COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC UTILITIES

Petition of Massachusetts Electric Company and Nantucket Electric Company each d/b/a National Grid For Approval of Proposed Long-Term Contracts for Renewable Energy With Cape Wind Associates, LLC Pursuant to G.L. c. 169, §83	)	D.P.U. 10-54

DIRECT TESTIMONY
OF
JONATHAN A. LESSER, PhD
ON BEHALF OF

THE ALLIANCE TO PROTECT NANTUCKET SOUND

JULY 30, 2010

TABLE OF CONTENTS

I. INTRODUCTION, QUALIFICATIONS, AND PURPOSE

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

A My name is Jonathan A. Lesser. I am President of Continental Economics, Inc., an economic consulting firm that provides litigation, valuation, and strategic services to law firms, industry, and government agencies. My business address is 6 Real Place, Sandia Park, NM 87047.

Q PLEASE DESCRIBE YOUR PROFESSIONAL QUALIFICATIONS, EMPLOYMENT EXPERIENCE, AND EDUCATIONAL BACKGROUND.

A I have 25 years of experience in the energy industry, and have worked for electric utilities, government agencies, and as an economic consultant. I have addressed and testified on numerous economic and regulatory issues affecting the energy industry, including cost-benefit analysis of renewable resources, incentive policy for renewable resources, economic impact analysis of renewable generating resources, prudence of purchase-power contracts, and cost-effectiveness analysis.

I have prepared expert testimony and reports in cases before public utility commissions in numerous states; before the Federal Energy Regulatory Commission; before international regulators in Belize, Guatemala, Mexico, and Puerto Rico; in commercial litigation cases; and

before legislative committees in numerous states. I earned my BS in Mathematics and Economics from the University of New Mexico, and my MA and PhD degrees in Economics from the University of Washington. I am the co-author of several textbooks, including *Environmental Economics and Policy*, published by Addison Wesley Longman in 1997, and *Fundamentals of Energy Regulation*, published in 2007 by Public Utilities Reports, Inc. A copy of my curriculum vita is attached as Exhibit JAL-1.

Q ARE YOU A MEMBER OF ANY PROFESSIONAL ORGANIZATIONS?

A Yes. I am a member of the International Association for Energy Economics, the Energy Bar Association, the Society for Benefit-Cost Analysis, and am an Associate Member of the American Bar Association.

Q DO YOU CONSIDER YOURSELF AN EXPERT ON COST-BENEFIT AND COST-EFFECTIVENESS ANALYSIS?

A Yes. My familiarity with cost-benefit analysis began with coursework I took as part of my PhD studies. I have prepared and testified on cost-benefit and cost-effectiveness studies on subjects as diverse as energy efficiency to utility mergers. I have also authored and co-authored articles on the subject, including a chapter entitled, "A

Practitioner's Guide to Benefit-Cost Analysis," in a 1998 text entitled *Handbook of Public Finance*.

Q WHO IS SPONSORING YOUR TESTIMONY?

A My testimony is sponsored by the Alliance to Protect Nantucket Sound.

Q HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE MASSACHUSETTS DEPARTMENT OF PUBLIC UTILITIES?

A No I have not.

Q WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A The purpose of my testimony is to rebut the conclusion of witnesses for National Grid and Cape Wind, LLC ("Cape Wind") that the proposed purchased power agreements ("PPAs") between Cape Wind and National Grid ("Grid" or "the Company") is cost-effective and meets the other criteria set forth in the Green Communities Act ("GC Act").

The cost of the Cape Wind PPA, which covers only half the project's output, plus the 4% price adder National Grid will charge, will force National Grid's ratepayers to pay more than double the projected market price for electricity over the entire 15-year duration of the

contract.[1] This amounts to a multi-billion dollar tax on Massachusetts ratepayers. If one assumes, *arguendo*, that the market price, capacity, and REC forecasts prepared by consultants for National Grid are correct (and in Section IV, infra, I argue that these forecasts are too high), the Cape Wind contract will assess at least a $1.6 billion tax on National Grid ratepayers. If the other half of the project is sold on similar terms to other in-state purchasers, the total tax premium that will be paid by all Massachusetts ratepayers will be at least $3.2 billion.

Therefore, two straightforward questions arise: (1) Are the presumed non-monetary benefits of the Cape Wind project greater than this tax premium? and (2) Are there other renewable resources that can provide these same non-monetary benefits at a lower cost? I conclude that National Grid has utterly failed to answer the first question and has completely ignored ample evidence, including bids received from its own RFP for renewable resources under the auspices of the Green Communities Act, proving the answer to the second question is "yes." As such, the proposed PPA should be rejected. The PPA is not cost-effective

---

[1] Power Purchase Agreements between National Grid and Cape Wind Associates, LLC, D.P.U. 10-54, May 10, 2010 ("PPA Agreements").

and will cause significant harm to the Massachusetts economy that will dwarf the 50 permanent maintenance jobs Cape Wind claims the project will create.

