merger Application was successfully approved by FERC in December 2012. Subsequently, LEI assisted the client in preparation of the 205 market-based rate authority analysis.

Date:	2012
Location:	United States
Company:	NRG, Inc.
Description:	Julia provided written testimony and oral testimony at the Connecticut Public Utility Regulatory Authority ("PURA") related to the market power consequences of proposed merger of NU-NSTAR.

Date:	2012
Location:	United States
Company:	Maine Public Utility Commission
Description:	Julia led a team of researchers at LEI in the preparation of a written report on the state of renewable portfolio standard ("RPS") requirements in Maine and regionally across New England. Julia also testified at the Maine legislature. The report was commissioned by the Maine Public Utility Commission to fulfill a statutory requirement to provide research on the issue of RPS and its impact on generators and consumers.

Date:	2011-2013 (ongoing)
Location:	Ontario, Canada
Company:	Ontario Power Generation
Description:	LEI was engaged by Ontario Power Generation ("OPG") to support senior management through regulatory processes related to performance-based rates. Julia and her team of experts prepared a discussion paper on incentive regulation mechanisms ("IRM") currently in place in Ontario for electricity and natural gas distribution utilities and presented it at a technical workshop at the Ontario Energy Board ("OEB"). LEI continues to support OPG as it moves to consider its next generation of rates.

Date:	2011-2012
Location:	Alberta, Canada
Company:	TransAlta
Description:	Julia prepared testimony and testified in support of TransAlta in relation to a settlement for contravention of FEOC Regulation related to timing of exports from 2010. The settlement was crafted by the Market Surveillance Administrator and filed with the Alberta Utilities Commission for approval in December 2011. LEI assessed the economic and policy considerations of the settlement and its appropriateness in context of enforcement and sufficiency of penalty payment.

Date:	2011-2012
Location:	United States
Company:	MPUC
Description:	Pursuant to An Act To Reduce Energy Prices for Maine Consumers, P.L 2011, ch.413, sec. 6 (Act) , the Maine Public Utilities Commission ("MPUC" or the "Commission") was directed by the Legislature to study Maine's renewable portfolio requirement established in 35-A M.R.S.A. § 3210 (3-A). London Economics International LLC ("LEI") was engaged by MPUC to conduct an in-depth analysis of the renewable portfolio standards ("RPS") required by the Act which would support the Commission's study and report to the Legislature. Julia led the team in preparation of the report, which was submitted to the Commission in January 2012 and later testified at the state legislature on the key findings of that report.

Date:	2011-2012

Location:	Alberta, Canada
Company:	FortisAlberta, Inc.
Description:	Julia provided expert testimony in support of FortisAlberta Inc. ("FAI"), a Canadian electricity utility, in its filing for a performance-based ratemaking ("PBR") plan with the Alberta Utilities Commission ("AUC"). The testimony provided detailed data analysis (including inflation and TFP trends), underpinning PBR economic theory, and reviews of best practices in various North American and International jurisdictions. The testimony offers back up elements for each of the various components of the PBR plan that is being proposed by FAI. Julia testified at the AUC in Spring of 2012.

Date:	2011
Location:	USA, Canada, the Netherlands, UK, Australia
Company:	Private Company
Description:	Julia managed the writing of a white paper for Canadian electricity regulators and utilities on the comparative advantages and drawbacks of various tariff-setting regimes, from performance-based regimes to cost-of-service. This project involved a general overview of tariff-setting practices across Canadian provinces as well as highly detailed Canadian and international case studies and an examination of the key-lessons to be learned from each case. Detailed case studies covered the tariff-setting regimes in place in the UK, the Australian National Electricity Market and the Netherlands. As part of its deliverables, two workshops were conducted with a variety of regulators and utilities.

Date:	2011
Location:	United States
Company:	Public Service of New Hampshire
Description:	On behalf of Public Service of New Hampshire, Julia testified in front of the new Hampshire Senate Committee on issue of eminent domain generally and more specifically, on the power market context and near term outlook for the New England power market and reasons for the development of a new proposed transmission project known as Northern Pass.

Date:	2011
Location:	United States
Company:	Private Client
Description:	LEI developed simplified HHI screens looking at summer peak period for a client's potential acquisition of a gas-fired facility in New York. Several scenarios were developed to test the impact on HHI.

Date:	2011
Location:	USA
Company:	Private Client
Description:	Triennial market power analysis: in support of a client's application to renew market-based rate authorization under the provision of the Federal Energy Regulatory Commission ("FERC"), LEI performed Pivotal Suppliers Analysis and Market Share Analysis for the Northeast region, including New England, New York, PJM as well as the Connecticut, NYC and PJM East submarkets.

Date:	2011
Location:	Japan
Company:	Private Client

Description:	For a Japanese client, LEI provided a study on electricity sector unbundling in the US. The study starts with an overview of the electricity sector unbundling in the US, including the history of restructuring and unbundling efforts, the categorization of unbundling, and the organizational impact of unbundling. Three case studies were also provided on specific unbundling experiences of TXU Corp., Commonwealth Edison, and Consolidated Edison.

Date:	2011
Location:	United States
Company:	Private Client
Description:	Julia led a modeling analysis, in which the market price impact of incremental wind resources was projected. LEI staff completed a simulation-based forecast of the New England system for a future test year (2015) with varying levels of wind generation. Using the multi-scenario approach, we then estimated the energy market price reductions across a range of incremental wind generation scenarios. The simulation modeling was further supplemented with statistical analysis. The one year analysis was also supplemented with sensitivities employing different baseline assumptions with respect to fuel prices.

Date:	2011
Location:	United States
Company:	Private Client
Description:	LEI performed a fifteen (15) year simulation analysis to estimate the market impacts resulting from a new transmission interconnection (covering the timeframe 2015-2029) and project the impact on Maine consumers (including Northern Maine consumers). LEI evaluated the market evolution with and without the interconnection and described the potential ramifications for purchasing electricity for Northern Maine consumers. The analysis also estimated the potential impact on ratepayers from the re-allocation of the ISO-NE Pool Transmission Facility rate to incorporate the Northern Maine load and franchise area under a pro forma 10-year transitional agreement. LEI performed the modeling using our up-to-date ISO-NE simulation model (which covers the energy and capacity markets), extended to represent in detail the Maritimes control area.

Date:	2011
Location:	United States
Company:	Private Client
Description:	Evaluation of fair market sales value of a coal-fired unit in Arizona, as required by a lease that expires in 2015. Results from LEI's proprietary modeling tool, PoolMod, on market prices and dispatch were used as inputs in the financial model, which used discounted cash flow techniques. Two cases (Base Case and High Case) were created to develop a range of value with a weighted average point estimate. In addition to the discounted cash flow model, the market approach, which looks at comparable transactions, and the cost approach, which looks at the cost of building the same facility were considered.

Date:	2011
Location:	United States
Company:	Private Client
Description:	LEI supported the negotiation of fuel supply and energy sales agreements for a biomass to energy facility. In particular, LEI's analysis focused on the appropriateness and risk associated with price and cost escalation factors. Reviewed similar power purchase agreements and analyzed a suite of available indices.

Date:	2011
Location:	PJM
Company:	Private Client
Description:	Provided valuation services for a waste coal facility located in the Pennsylvania-New Jersey-Maryland ("PJM") regional market. Specific tasks consist of i) due diligence review of documents such as past financial statements, operational statistics report, fuel agreements and power purchase agreements ("PPA"); ii) forecasts energy and capacity prices in the PJM regional market; iii) create a pro forma financial model to evaluate the market value of the plant as of expiration of its PPA; iv) writing a final report documenting assumptions, methodologies used and modeling results.

Date:	2011
Location:	New England
Company:	Private Client
Description:	LEI prepared presentation material on the electricity market impacts and the benefits of Northern Pass Transmission project for New Hampshire and New England consumers. In addition, LEI staff assisted the client in preparation of an op-ed piece for dissemination to New Hampshire press outlets. LEI staff also attended an internal company meeting and testified on behalf of the client. Lastly, LEI staff assisted in the preparation for and attended the live New Hampshire Public Radio program "The Exchange" to discuss the benefits of the Northern Pass Transmission over the hour-long live show.

Date:	2011
Location:	USA
Company:	Private Client
Description:	LEI provided extensive late stage development due diligence for investor in four potential merchant transmission investments. LEI prepared three presentations analyzing four proposed merchant HVDC transmission projects across the US. Analysis included detailing the development roadmap for HVDC projects and the current status of the proposed projects, identifying potential competitive threats from other similar competing transmission lines and proposed local generation, and examining the renewable needs and willingness to pay of utilities in the "sink".