Q HOW IS YOUR TESTIMONY ORGANIZED?

A In Section II, I provide a brief summary of my findings and my rebuttal points regarding the Pre-Filed Direct Testimony of National Grid witnesses Susan Tierney and Milton Milhous, and Cape Wind Associates LLC ("Cape Wind") witnesses Robert Stoddard and Dennis Duffy. I then address specific rebuttal areas in more detail. In Section III, I demonstrate there are ample supplies of renewable generating resources available and that National Grid failed to even evaluate lower-cost alternative renewable resources that were bid in response to its RFP. In Section IV, I rebut numerous arguments advanced by both National Grid and Cape Wind witnesses to justify the failure to perform <u>any</u> type of proper cost-effectiveness analysis to gauge the reasonableness of the proposed PPA with Cape Wind and rebut a number of issues these witnesses raise. As part of this section, I demonstrate that:

1. The cost-effectiveness criteria established by National Grid witnesses Tierney and Milhous are based on flawed and circular

logic, and fail to justify National Grid's failure to prepare any actual cost-effectiveness analysis. Similarly, Mr. Milhous's comparison of the Cape Wind PPA to other offshore wind projects, and finding the Cape Wind PPA to lie within an "acceptable" range of the prices of such projects, is fundamentally flawed.

2. Dr. Tierney's arguments regarding why many of the non-price attributes of the Cape Wind PPA cannot be priced are incorrect;

3. The definitions developed by National Grid and Cape Wind for the "contribution to reliability" and "peak load mitigation" benefits under Section 83 are meaningless, because they are true for all generating resources, renewable or otherwise;

4. Dr. Tierney's arguments regarding the need for Cape Wind to reduce so-called "market barriers" is based on a complete misinterpretation of what market barriers are;

5. The "price suppression" benefits presented by National Grid witness Milhous and Cape Wind witness Stoddard are not economic benefits at all, as well as based on erroneous calculations; and

6. The project benefits presented by Cape Wind witness Duffy are unsupported; and

7. The economic benefits of the Cape Wind project are illusory and will be far overshadowed by economic losses induced by higher electric rates.

These points not only demonstrate that National Grid has failed to show that the Cape Wind PPA is cost-effective, they affirmatively show that the PPA is not cost-effective. Arguments that the Green Communities Act call for an "expansive" view of cost-effectiveness analysis, arguments that many of the purported benefits of Cape Wind cannot be measured, but are nevertheless huge, and arguments that, but for Cape Wind, Massachusetts will be unable to meet its renewable energy goals by the year 2025 are at best evidence of a failure of National Grid's witnesses to understand fundamental principles of cost-effectiveness analysis and, at worst, an attempt to obfuscate the clear fact that the PPA is not cost-effective under any acceptable economic or rate-making measure.

II. SUMMARY OF CONCLUSIONS

A. National Grid wrongly uses a "cost-effective by definition" approach to justify the Cape Wind PPA

Q PLEASE SUMMARIZE THE FLAWS IN THE COST-EFFECTIVENESS "ANALYSIS" PERFORMED BY NATIONAL GRID WITNESSES MILHOUS AND TIERNEY.

A Rather than perform any type of quantitative analysis comparing the cost of the proposed PPA against that of other available renewable generating resources, the witnesses for National Grid and Cape Wind, namely, Dr. Tierney and Mr. Milhous, propose a circular and self-serving definition of cost-effectiveness that is based on fundamentally flawed logic. These witnesses' cost-effectiveness syllogism can be summarized as follows:

1. Renewable energy resources are needed to meet specific Massachusetts state and regional policy goals;
2. The quantity of renewable energy resources needed to meet these goals exceeds the available supply; *ergo*
3. The PPA contract is cost-effective because the output from Cape Wind is needed to meet these goals.

Not only is the logic embedded within this argument false from both economic and ratemaking perspectives, it turns the concept of cost-effectiveness on its head. Moreover, the factual basis for this logic is completely wrong: there are ample supplies of renewable resources available that are less costly than the Cape Wind PPA.

Q PLEASE EXPLAIN WHY THIS LOGIC IS INACCURATE FROM BOTH ECONOMIC AND RATEMAKING PERSPECTIVES.