Date:	2010 - 2013 (ongoing)
Location:	United States
Company:	Transmission Developers, Inc. ("TDI")
Description:	Julia led the detailed cost-benefit analysis and macroeconomic impact analysis in support of the Champlain Hudson Power Express ("CHPE") application for siting approval at the New York Department of Public Service ("DPS"). LEI's analysis on economic effects was the cornerstone of the settlement agreement reached between TDI and a number of New York agencies. Julia acted as independent expert on behalf of TDI and prepared updated study results on energy market impacts, capacity market impacts and also macroeconomic benefits stemming from the operation of the CHPE project. Julia's testimony was used in the DPS proceeding in the summer of 2012. Julia continues to support TDI on various market and regulatory issues in 2013.

Date:	2010 – 2013 (ongoing)
Location:	United States
Company:	Tres Amigas

Description:	Julia and her team assisted Tres Amigas LLC, a start-up company on the revenue forecasting and modeling for the second stage financing. The start-up company aims to develop, own and operate a unique three-way AC/DC transmission facility located in New Mexico. In 2010, for the feasibility analysis stage, LEI provided extensive transmission evaluation, financial modeling, price forecasting, and market analysis for the markets, including the Arizona/New Mexico/Southern Nevada sub region of the Western Electricity Coordinating Council, the Electric Reliability Council of Texas, and the Southwest Power Pool. LEI's analysis support over $15 million of development stage funding. LEI continues to serve as economic advisor to Tres Amigas, as it seeks debt and equity financing to support construction of Phase I.

Date:	2010 – 2011
Location:	United States
Company:	Maine Public Utilities Commission
Description:	LEI advised Maine Public Utilities Commission on methodologies for transmission cost allocation by comparing and contrasting alternative planning approaches and pricing models employed within the US and one international jurisdiction, the United Kingdom. The final report provided a 'strawman' recommendation for an effective cost allocation methodology, which was used by the Maine PUC to guide it in its filings at FERC related to Order 1000 and the preceding NOPR on the same issue.

Date:	2010-2011
Location:	Northeast USA
Company:	Private Client
Description:	Market power analysis as a result of a proposed merger: in support of a client's opposition of a proposed utility merger in the Northeast US, LEI provided a white paper analyzing the impact of the merger on competition. The white paper covers analysis on buyer market power, concerns with utility's returning to rate base generation and vertical market power.

Date:	2010 – 2011
Location:	Massachusetts, United States
Company:	Private Client
Description:	Julia Frayer served as lead expert witness for a private equity investor in matter related to a contractual dispute regarding a long term power purchase agreement between a municipal utility located in New England and a landfill gas generator. Ms. Frayer analyzed key contractual terms of the PPA and provided an expert's review of how those terms compared to the industry norm when the contract was signed and became effective. Ms. Frayer provided an independent estimate of potential contractual damages. The case was scheduled be heard in Massachusetts Superior Court, however, Julia's analysis helped support a successful settlement.

Date:	2010-2011
Location:	United States
Company:	NRG (various acquisitions)
Description:	In support of various acquisitions, Julia prepared expert testimony for filing with FERC, related to Market-based Rate Authorization applications, Triennial Reviews, and Section 203 filings. All applications were successfully accepted by FERC.

Date:	2010
Location:	United States

Company:	Private Clients
Description:	In support of various acquisitions by Brascan and Emera in the Northeast announced in 2004, Julia prepared expert testimony for Market-based Rate Authorization applications, Triennial Reviews, and Section 203 filings.

Date:	2010
Location:	Alberta and Ontario, Canada; UK; Australia
Company:	Private Company
Description:	For a Canadian client, Julia prepared a report that looks into the different capital expenditure recovery mechanisms utilized in four markets namely Australia, New Zealand, Ontario, and the UK for electric network utilities. The report also provided different options that the client can propose for its performance-based ratemaking filing.

Date:	2010
Location:	Greece
Company:	Private Client
Description:	Market design in support of electricity sector restructuring in Greece, specifically consideration of alternatives to physical divestiture of generation assets. On behalf of PPC, the government-owned vertically integrated national utility, LEI examined the following options: virtual power plant ("VPP") auctions, contract for difference ("CFD") and physical energy swaps. In case study format, the various options were compared against the following criteria: instrument objective, contract structure, contract terms, sale platform, settlement structure and the extent of physical control right transfer. Real-world experience from France, UK, Belgium, Denmark, Netherlands, Australia, and Alberta (Canada) helped shape the discussion of comparative advantages and disadvantages, taking into account the unique concerns for Greek policymakers.

Date:	2010
Location:	Louisiana, USA
Company:	City of New Orleans
Position:	Co-Project Manager
Description:	Julia acted as manager for LEI's engagement with the City of New Orleans. LEI was engaged to act as the independent monitor for Entergy New Orleans' solicitation of a Third Party Administrator to implement and deliver conservation and demand management programs on behalf of the utility. LEI provided guidance to Entergy and the City on the development of the request for Proposals, including mandatory requirements and commercial terms. LEI oversaw the bid receipt as well as the review and selection process. A final report was provided outlining LEI's opinion as to the fairness of the overall process.

Date:	2009-2011
Location:	United States
Company:	Private Client
Description:	Julia and her team assisted the client with certain matters pertaining to FERC investigation. Specifically, the scope of this retention includes economic and market analysis in support of a market participant in ISO New England's day ahead load response program ("DALRP"). Julia also provided testimonys and deposed in connection with FERC investigation of behind-the-fence industrial generator and participation in a wholesale power market in New England. Julia helped the client to respond to assertions of market manipulation and estimate market benefit provided through its participation in demand response program.

Date:	2009-2010

Location:	United States
Company:	Maine Public Utilities Commission
Description:	Julia and the LEI team are currently assisting the Commission on the RFP related to the procurement of electricity in response to statutory mandates and state policy preferences. LEI provided economic analyses of bid Proposals by estimating the benefits and costs to the ratepayers, and is currently supporting Commission staff in negotiations with short-listed bidders.

Date:	2009-2010
Location:	United States
Company:	Shell Energy
Description:	Ms. Frayer provided expert testimony before FERC related to Shell Energy's sale of capacity commitments from facilities in New York to New England in an alleged market manipulation case. Ms. Frayer examined market rules, operating procedures, and pricing arrangements in New England and New York at the time of the investigation, and examined the participation of Shell in the capacity markets and compliance offers in the energy markets, commenting on the economic rationale behind the client's must offer strategies in the energy market for capacity compliance.

Date:	2009
Location:	Canada
Company:	Coalition of Large Distributors in Ontario
Description:	Julia recently advised the Coalition of Large Distributors in Ontario on 3rd generation Incentive Regulation Mechanism proceedings of the Ontario Energy Board. The work involves expert testimony filed with the Board with detailed analysis of the theory behind the various components of PBR system, including inflation and efficiency gains factors, treatment of capital expenditures among others. The analysis was supplemented with comparison of actual factors and indices, and determination of the more robust and appropriate indices for the Ontario's distribution industry, including total factor productivity analysis for the sector

Date:	2009
Location:	United States
Company:	Maryland Public Utilities Commission
Description:	Julia submitted testimony on behalf of the Staff of the Maryland Public Service Commission ("MPSC") to the MPSC to conduct a cost-benefit analysis in relation to the proposed transaction between Constellation Energy Group, Inc. ("CEG") and Électricité de France ("EDF") whereby EDF would purchase from CEG a 49.99% interest in Constellation Energy Nuclear Group, LLC ("CENG"). Benefits related to the decreased likelihood of a Baltimore Gas & Electric ("BGE") downgrade, increased likelihood of the Calvert Cliffs expansion being completed and several macroeconomic benefits stipulated to by EDF. Costs related to the limitation on the allocation costs of CEG corporate support services to CENG, increased risk of capital deprivation and reduced quality of service, and implications of CEG's more aggressive nuclear development. (2009; MPSC, Case No. 9173)

Date:	2009
Location:	United States
Company:	Private Client
Description:	LEI advised a major transmission company on financial implications of proposed new 400kV transmission line to New York City and Connecticut. Analyzed impact of new transmission, assuming it delivered 100% carbon-free energy, on electricity prices and emissions levels in New York and New England.

Date:	2009
Location:	United States
Company:	Private Client
Description:	LEI was asked to evaluate third-party energy price forecast for the New England and Texas (ERCOT) regions, with a specific eye on the underlying assumptions. We recommended that certain key assumptions should be updated, including demand projections and CO2 price forecasts. We also argued that some underlying assumptions were unrealistic given actual market conditions, and should be adjusted or eliminated.

Date:	2009
Location:	United States
Company:	Maine Public Utilities Commission
Description:	As the team leader of this project, Julia assisted the Maine Public Utilities Commission in developing an electric resource adequacy plan to aid MPUC in the development of a strategy for the pursuit of the long-term contracts. LEI submitted a report that builds up a set of recommendations for a long-term investment strategy based on an analysis of the current supply-demand situation, a review of the existing wholesale market rules for energy and the Forward Capacity Market, an examination of historical price trends, and review of the investment needs assessments prepared by the utilities and ISO-NE, as well as relevant sub-regional planning studies.