A By definition, cost-effectiveness analysis requires a comparison, i.e., "cost-effective relative to what?" Thus, one cannot conclude that "Resource A is cost-effective" without reference to one or more alternatives, e.g., "Resource A is cost-effective relative to available alternative Resources B, C, D, and so forth." In this case, at the very least, one would presumably compare the estimated costs and benefits of the proposed Cape Wind PPA with the estimated costs and benefits of other available renewable energy resources, such as those that were bid to National Grid in response to its RFP. This is an especially important point because, contrary to the testimony of National Grid witness Rapp,[2] Section 83 of the Green Communities Act ("GC Act") does not mandate purchase of renewable generation regardless of cost.[3] Utilities must still assess the costs of renewable generation relative to the cost of generation in the market to determine whether purchasing the renewable generation is in

---

[2] Prepared Direct Testimony of Richard A. Rapp, Jr. ("Rapp Direct") at 4:16–20.

[3] Section 83 states, in part, "Commencing on July 1, 2009, and continuing for a period of 5 years thereafter, each distribution company, ... shall be required twice in that 5 year period to solicit proposals from renewable energy developers and, provided reasonable proposals have been received, enter into cost-effective long-term contracts ..." (emphasis added).

the public interest.[4] To suggest, as National Grid does, that Cape Wind is required to meet state policy goals and, as a result, the price must be "just and reasonable," is completely at odds with basic ratemaking principles.

Q DID NATIONAL GRID EVALUATE THE CAPE WIND PPA AGAINST ANY OTHER RENEWABLE RESOURCES TO ASSESS THE COST-EFFECTIVENESS OF THE PPA?

A No. National Grid made no effort to evaluate the costs of the Cape Wind PPA against the costs of the other renewable generating resources that responded to the RFP it issued under the auspices of the GC Act. Nor did Grid employ the evaluation methodology it had itself specified in that RFP—80% price and 20% non-price factors—to evaluate the cost-effectiveness of the proposed PPA.[5]

---

[4] Cape Wind witness Dennis Duffy wrongly concludes that, "[t]he statute's long-term cost-effectiveness test must, by necessary implication, be applied to the other yet-to-be financed renewable energy options that a distribution company would have available to it to meet its obligations under Section 83 and that would provide comparable contributions to the public policy objectives of the Commonwealth." Prepared Direct Testimony of Dennis J. Duffy ("Duffy Direct") at 22:6–10 (emph. added). This is simply false. Section 83 does not preclude comparisons with renewable generating resources that may already be under development or whose developers have already obtained financing.

[5] *Joint Petition by Fitchburg Gas and Electric Light Company d/b/a Unitil, Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid, NSTAR Electric Company, Western Massachusetts Electric Company, and the Commonwealth of Massachusetts Department of Energy Resources for approval of proposed timetable and methods for the solicitation and execution of long-term contracts for renewable energy,*

Furthermore, Mr. Milhous sets up a strawman argument, to wit, the cost-effectiveness of the PPA should be assessed solely relative to other offshore wind projects. Nothing in Section 83 of the GC Acts sets out a cost-effectiveness standard for renewable resources that limits comparisons solely to the costs of identical technologies. Indeed, such a limitation makes no economic sense because any new technology that lacks comparisons to other resources is cost-effective by definition. That is hardly a reasonable way to consider the interests of Massachusetts ratepayers.

For example, in his response to Information Request APNS-1-6(a), Mr. Milhous states that "the pricing in the PPAs was within an 'acceptable range' for offshore wind projects."[6] He also states in his response to Information Request APNS-1-6(c) that "National Grid concluded that offshore [wind] was a necessary technology to be supported and developed, that Cape Wind was the single best offshore wind option

---

(cont.)

pursuant to St. 2008, c. 169, § 83., D.P.U. 09-77, Order, December 29, 2009 ("RFP Order"), at 3-4.

[6] *See* Response to APNS Information Request APNS-1-6, attached as Exhibit JAL-2.

available now and in the foreseeable future ..."[7] And, in his response to Information Request AG-2-3 (attached as Exhibit JAL-3), Mr. Milhous also states that National Grid "was aware of pricing generally based on the following broad sources of information ... Comparison of Deepwater Wind and Cape Wind pricing prepared internally for the Company."

This last statement by Mr. Milhous is somewhat ironic, in that National Grid, including Mr. Milhous himself, negotiated the Deepwater Wind contract that was submitted to the Rhode Island PUC for approval, and subsequently rejected by the Rhode Island PUC because the project was not cost-effective.[8] In other words, Mr. Milhous finds that, because the Cape Wind PPA price is less than the rejected Deepwater Wind PPA price, it is cost-effective.