Date:	2009
Location:	United States
Company:	Private Clients
Description:	Julia led a due diligence team and assisting in the exclusivity negotiations with respect to an acquisition of a 400+ MW coal fired plant in the PJM market by a group of private investors. Julia's role included management of LEI's economic appraisal, coordination of preliminary technical due diligence, negotiations with third parties on possible off-take arrangements, and oversight over financial modeling.

Date:	2009
Location:	United States
Company:	NRG
Description:	LEI was engaged by NRG Energy, Inc. to provide testimony in opposition to the proposed acquisition of NRG by Exelon Corp (Exelon). LEI performed a preliminary Herfindahl-Hirschman Index (HHI) test for market power for all regions affected, and a Delivered Price Test (DPT), including a more detailed HHI test, for the PJM East and ComEd regions. In addition, LEI examined Exelon's post-merger optimal bidding strategies using our proprietary model of strategic, known as CUSTOMBid. LEI also assessed the impact of changes in the parent company Exelon's cost of capital on the activities of the company's two regulated subsidiaries: ComEd and PECO. LEI also estimated the impact on customer costs from potential debt downgrades following the merger, and assessed the effectiveness of Exelon's proposed ring-fencing measures.

Date:	2009
Location:	United States
Company:	Private Client

Description:	Using LEI's proprietary simulation model of electricity wholesale markets in ISO New England, LEI forecast future cash flows for a portfolio of electricity generation assets and applied the net present value analysis to evaluate the portfolio's economic value under different potential future market conditions. This analysis supported the investment fund's decision to acquire and hold the generation portfolio's distressed debt

Date:	2009
Location:	United States
Company:	Private Client
Description:	Julia investigated opportunities for portfolio of biomass plants to earn renewable energy revenues from RECs, capacity markets, and carbon offsets given regulations in all states belonging to MISO, PJM, and ISO-NE. Engagement also involved formulating strategies for client to optimize the generation assets' revenue potentials by exploiting the identified renewable energy opportunities.

Date:	2009
Location:	United States
Company:	Private Client
Description:	Julia led a team analyzing potential revenues of pumped storage hydroelectric facilities (energy, capacity, ancillary services) proposed in various locations in ISO-NE and NYISO. The analysis included detailed simulations of the wholesale electricity markets, application of sophisticated statistical tools to estimate the volume and the price level of various ancillary services.

Date:	2009
Location:	United States/Canada
Company:	Private Client
Description:	Julia led a team that assisted a major Canadian renewable power company in its economic valuation of a New England based renewable company, prior to acquisition. Work involved due diligence, analyzing the revenue potential of the potential acquiree's assets over the 2009-18 period across all major ISO-NE product markets, and separately analyzed the market power implications of the acquisition in preparation of a potential FERC application, including analysis of market power issues in ancillary services market

Date:	2009
Location:	United States
Company:	Private Client
Description:	Julia evaluated potential value of assets available under various regional auctions for a dominant IPP player. Julia worked with the client in composing a bid Proposal by assessing market risks posed by various factors, such as fuel price shifts, merchant plant construction scenarios, site conversion potential, and transmission constraints and through extensive production cost modeling

Date:	2009
Location:	United States
Company:	Maryland Public Utilities Commission

Description:	Julia submitted testimony on behalf of the Staff of the Maryland Public Service Commission (MPSC) to the MPSC to conduct a cost-benefit analysis in relation to the proposed transaction between Constellation Energy Group, Inc. ("CEG") and Électricité de France ("EDF") whereby EDF would purchase from CEG a 49.99% interest in Constellation Energy Nuclear Group, LLC (CENG). Benefits related to the decreased likelihood of a Baltimore Gas & Electric (BGE) downgrade, increased likelihood of the Calvert Cliffs expansion being completed and several macroeconomic benefits stipulated to by EDF. Costs related to the limitation on the allocation costs of CEG corporate support services to CENG, increased risk of capital deprivation and reduced quality of service, and implications of CEG's more aggressive nuclear development. (2009; MPSC, Case No. 9173)

Date:	2009
Location:	Canada
Company:	Brookfield Power
Description:	In the matter of Hawk Nest Hydro LLC acquisition of Hawk Nest-Glen Ferris Hydroelectric Project Julia and the LEI team prepared the MBR Authorization for the FERC filing. (Docket No. ER06-1446-000)

Date:	2009
Location:	Canada
Company:	Private Clients
Description:	Julia prepared a market study of the Ontario electricity market for a major potential investor in Ontario's generation assets. This report contains an overview of the Ontario electricity market, including a description of market evolution, a summary of key institutions, regulatory and policy initiatives that have impacted the market landscape, and a long term projection for the market going forward.

Date:	2009
Location:	Canada
Company:	Private Client
Description:	Julia advised a major utility in Canada in its call for tenders strategy for procuring firm capacity over a long term horizon from neighboring jurisdictions. Julia evaluated the opportunity for purchasing capacity from interconnected jurisdictions and devising a procurement that would efficiently overcome seams issues and market design issues that attach different counting and valuation methods for capacity across jurisdictions

Date:	2008-2009
Location:	United States
Company:	Private Client
Description:	In response to NU retaining LEI, New England wholesale electricity markets were simulated in order to determine whether the Greater Springfield Reliability Project ("GSRP") would produce economic benefits to the New England region. In order to ensure that economic benefits were not subject to the forced outage and availability schedule of the simulated energy markets, LEI simulated the energy market with 30 different random forced outage and availability schedules. Using these simulations, a distribution of results was used to calculate confidence intervals and hypothesis tests run on the results, hence increasing the robustness of our findings. The study results were used to produce written testimony to the CSC and oral testimony was provided in late August and early September 2009.

Date:	2008
Location:	United States

Company:	California Energy Commission
Description:	LEI prepared for the California Energy Commission a background report on the design evolution of a capacity market in California and its potential future impact on the generating assets in Mexico that import into the California ISO market.

Date:	2008
Location:	United States
Company:	PacifiCorp
Description:	Julia was part of a consortium that is serving as the Independent Monitor for PacifiCorp's renewable solicitation process for the 2008R-1 solicitation process for additional renewable power supplies. The Independent Monitor will report to the Utah Public Service Commission. This process includes review and assessment of the solicitation process, documents, and modeling methodologies; valuation of the bidder pre-approved process; development of review criteria, monitoring, auditing, and validation of bid evaluation process; bid evaluation; contract negotiation. Final report and testimony has been filed with the Utah PSC [Public Utility Commission of Oregon, Docket No. UM1368]

Date:	2008
Location:	United States
Company:	Brascan Power Generation LLC
Description:	Bear Swamp Power Company LLC (Bear Swamp) has asked Julia to perform a market power analysis in conjunction with Bear Swamp's application for market-based rate authorization. Similar study was done for Carr Street Generating Station L.P. ("Carr Street"), Erie Boulevard Hydropower L.P. ("Erie Boulevard"), and Brascan Power St. Lawrence River LLC ("St. Lawrence River"). Also for Brascan another MBR was filed that year: Brascan Power and Piney and Deep Creek LLC (Docket No. ER05-639-000)

Date:	2008
Location:	United States
Company:	Kentucky Public Service Commission
Description:	To satisfy the requirements of a recently passed statutory mandate, Julia and the LEI team conducted a broad-based analysis of current practices and the potential for reform within Kentucky's electricity industry in four areas: (i) energy efficiency and demand side management; (ii) use of renewables; (iii) full cost accounting; and (iv) tariffs. Reported results to the state's regulatory commission, including a full set of recommendations in each of the four areas for overcoming existing impediments to legislative objectives for improvements in the industry's overall efficiency and reductions in its environmental impact

Date:	2008
Location:	United States
Company:	Private Client
Description:	LEI served as an independent economic expert, opinion on specific matters related to a market participant's participation in the day ahead demand response program implemented by ISO-NE. LEI staff reviewed the specific facts of the case related to how the customer baseline was developed and the offering strategy of the market participant in the demand response program. LEI conducted independent analysis of the decision making process that had been undertaken in support of the customer baseline and offer strategy. LEI also prepared an analysis of the market benefits created for the market as a whole through the demand reductions offered by the market participant (a customized VBA model was created to reconstruct day-ahead ("DAH") and real-time ("RT") energy market clearing prices using public historical hourly offer and bid data). A cost-benefit analysis was conducted to estimate ratepayer impacts based on the reconstructed market outcomes. LEI staff submitted written testimony, as well as oral testimony.

Date:	2008
Location:	Canada
Company:	Private Client
Description:	Julia led a team that provided a comprehensive analysis of the proposed market power mitigation measures for Alberta's electricity market for a major utility. Julia and her team looked at various scenarios and presented the likely outcomes given various generation portfolio configurations under each Proposal and whether these mitigation measures will result in the desired results. Led by Julia, the LEI staff made a case that more rigorous and robust approaches are needed than the proposed measures. Additionally, Julia's team conducted a comparative analysis of the procurement processes and compensation schemes of the different ancillary services products in eight markets, namely: New York, New England, Pennsylvania-New Jersey-Maryland, Texas, UK, Alberta, Australia, and Ontario. The results of this analysis were used to support the client in the Alberta's stakeholder process to redesign a system operator's procurement process

Date:	2008
Location:	Canada
Company:	Ontario Energy Board
Description:	Julia provided comments on the benchmarking methodology suggested by OEB consultants, looking at the analytical aspects of defining and benchmarking the performance of multiple utilities across long period of time. The critique provided details on how each criterion affects the benchmarking study and what are the remedies available to improve the results.

Date:	2008
Location:	Canada
Company:	Ontario Energy Board
Description:	Julia led a team that reviewed industry best practices in other jurisdictions and the current situation in Ontario to advise OEB on the appropriateness of the uniform transmission rate, as well as on the feasibility of moving to long-run zonally-differentiated marginal cost pricing. As part of this process, LEI undertook a comprehensive stakeholder review

Date:	2007-2008
Location:	United States
Company:	Private Clients
Description:	over the course of 2007 and 2008, LEI prepared over a dozen MBR filings for various markets coming under the FERC's triennial schedule as established in Order 697

Date:	2007
Location:	Canada
Company:	Brascan Energy marketing, Inc.
Description:	In the context of a transmission rate case at the Regie (Quebec) and consideration of alternative transmission rate designs, Julia led the economic analysis for the client investigating the impact on trade from increased transmission costs, involving multi-factor regression analysis of nodal electricity prices, price spreads across markets, and interchange flows (imports and exports) across borders. Julia also considered the impact of the elasticity of demand for transmission services between Canadian provinces and US markets in the Northeast for maximizing revenues in rate setting. Julia provided testimony at the Regie.

Date:	2006
Location:	United States
Company:	Confidential

Description:	LEI was engaged by a major US utility to conduct a capacity market modeling exercise to evaluate the potential impacts to the client of different resource adequacy mechanisms. The objective of the study was to identify a market design that would provide the maximum profits at the lowest possible risk, including market and regulatory risk. LEI modeled market prices, market revenues, and gross profits under three supply-demand scenarios and tried to simulate the impact of market intervention policies on such market revenues in order to understand the potential risks and benefits to the client's baseload fleet under different market designs

Date:	2006
Location:	United States
Company:	Oklahoma Municipal Power Authority
Description:	Julia concluded that the mitigation offer, as it was proposed, was inadequate in size and scope due to the potential for strategic behavior and generation market power abuses. She argued that "if competitive harm created by the acquisition was to be reversed, transmission capacity upgrades were need to create sufficient competition to defeat the strategic bidding opportunities that Westar will obtain with its acquisition of the Spring Creek plant." (Docket No. EC06-48-000)

Date:	2006
Location:	United States
Company:	California Independent System Operator
Description:	Julia led LEI's advisory services to the California Independent System Operator, where she and her team devised an innovative approach for evaluating the economics, environmental, and siting costs and benefits of transmission (and generation investment). Building upon the traditional economic framework for cost-benefit analysis, the LEI team devised an approach to quantitative value the expected net benefits from various infrastructure projects, taking into account market uncertainties as well as the classic deregulated market coordination problem of planning for transmission give uncertain generation investment and vice versa. A scoring technique for environmental permitting and siting issues was also developed, in order to quantify the potential impact of the proposed project on the local environment and economy, as well as to measure the impact of such factors on the project timetable and eventual net benefits to society. Real option techniques were also considered in this engagement to assess the potential value of uncertainty and the benefits for delaying various investment strategies. The methodology was also expanded to handle the potential to evaluate numerous competing projects, in recognition of the fact that transmission and generation investments (and other potential investments) could be both complements and substitutes

Date:	2006
Location:	United States
Company:	Connecticut Department of Public Utility Control
Description:	Julia has evaluated measures needed to reduce Federally Mandated Congestion Charges ("FMCC") in Connecticut. Together with the LEI team she also performed an economic evaluation of the New England and Connecticut energy markets using LEI proprietary production cost model, POOLMod. Julia testified at the Connecticut Department of Public Utility Control ("DPUC") regarding the RFP process, RFP documentation, and contract template. Julia also testified on evaluation of project bids in comparison to anticipated market outcome. Julia's analysis supported hundreds of millions of dollars of investments.

Date:	2006
Location:	United States
Company:	Private Client

Description:	For an infrastructure fund, LEI used our propriety production cost simulation model to forecast electricity prices and generation from each plant. In addition, we provided capacity price forecasts for California based on the Resource Adequacy Requirement (RAR) at the system and local level.

Date:	2006
Location:	United States
Company:	Barrick Goldstrike Mines
Description:	Julia has written the report that served as an Addendum to the market power analyses that were filed with FERC in Docket No. ER05-665-001. The objective of this Addendum was to address the items requested by FERC in the deficiency letter issued on June 23, 2005 in this docket

Date:	2006
Location:	United States
Company:	California Energy Commission
Description:	LEI was contracted by CEC to study the capacity products that have been traded in other jurisdictions, and more broadly examine trading platforms that may be useful models for California if a voluntary trading mechanism was implemented to assist market participants in trading capacity to achieve compliance with Resource Adequacy Requirements. Additionally, LEI produced a report to cover the functional requirements for a bulletin board posting and trading platform for bringing buyers and sellers together and allow trading of the various capacity products supported by RAR in California, such as System RA Capacity and Local RA Capacity, and possibly some form of Import RA Capacity. We also covered the functional requirements for a tracking system, including title tracking, certification of transactions, and possibly, compliance filing

Date:	2006
Location:	United States
Company:	California Energy Commission
Description:	LEI advised the California Energy Commission and other stakeholders on the design and development of a web-based software system supporting the trading of an electricity capacity product tracked by state regulators in connection with resource adequacy requirements. LEI analyzed similar systems in other jurisdictions, defined potential core functionalities of the California system – including, for example, posting of bids and offers. The engagement also required LEI to track titles, examine bilateral and/or multi-lateral trades and compliance reporting. LEI conducted a survey of industry participants to identify required and desired system capabilities

Date:	2005-2006
Location:	United States
Company:	Texas Public Utilities Commission

Description:	In September 2005, Julia's Proposal for pricing safeguards in the wholesale market, referred to as the Peaker Entry Test, was submitted to the Public Utility Commission of Texas as an alternate to the Commission staff's Proposal initially under Project No. 24255 which was later moved to and renamed by the PUCT a Project No. 31972. In April 2006, the PUCT adopted a variant of this Proposal for use as pricing safeguards – the Scarcity Pricing mechanism (as specified in the above mentioned project). Under Project No. 29042 in September 2005 Julia looked at the Pivotal Supplier Test and supplied a critique of the PUCT staff's initial market power mitigation Proposal. In June 2005, Julia participated on panel discussing market monitoring issues, as well as market power safeguards for wholesale electricity markets. In 2004, she also provided testimony on pricing safeguards proceeding, which looked at alternative market power testing procedures for market power, analyzed implications on investment, and discussed efficiency consequences of certain bidding behavior. She also prepared and filed comment testimony and quantitative analysis on questions of market definition and market integration for the Public Utility Commission review in Project No. 29042. In November 2005, by the PUCT decision, both, Project Nos. 24255 and 29042 were rolled into the Project No. 31972

Date:	2005-2006
Location:	United States
Company:	Connecticut Department of Public Utility Control
Description:	The Department of Public Utility Control retained the services of LEI to assist the DPUC in monitoring the power procurement processes for Connecticut Light & Power's (CL&P) Transitional Standard Offer auction in November 2004 for services in 2005 and 2006, and once again selected LEI in September 2005 to monitor the November 2005 auction for services in 2006. Julia led LEI's team in providing advisory services to the DPUC, including guidance on communications protocols, design of sales contract agreement (between CL&P and winning bidders), and also valuation of final bids vis-à-vis the forward market alternatives available to the utility. In November 2004 and 2005, Julia filed an testimony after completion of the procurement process which the Commissioners used to approve the process and the contracts between CL&P and the winning bidder.

Date:	2005
Location:	United States
Company:	Private Clients
Description:	Testimony at FERC on market power issues on behalf of intervener in proposed Exelon-PSEG merger per Section 203 of the Federal Power Act. In May 2005 Julia provided direct and supplemental testimony outlining key considerations relating to the potential for adverse competitive effects in light of the proposed merger and recommended additional mitigation measures to cure horizontal market power concerns through independent analysis of merger's impact on wholesale energy and capacity markets in PJM.