Q DID MR. MILHOUS CALCULATE ANY PRICE ABOVE WHICH PPA-1 WOULD NOT BE COST-EFFECTIVE?

A No. In response to Information Request AG-2-7 (attached as Exhibit JAL-4), Mr. Milhous states that National Grid had not determined such a bundled price level, but rather determined the lowest price at

---

[7] *Id.*

[8] *In Re: Review of New Shoreham Project Pursuant to R.I. Gen Laws § 39-26.1-7*, Docket No. 4111, Report and Order, April 2, 2010.

which the Cape Wind project could be financed. The latter has absolutely nothing to do with whether the PPA price is cost-effective.

Q. SECTION 83 OF THE GC ACT PROVIDES THAT DISTRIBUTION COMPANIES MAY SOLICIT ADDITIONAL PROPOSALS USING INDIVIDUAL NEGOTIATIONS, A PUBLIC SOLICITATION, OR ANY OTHER METHOD THAT THE DISTRIBUTION COMPANY PROPOSES IN CONSULTATION WITH THE DPU AND THAT THE DPU APPROVES. IN D.P.U. 09-138, THE DPU APPROVED NATIONAL GRID ENTERING INTO NEGOTIATIONS WITH CAPE WIND SEPARATE AND APART FROM ITS PUBLIC RFP PROCESS. ARE YOU CHALLENGING THE DPU'S APPROVAL OF THAT SEPARATE NEGOTIATION?

A No. I am simply challenging National Grid's assertion that the resulting PPA between National Grid and Cape Wind is cost-effective. I would also note that in approving individual negotiations with Cape Wind in D.P.U. 09-138, the DPU stated that National Grid would still "have the burden to demonstrate that all applicable laws, regulations, and precedent have been met," including the requirement that it demonstrate the cost-effectiveness of any PPA it executes. The DPU further stated that National Grid would be required to show that any PPAs resulting from such individual negotiation are "consistent with the public interest and result in just and reasonable rates."[9]

---

[9] D.P.U. 09-138, at 11–12 (Dec. 29, 2009).

Q HOW DOES THE COST OF THE CAPE WIND PPA COMPARE WITH CURRENT ELECTRIC MARKET PRICES IN NEW ENGLAND?

A According to the Independent System Operator for New England ("ISO-NE") , the average "all-in" electric market price in New England markets for calendar year 2009 was $58.36/MWh.[10] ISO-NE defines the all-in price as including "the cost of electric energy, forward reserves, regulation, capacity reliability commitments, and FERC-approved Reliability Cost-of-Service Agreements."[11]

By contrast, under the terms of the PPA, in 2015, a more reasonable date for the entire project to be on-line,[12] the price paid by National Grid ratepayers will be at least $221.75/MWh,[13] almost four times higher (roughly 300%) than the 2009 all-in price in the New England wholesale market. If the project fails to qualify for the federal investment tax credit

---

10 ISO-NE, *2009 Annual Markets Report*, May 18, 2010, at 21.

11 *Id.*

12 Section 3.1(a)(v) of the PPA Agreement establishes as a critical milestone date the Commercial Operation Date by December 31, 2015.

13 The contract stipulates a base price of $207/MWh in 2013, with an escalation rate of 3.5% annually over the 15-year term and with additional inflators if the project fails to qualify for federal tax incentives. In addition, National Grid ratepayers will pay an additional 4% adder to National Grid above the PPA contract price.

("ITC"), the contract cost will be 10.15% higher.[14] If the project neither qualifies for the ITC nor the existing production tax credit (PTC), the price will be 13.53% higher.[15]

Moreover, these contract prices do not include the 4% adder that National Grid will charge ratepayers. Thus, even if the project is on-line in 2013, the minimum price that will be paid that year by National Grid ratepayers is $215.28/MWh. The price will escalate 3.5% annually thereafter. However, the price could be as high as $244.40/MWh in 2013 and escalate 3.5% annually thereafter. By the end of the 15-year contract term, the price paid by National Grid ratepayers could be as high as $409.46/MWh, assuming the project is on-line by 2013.[16] If the on-line date of the project is delayed, the maximum prices will increase 3.5% for each year of the on-line delay. These prices are more than double the forecast market prices provided in the testimony of National Grid witness

---

[14] Power Purchase Agreements Between National Grid and Cape Wind Associates, LLC, May 10, 2010, Exhibit E, Appendix F at 1. The initial price without the ITC is $228/MWh. *Id.*

[15] *Id.* The initial price in 2013 with neither the ITC nor the PTC is $235/MWh.