Date:	2005
Location:	United States
Company:	Private Client

Description:	Julia headed the analysis of long-term price forecasts and energy market dynamics for many of the regions in the US and Canada, including New England, Pacific Northwest, California, Alberta, Southwest Power Pool, SERC, the Midwest US (ECAR, MAIN, and MAPP), Maritimes, Ontario, New England, and PJM. In this practice area, she manages a team of economists that use a variety of modeling tools to forecast one-year to fifteen-year wholesale energy, capacity (where relevant), and market-based ancillary services price forecasts. As part of the modeling effort, LEI proprietary dispatch simulation model, POOLMod, as well as other tools that have been developed by LEI, such as CUSTOMBid, ConjectureMod, ViTAL, and LEI's real options spark-spread module. This type of modeling effort required detailed investigation of the micro and macro-economic issues facing these regional markets: demand profiling, growth forecasting, reserve margin and new entry activity assessment. Such analyses are used by clients in establishing market values for assets they have targeted to acquire, consideration of portfolio risk and exposure, and assessments of procurement opportunities. This same modeling has supported regulatory analysis of utility acquisitions and planning strategies, consideration on the impact of market rules and as "reservation prices" for sale processes.

Date:	2005
Location:	Canada
Company:	Alberta Department of Energy
Description:	As part of the LEI team, Julia managed the theoretical analysis and quantitative simulation modeling in the design and testing of recommended new regulatory regime. Analysis and recommendations will be presented to stakeholders in the spring of 2005.

Date:	2005
Location:	United States
Company:	California Public Utility Commission
Description:	Julia served as an expert witness on economic issues related to pricing, investment signaling and data confidentiality in Resource Adequacy and Procurement Proceedings at the California Public Utility Commission in November-December 2005 on behalf of the California Energy Commission. Julia authored direct and rebuttal testimony on these issues and testified in San Francisco in late November 2005.

Date:	2005
Location:	Canada
Company:	Private Clients
Description:	In response to government proposed policies on what defined a "fair, efficient, and openly competitive" market, LEI prepared a detailed white paper and market analysis on the proposed market power tests to be added regulation, and specifically demonstrating the adverse effects of the 20% hard cap market share limit proposed by Department of Energy ("DOE"). White paper was filed as testimony with the DOE in their consultation on Section 6 of the Electric Utilities Act.

Date:	2005
Location:	United States
Company:	Private Client
Description:	Economic advisory on market power mitigation tests for a large US-based utility in the Southwestern part of the US, consulting on market design features related to a proposed nodal market, including most significantly the market power analysis framework. LEI proposed strategy and is assisting in the development of an implementation framework for the local market, including prepared reports for the market design team and state commission. In addition, the approach will be proposed for federal review at FERC.

Date:	2004 – present
Location:	United States
Company:	Numerous Clients – FERC
Description:	In support of numerous acquisitions by various Independent Power Producers and generators across the US, Ms. Frayer prepares and continues to be involved in expert testimony for Market-based Rate Authorization applications, Triennial Reviews, and Section 203 filings. All Market-based Rate Authorization applications to date have been successfully accepted by FERC.

Date:	2004-2005
Location:	United States
Company:	Private Client
Description:	Prepared and filed testimony and quantitative analysis on questions of market definition and market integration. In June 2005, Julia participated on a panel discussing market monitoring issues, as well as market power safeguards for wholesale electricity markets. In 2004, she also provided testimony on pricing safeguards proceeding, which looked at alternative market power testing procedures for market power, analyzed implications on investment, and discussed efficiency consequences of certain bidding behavior.

Date:	2004-2005
Location:	United States
Company:	Connecticut Department of Public Utility Control
Description:	In her testimonys in 2004 and 2005 before the Connecticut Department of Utility Control, Julia described the procurement processes of Connecticut Power and Light Company (“CL&P”) TSO. Her testimony outlined what would be the best practice and procurement processes for DPUC to adopt in order to have the most efficient and competitive process which would result in the lowest price possible for the electricity consumers under CL&P’s TSO.

Date:	2004
Location:	Canada
Company:	Private Client
Description:	For a major Canadian utility, Julia undertook a comprehensive market assessment of the New England REC markets, and specifically the Massachusetts and Connecticut markets, under three different scenarios, the status quo, with the utility’s resource commercialization schedule, and assuming sporadic participation by the utility.

Date:	2004
Location:	United States
Company:	Private Clients
Description:	Using LEI's proprietary simulation model of electricity wholesale markets in ISO New England, LEI forecast future cash flows for a portfolio of electricity generation assets and applied the net present value analysis to evaluate the portfolio’s economic value under different potential future market conditions. This analysis supported the investment fund's decision to acquire and hold the generation portfolio's distressed debt.

Date:	2002
Location:	United States
Company:	Private Client

Description:	LEI was engaged by a large industrial customer to help review of power purchasing options at one of its Southeastern facilities over the next three years. We assessed the probability of a supply interruption over the next three years due to the state of the transmission system in this region. We also assessed the facility's options for purchasing power for this load in the wholesale market.

Date:	2001
Location:	United States
Company:	Private Client
Description:	LEI conducted an indicative valuation of a proposed new transmission line, known as the International Transmission Line. We forecasted the revenues associated with the project and combined this revenue forecast with the estimated costs of the project to arrive at an estimate of the net present value of the project and return on investment.

SPEAKING ENGAGEMENTS:

When	Description
Jan 11, 2013	Julia Frayer "Merchant Transmission: Planning and Development and Lessons Learned from North America", Integrated Transmission Planning and Delivery, Imperial College - Workshop for OFGEM, London, United Kingdom
Sep 5, 2012	Julia Frayer and Shawn Carraher "Demand for wind in New England: an economist's perspective", AWEA Regional Wind Energy Summit, Portland, Maine, USA
May 22, 2012	Julia Frayer, "Cost effective procurement of Renewables to Meet Policy Requirements", NECPUC Symposium, Rockport, Maine, USA
Mar 16, 2012	Julia Frayer, Shawn Carraher, and Yifei Zhang, "Best Practices for Transmission Asset Valuation", Transmission Grid Conference, London, United Kingdom
Oct 10, 2011	Julia Frayer "How effective is US technology policy on clean energy." 30th USAEE/IAEE North American Conference, Washington, DC, USA
Jun 21, 2011	Julia Frayer "Are Markets Ready for New Energy Storage Technologies?" 34th IAEE, Stockholm, Sweden
Jun 7, 2010	Frayer, Julia, Furhana Husani, and Yunpeng Zhang "Long Term Market Impact of Demand Response" 33rd IAEE International Conference, Rio de Janeiro, Brazil
Jun 21-24, 2009	Frayer, Julia, Zvika Neeman, and Matthew Wittenstein "Applications of Information Policy Principles from Auction Theory in the Deregulated Electricity Market" 32nd IAEE International Conference, San Francisco, California
Jun 10, 2005	Frayer, Julia "Prepared Presentation of Julia Frayer for Market Monitoring and Surveillance in the context of Market Design." Panelist, PUCT Workshop for Project #28500, Austin, Texas
Jan 27, 2005	Frayer, Julia "Written Statement of Julia Frayer for the January 27th 2005 Technical Conference in Docket RM04-7-000" Panelist, FERC Technical Conference, Washington D.C.
Nov 24, 2004	Frayer, Julia "Competitive procurement options for Ontario's LDCs" Speaker, APPrO 2004 Conference, Toronto, Ontario (Canada)
Nov 2004	Frayer, Julia, Nazli Uludere, and Sam Lovick "Beyond market shares and cost plus pricing: designing a horizontal market power mitigation framework for today's electricity markets." *Electricity Journal*
Mar 30, 2004	Frayer, Julia "The World Changed on August 14th: the (Second) Great Northeast blackout." Chairman of Panel Session, Electric Power Conference 2004, Baltimore, Maryland
Mar 31, 2004	Frayer, Julia "Alternative to LMP pricing for transmission: a case study of the ICRP approach used by National Grid Company in the UK." Speaker, Electric Power Conference 2004, Baltimore, Maryland
Mar 12, 2003	Frayer, Julia "Big ticket leasing - what next for the future?" Panelist, Big Ticket Leasing 2003, London (United Kingdom)

Nov 28, 2001	Frayer, Julia ”Evaluating the Electron Highway” Speaker, IPPSO 2001 Conference, Richmond Hill, Ontario (Canada)
Nov 2001	Frayer, Julia and Nazli Uludere “What is it worth? Application of real options theory to the valuation of generation assets” Electricity Journal
Jul 15 2001	Goulding, A.J., Julia Frayer, Jeffrey Waller “X Marks the Spot: How UK Utilities Have Fared Under Performance-Based Ratemaking” *Public Utilities Fortnightly*
Mar 22, 2001	Frayer, Julia “How much is it worth? Applying real options valuation framework to generation assets” Speaker, Electric Power 2001, Baltimore, Maryland
Mar 1, 2001	Goulding, A.J., Julia Frayer, Nazli Z. Uludere “Dancing with Goliath: Prospects After the Breakup of Ontario Hydro” *Public Utilities Fortnightly*

LANGUAGES:

Language	Reading	Speaking	Writing
English	Native	Native	Native
Russian	Fluent	Fluent	Fluent

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FERC Docket No. ER13-2313-000

FERC Docket No. ER13-323-000. Order on Proposed Tariff Revisions. January 9, 2013. http://www.ferc.gov/EventCalendar/Files/20130109143157-ER13-323-000.pdf

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X. APPENDIX C: FCM HISTORICAL PERFORMANCE

The ISO-NE has operated the FCM for almost a decade.[122] The first FCA under the FCM was conducted on February 11, 2008 for the 2010/2011 Capacity Commitment Period (and market rules and qualifications for that first FCA began shortly after the Settlement Agreement was accepted by FERC in 2006).[123] To date, eight FCAs have been completed - the eighth FCA, for the 2017/2018 Commitment Period, was completed just this month (February 2014).

The FCM has generally functioned as anticipated and intended. Indeed, as noted by ISO-NE's Internal Market Monitor, "since the start of the FCM transition-period payments and continuing through each FCA, more than enough capacity has been available to meet New England's Installed Capacity Requirement. Thus, *the FCM has met its primary purpose of sending price signals that attract new resources and maintain existing resources to meet the region's resource adequacy standard*."[124] (emphasis added). The external market monitor, Potomac Economics, notes that it may be too early to tell whether the FCM is meeting the

[122] From 1999 to 2006, ISO-NE had a monthly ICAP market. There were many criticisms of that market design, and ISO-NE and key stakeholders entered into a lengthy negotiation process to re-design capacity market institutions in New England. In March 2004, ISO-NE proposed a locational installed capacity mechanism ("LICAP") that would add a locational element to the already existing ICAP market. This called for four separate regions, capacity transfer limits between regions, the use of a downward sloping demand curve to price capacity, and the allocation of capacity transfer rights to market participants. Interested parties proposed and negotiated an alternative to LICAP. The June 2006 Settlement Agreement led to the implementation of the FCM.

[123] ISO-NE. *Overview of Forward Capacity Market.* September 2013. P6. http://www.iso-ne.com/support/training/courses/wem101/21_overview_of_fcm_coutu.pdf

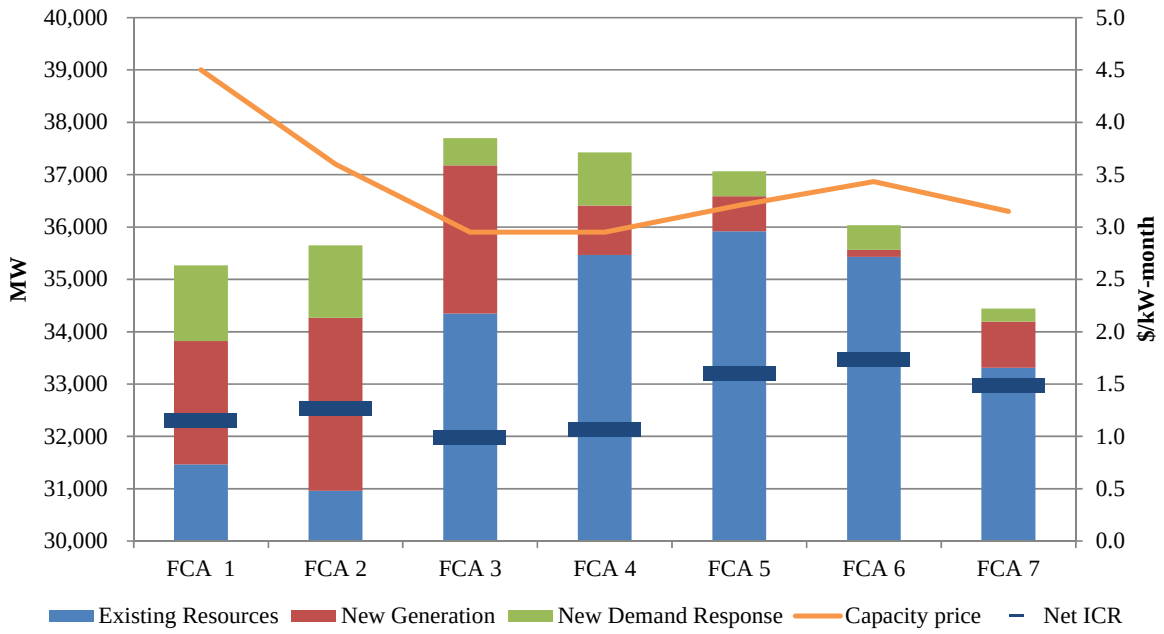
[124] ISO-NE Internal Market Monitor. *2012 Annual Markets Report.* p81. http://www.iso-ne.com/markets/mkt_anlys_rpts/annl_mkt_rpts/2012/amr12_final_051513.pdf

objective of motivating efficient new investment given the over-supply to date. Indeed, the market outcomes of the FCAs have been heavily affected by the over-supply situation.

For example, the FCAs have routinely cleared at the floor price that was initially set for three auctions and then extended by FERC. As can be seen Figure 20 below, new supply (including significant amounts of demand response) entered the market with the first FCA, and incremental new entry had also continued in subsequent FCAs.[125] Given ISO-NE's fixed Installed Capacity Requirement ("ICR"), there has not been "room" for significantly more merchant new entry. In the most recent auction (FCA 7), Footprint Power was able to clear the FCA, because it was able to take advantage of the shortfall in capacity relative to the Local Sourcing Requirement ("LSR") for the import-constrained NEMA/Boston capacity zone.

[125] Some new generation projects had long term contracts from competitive procurement efforts of states within ISO-NE. For example, the Kleen Energy plant and the Waterside peaking plant entered the market as a result of a procurement led by Connecticut's Department of Public Utility Control. Several wind plants have also come online as a result of procurements in Maine.

Figure 20. FCM Supply-Demand Balance and Historical Clearing Prices

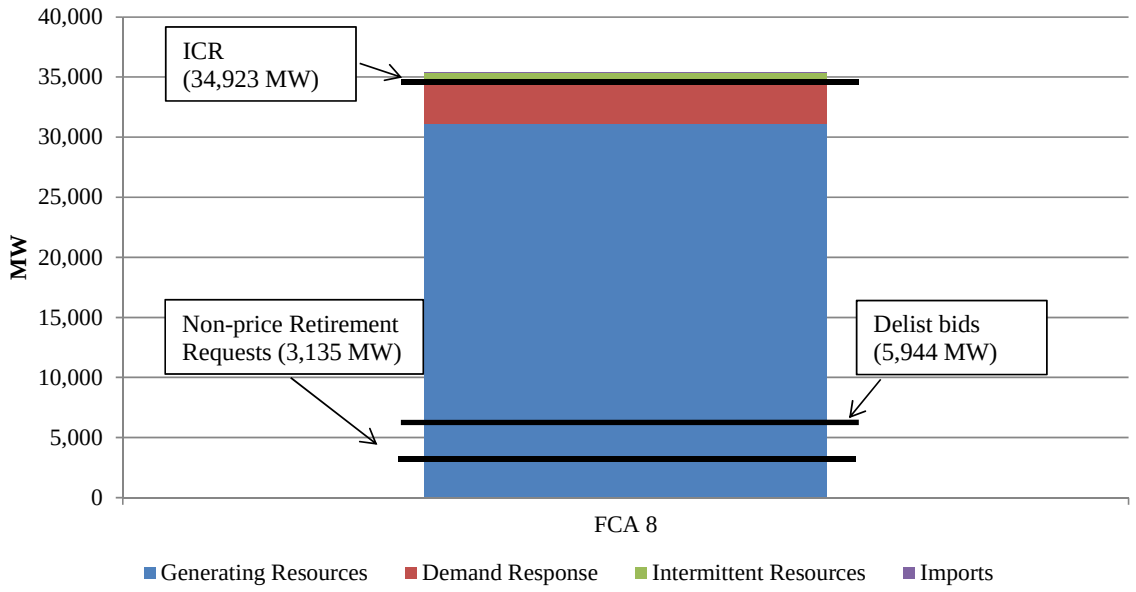


With the removal of the price floor and over the course of the last twelve months, we are now beginning to see some additional retirements and a rationalization of the oversupply. For FCA 8, a total of 79 delist bids were submitted to ISO-NE, totaling 5,944 MW.[126] On top of de-list bids, resources can also exit the capacity market through non-price retirement requests. For the capacity commitment period 2017-2018, 98 non-price retirement requests were submitted to ISO-NE, with a combined summer qualified capacity of 3,135 MW.[127]

[126] To date, ISO-NE has not published the final results of FCA 8, which include the delist bids that cleared. *See:* FERC Docket No. ER14-329.

[127] This includes Brayton Point. Brayton Point first submitted a de-list bid, was rejected by ISO-NE, and then submitted a non-price retirement request.

Figure 21. Existing capacity, Delist Bids and Non-Price Retirement Requests in FCA 8 relative to projected ICR



Source: ISO-NE

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

ISO New England Inc. and	**)**	**Docket No. ER14-1050-000**
New England Power Pool	**)**	

TESTIMONY
OF RICHARD D. TABORS, Ph.D.
ON BEHALF OF THE NEW ENGLAND POWER POOL

I. BACKGROUND AND QUALIFICATIONS

Q. Dr. Tabors, please state your full name and business address.

A. My name is Richard D. Tabors. My business address is 1 Memorial Drive, Suite 1410, Cambridge, Massachusetts 02142.

Q. Dr. Tabors, have you presented material in this case before?

A. Yes, I prepared a report at the request of NEPOOL that was submitted with their filing on January 17, 2014. My report entitled "Report on Two Proposals for Performance Incentive Revisions to the ISO-NE Markets: ISO-NE and NEPOOL" and my full resume are attachments N-1f.a and N-1f.b, respectively, to that filing.

Q. Can you summarize the main points from your previous report?

A. Yes. With respect to ISO-NE's Proposal, I concluded that it defies economic logic, imposes penalties in unjustified circumstances and does not reflect cost causation. Further, the ISO-NE Proposal would burden the New England consumers with large costs that are not commensurate with the asserted benefit to the system.

With respect to the NEPOOL Proposal, I concluded that it better incentivizes real-time performance than would the ISO-NE Proposal because it builds upon the current structure of the Forward Capacity Market ("FCM") and strongly reinforces the economic market signals for both availability and performance through positive incentives.

Q. In your earlier report you concluded that the ISO-NE Proposal is not, in your opinion, just and reasonable. Can you explain how you arrived at that conclusion?

A. The underlying structure of the ISO-NE Proposal is based on a flawed logic. Setting the forward financial positions in proportion to the balancing ratio contradicts the economics and operations of energy and ancillary service markets. Doing so could only possibly make sense if resources were dispatched in proportion to the system-wide load they serve. They are not. They are committed and dispatched as complete units or to agreed loading point based on their marginal operating costs.

In addition, the magnitude of redistributed revenues has no connection with the magnitude of the scarcity problem that triggers the revenue distribution. A scarcity created by a shortage of 1 kW, 1 MW, or 100 MW could cause nearly identical dollar amounts of revenue redistribution.

Lastly, the risk premiums that the generators would have to add to their offers into the Forward Capacity Auctions ("FCA") to cover the fact that the uncertainties in their revenues are not likely to be able to be hedged given existing financial instruments would cause increases in consumer payments that cannot be justified based upon the minimal benefits that New England consumers would be expected to receive. It is unreasonable

that New England consumers should bear the cost associated with implementation of the ISO-NE Proposal.

Q. Since writing your initial Report, have your conclusions changed?

A. No, they have not.

Q. What additional issues have you identified?

A. Based on my review of ISO-NE's January 17, 2014 filing, I have identified five further areas of concern. These are:

- Statements and assumptions made by ISO-NE claiming that the FCM is broken and fatally flawed and that the ISO-NE Proposal deals with those flaws;
- A fundamental re-definition of the FCM capacity product;
- Misleading description of the ISO-NE Proposal as a two settlement market;
- Failure by ISO-NE to recognize the significant adverse or unintended consequences of its Proposal; and
- Not recognizing the advantages of the NEPOOL Proposal in terms of logic, implementation and similarity to the structure of other RTOs.

II. STATEMENTS AND ASSUMPTIONS MADE BY ISO-NE CLAIMING THAT THE FCM IS FATALLY FLAWED AND THAT THE ISO-NE PROPOSAL DEALS WITH THESE FLAWS

Q. What are the flaws in the current FCM structure that ISO-NE claims can be remedied by their Proposal?

A. Dr. Matthew White in his testimony states that the FCM is broken; that the underlying problem is that the Shortage Event mechanism is flawed because "availability" is the wrong metric.[1] Dr. White contends that continued use of "availability" as a metric "undermines incentives for true resource performance and the investments that enable it;" and that it "has numerous exemptions that remove almost all financial consequences of non-performance."[2]

I disagree that the FCM is broken. Rather, the ISO-NE arguments point to a need to adjust the FCM to provide improved metrics and greater incentives for generator performance – precisely what the NEPOOL Proposal provides. Further, availability ***is*** the correct metric given the logic and reality of the operating principles of ISO-NE and all other system operators.

ISO-NE is tasked with operating the system given the resources that it has at its disposal – those that are available to it at any point in time. ISO-NE is arguing that this is not sufficient and that it should have the right to call on all capacity resources at any and all

[1] Testimony of Matthew White on Behalf of ISO New England Inc. at 15, Filings of Performance Incentives Market Rule Changes, *ISO New England Inc., New England Power Pool Participants Committee*, Docket No. ER14-1050-000 (Jan. 17, 2014).

[2] *Id.*

times regardless of whether they are available or not, i.e., that all capacity resources should be available at all times. Under the ISO-NE Proposal, capacity resources that are not available for any reason, including because ISO-NE did not schedule them, will be penalized. The reverse is also the case; units will be rewarded, even if the unit is already dispatched and operating at a level greater than its "share" of the incremental capacity requirement.

NEPOOL has proposed replacing the Shortage Event with an availability metric, the Equivalent Peak Period Forced Outage Rate ("EFORp") that is similar to the concept approved by the Commission for PJM. EFORp is focused on the measurement of capacity availability during all defined EFORp hours rather than availability only during declared Shortage Events as is currently the case.

The "no exemption" or "no excuse" approach proposed by ISO-NE is both unrealistic and unworkable. ISO-NE's proposed elimination of all exemptions is at odds with the manner in which all RTOs operate. For example, generators request and coordinate maintenance outages with the approval and sign off of ISO-NE to assure that the ISO-NE knows what capacity resources will be available at any time. Transmission owners coordinate (at times at the request of ISO-NE) the taking of transmission facilities off-line. ISO-NE approves these requests and subsequently schedules ISO-NE operations with these outages as part of their scheduling algorithms. It is ISO-NE that is informed or directly schedules availability of the many generation, demand response and transmission assets at its disposal. To ignore these realities in establishing capacity payments and penalties is illogical.

III. REDEFINITION OF THE FCM CAPACITY PRODUCT

Q. Does the ISO-NE Proposal redefine the New England capacity product? If so, how?

A. Yes, ISO-NE redefines the capacity product from being planning capacity to being operational capacity.

Q. Why is this a misconception?

A. ISO-NE is responsible for calculating the amount of capacity that is needed to meet the reliability requirements as set by the North American Electric Reliability Corporation ("NERC"). The criterion underlying the decision as to how much capacity is needed is that there should, on average, be no loss of load greater than 1 day in 10 years. ISO-NE calculates the capacity need using the GE-MARS analytic tool that takes knowledge of the existing and *planned* capacity, its operating characteristics and knowledge of load growth to arrive at a total amount of capacity needed to meet the 1 day in 10 years criterion. The answer from GE-MARS is in terms of megawatts of capacity needed on a planning basis. The model results consider that operating procedures of ISO-NE will accommodate any reserve scarcity condition that does not result in actual loss of load. The results of GE-MARS does not, and from an analytic perspective cannot, be used to, measure the need for operational capacity. The tool and the logic can only be applied to measurement of need for planning capacity which is the product of the FCM. Simply put, this is not sound market design.

IV. MISLEADING DESCRIPTION OF THE ISO-NE PROPOSAL AS A TWO SETTLEMENT MARKET

Q. Would you describe the ISO-NE Proposal as a traditional two-settlement system?

A. No, it is not like any two settlement system that I have seen and it bears little resemblance to the two settlement systems that Dr. White uses as examples in his testimony. Dr. White describes a two settlement system as one in which a buyer contracts for the forward purchase a good to be delivered at a fixed location, the final price for which is cleared at the market price at the time of final delivery. In power trading a "contract for differences" is a typically used example of a two settlement system. The buyer and the seller agree on the quantity, location and price for delivery at a known time in the future. At the time of delivery, if less is delivered than the buyer contracted for the seller must replace the energy from the spot market. If the buyer takes precisely what was contracted, the buyer is neutral even though the seller may either gain (the actual cost of providing the energy was less than forecasted in advance) or lose (the cost of the energy was higher in real-time). By the same token, the buyer may no longer need the amount that was contracted for and therefore have to sell the excess into the spot market at a loss or, potentially a gain. Both parties are at risk but the spot market is liquid and both parties have other financial and physical mechanisms available that can be used to hedge the transaction.

The ISO-NE acknowledges that its Proposal lacks a clearing or spot market to value their proposed capacity product when delivered. Dr. White states that a bilateral market will emerge between those entities that have operating capacity in excess of their share and

those that are not on-line or cannot come on line and therefore will be being penalized for non-performance.[3] A future liquid bilateral market cannot exist because there is no incentive for either the individual in surplus to sell below the administrative price or a buyer in deficit to purchase above the administrative price.

Q. What are consequences of ISO-NE's approach?

A. The result of the ISO-NE's proposed two settlement system is a "pseudo market" because no actual market transactions would take place at closing. Instead, where normally there would be a liquid clearing market – a spot market – for the second settlement, the ISO-NE Proposal provides for an exchange of monies between those in excess and those in deficit at an administrated value.

V. NOT RECOGNIZING THE SIGNIFICANT ADVERSE OR UNINTENDED CONSEQUENCES OF ISO-NE'S PROPOSAL

Q. What adverse or unintended consequences of the ISO-NE Proposal do you see?

A. The most significant consequences that consumers would be paying considerably more without receiving commensurate benefits. As shown by the Report entitled "*Assessment of the Impact of ISO-NE's Proposed Forward Capacity Market Performance Incentives*" prepared by Analysis Group for ISO-NE and included in ISO-NE's January 17, 2014 filing as Attachment I-1g, the additional clearing price in the FCM would be needed by

[3] *Id.* at pp. 114, 160.

capacity resources to cover the unhedgeable revenue risks[4]. Only a small proportion of the increased revenue would be used for incremental investment in more flexibility of existing units or more flexible resources. In effect, because the analytic tool being used to calculate the capacity need – GE-MARS – is being used today in the FCM and would be used in the future under the ISO-NE's Proposal, consumers would be receiving the same product planning capacity, but would be asked, even by ISO-NE's own projections, to pay nearly three times as much for it.

A second consequence is that the ISO-NE Proposal would be paying the performance incentive to capacity resources (generators) that are by definition the *most inflexible* on the system. These are base load units that are in service, are operating and are already being paid for both their energy and capacity. They would be the units that consistently receive positive performance incentive payments, because, given their operating characteristics, ISO-NE commits them day ahead and dispatches them in virtually all hours. Mid-merit units, on the other hand, may also function as committed (or not) day ahead by ISO-NE but then be penalized because they are not capable of being dispatched on short notice.

[4] Joint Filing Attachment I-1g. Todd Schatzki and Paul Hibbard, "Assessment of the Impact of ISO-NE's Proposed Forward Capacity Market Performance Incentives," The Analysis Group (Sept. 2013) ("The Analysis Group Report") at pp. 30, 41.

VI. NOT RECOGNIZING THE ADVANTAGES OF THE NEPOOL PROPOSAL IN TERMS OF LOGIC, IMPLEMENTATION AND STRUCTURAL SIMILARITY TO OTHER RTO'S

Q. What is your response to the criticisms of the NEPOOL Proposal that were filed by ISO-NE on January 17, 2014?

A. The ISO-NE presents four (4) general criticisms of the NEPOOL Proposal. These are that the NEPOOL adders are insufficient, that elimination of the Shortage Event is ineffective, that the long-term availability incentive is ineffective and that exemptions are inconsistent with sound market design.

NEPOOL has proposed an increase in the Reserve Constraint Penalty Factors ("RCPF") for TMOR to $1,000/MWh and for TMNSR to $1,500/MWh. ISO-NE has argued that the NEPOOL proposed RCPF increases are not of the same order of magnitude as their Proposal.[5] NEPOOL's proposed RCPF value was never intended to mirror the Performance Payment Rate proposed by ISO-NE. It was designed to allow ISO-NE access to all capacity resources that have must offer requirements in the Day-Ahead and Real-Time Energy Markets. At the same time, the increases are not too small to enhance economic incentives in the real-time hourly markets.

Further, the proposed NEPOOL Reserve Constraint Penalty Factors represent charges that would be seen in the locational energy market and therefore would not only provide an incentive to generation to be available but would also provide a significant incentive to

[5] ISO-NE Transmittal Letter at 27, Filings of Performance Incentives Market Rule Changes, *ISO New England Inc., New England Power Pool Participants Committee*, Docket No. ER14-1050-000 (Jan. 17, 2014).

demand side resources to reduce or curtail demand – a critical benefit neither considered nor provided by the ISO-NE Proposal. In sum, the increase to the RCPF provides for more efficient market signals and thereby a greater positive incentive to generators to be available during periods of shortage.

ISO-NE has argued that while its "Shortage Event mechanism provides only weak incentives for resource performance during scarcity conditions, it is the only feature of the current FCM design that performs such a role."[6] ISO-NE is wrong. There is another available instrument, and that is using the real-time markets to provide real-time incentives. Such an approach is far better targeted to the actual performance ISO-NE is seeking to incentivize. Further, the proposal to move to a metric based on availability during critical hours, EFORp, is a metric and associated mechanism designed to measures consistency in availability and is analogous to the metric approved by Commission for PJM. ISO-NE has argued that its Proposal assures the desired performance of New England capacity resources when the performance is needed the most and that EFORp does not. There is, however, no empirical evidence that the ISO-NE Proposal does, in fact, do this. As has been discussed above, the analysis undertaken of the ISO-NE Proposal shows little if any change in behavior of capacity resources either in investment or in participation in the FCA, only an increase in the cost to consumers.

EFORp, combined with the significant increase in Reserve Constraint Penalty Factors as proposed by NEPOOL, provides a different, but, I would argue, superior incentive structure, without the onerous penalty for non-performance and without the unwarranted

[6] *Id*. at 27.

cost to consumers. Given the NEPOOL Proposal, capacity resources are able to forecast their revenue and operate so as to be available during times of expected shortage.

Finally, ISO-NE argues that a critical element of its Proposal is no exemptions from capacity performance incentives. As discussed above, elimination of exemptions defies the logic of the way power systems plan, schedule, dispatch and operate. ISO-NE has nearly full knowledge of resource availability and directs the operations of the resource through the unit commitment process and through the scheduling of planned outages for refueling, annual maintenance and line outages. The NEPOOL Proposal acknowledges that there are logical and justifiable reasons for certain exemptions while adding incentives for performance.

Q. Having reviewed the filings by both ISO-NE and NEPOOL, what are your overall conclusions?

A. Both Proposals are attempts to deal with an issue of importance in the region, performance at times of capacity shortage. NEPOOL approaches the question with a logical step forward from the current FCM structure recognizing that greater incentives are required and that there is a need for a revised metric that can both measure resource performance and be used to penalize consistent under performers. The NEPOOL Proposal offers a well-conceived and rational approach for providing the right signals for greater economic efficiency in the capacity, energy, and ancillary markets.

In contrast, the ISO-NE Proposal has attempted to re-develop FCM by re-defining the product in a manner that contradicts the analytic engine that is used to calculate capacity requirements. It then has created a calculation procedure that is illogical in that it

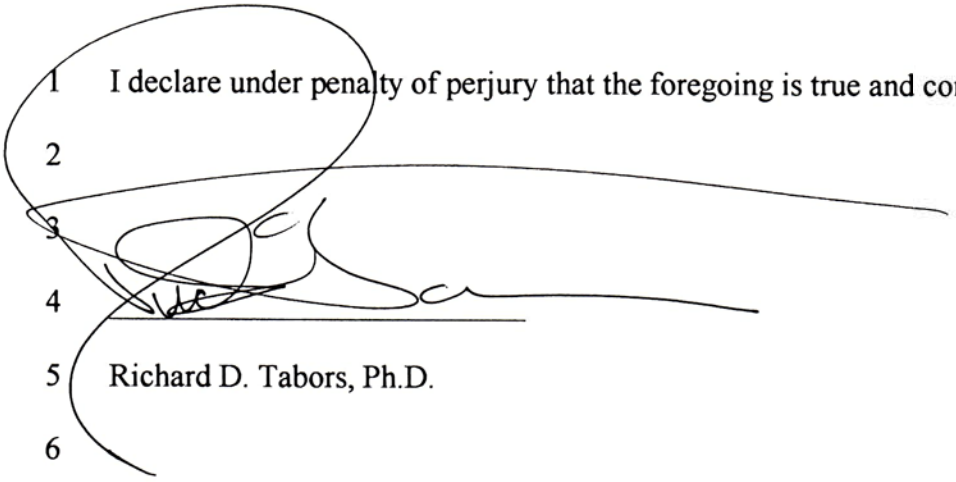
allocates responsibility, penalty and reward to capacity resources in proportion to the load – a process that is antithetical to the economic logic of power system dispatching. Further, the ISO-NE Proposal provides no demonstrable benefits to consumers in the region. It charges consumers nearly three times the cost of capacity for the same product and service they are now receiving. In the process ISO-NE would create a market that is not a market but rather an administrative mechanism for redistribution of monies between units that are on line and those that are not at times of Scarcity Conditions.

Improvements to the current FCM are needed. The NEPOOL Proposal provides the more logical and reasonable improvements.

Q. Does this conclude your testimony?

A. Yes.

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



Richard D. Tabors, Ph.D.

Executed on: February 12, 2014

CERTIFICATE OF SERVICE

I hereby certify that I caused a copy of the foregoing document to be served electronically upon each person designated on the official service list compiled by the Secretary in these proceedings.

Dated at Hartford, Connecticut this 12th day of February 2014.

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