[16] According to Cape Wind witness Duffy, the project will require at least 24 months to construct. Under that timeline, the project is unlikely to be on-line until late 2013 at the earliest. Duffy Direct at 26:13–14.

Milhous, which are likely themselves too high.[17] Given this huge price premium, the key question is whether the value of the purported Section 83 benefits that will be provided by Cape Wind are equal to or greater than this premium. Neither National Grid nor Cape Wind has provided any actual evidence of this. And, given that there are alternative renewable resources that can provide the same Section 83 benefits, as defined by National Grid, Cape Wind cannot be cost-effective by definition.

Q DOESTHE CAPE WIND PPA PRICE INCLUDE THE COSTS OF THE ANCILLARY SERVICES THAT WILL BE NEEDED TO "FIRM-UP" THE INHERENTLY VARIABLE GENERATION OUTPUT?

A No. Therefore, the contrast between the ISO-NE market price and the PPA price is even more stark. The average all-in price for ISO-NE resources includes the value of capacity and ancillary services. By contrast, should Cape Wind qualify for capacity payments in the ISO-NE Forward Capacity Market ("FCM"), the contract price will not include any of the substantial ancillary services costs required to integrate Cape Wind's intermittent output into the ISO-NE system. Thus, not only will

---

[17] *See* Prepared Direct Testimony of Milton Milhous, June 4, 2010 ("Milhous Direct), Confidential Exhibits MNM-2 and MNM-3.

the proposed PPA cost Massachusetts ratepayers over four times the cost of other New England resources, the contract will also require customers to bear additional costs to provide ancillary services needed to "firm-up" the inherently volatile generating output from Cape Wind, making the cost impact on Massachusetts ratepayers even more pronounced. And, because of its intermittent nature, the Cape Wind project will provide little capacity value.

Q **BUT WON'T MARKET PRICES BE MUCH HIGHER IN 2013?**

A Not necessarily. The change in market prices depends on three major factors: (1) the timing and strength of recovery from the current recession, which will affect the demand for electricity in New England; (2) future natural gas prices, which are a key determinant of wholesale electric market prices; and (3) whether Congress enacts some form of carbon cap-and trade legislation prior to that time and, if so, what the implied market price of carbon will be under such a policy. All three of these factors are embedded in the price forecasts that were prepared by ESAI and LAI for National Grid, and which are attached to the testimony of National Grid witness Milhous, as well as embedded in the study provided by Cape Wind witness Stoddard regarding his estimated "price

suppression benefits."[18] As I discuss in Section IV, infra, the assumptions made by Mr. Stoddard are particularly egregious, as he uses an outdated natural gas price forecast prepared by the U.S. Energy Information Administration ("EIA"), artificially extrapolates that forecast five years beyond its ending date of 2030, and assumes unreasonably high carbon values.

However, even if one accepts, *arguendo*, the market price forecasts provided by National Grid witness Milhous, these forecasts clearly show that even the lowest possible PPA price will be more than double the projected market price in 2013. For example, the combined energy, capacity, and REC market value in the ESAI forecast provided by Mr. Milhous is about $120/MWh in 2013.[19] The minimum price that National Grid ratepayers will be required to pay in 2013, $215.28/MWh (including the 4% adder National Grid will charge ratepayers), is almost double the ESAI forecast of the combined energy, capacity, and REC values.

---

[18] Prepared Direct Testimony of Robert Stoddard, June 4, 2010 ("Stoddard Direct"), Exhibit CW-RBS-3.

[19] Milhous Direct, Exhibit MNM-2 at 1. The implied price equals the Cape Wind PPA cost less the above-market cost of the generation using the ESAI forecast, divided by the expected output of the Cape Wind facility.

In light of the slow pace of economic recovery and the increasing abundance of natural gas supplies stemming from the large projected increases in production forecast from shale gas reserves, including the Marcellus shale in the northeast U.S.,[20] it seems highly unlikely that the combined price of energy, capacity, and RECs will increase by more than 60% in the next three years.[21] Moreover, carbon futures prices, as traded on the Chicago Climate Futures Exchange ("CCFE"), have decreased this year, with prices for December 15 trading (as of July 12, 2010) at $7.55/ton.

Q IS THE APPROPRIATE COST-EFFECTIVENESS COMPARISON SOLELY BETWEEN THE CAPE WIND PPAS AND OTHER RENEWABLE GENERATION?

A No. The language of Section 83 of the GC Act does not mandate that utilities must purchase renewable generation solicited regardless of the price. Rather, solicited responses for renewable generation must be reasonable and, if so, contracts entered into between utilities and renewable generation providers must be cost-effective. Thus, comparisons with wholesale market prices are entirely relevant because

---

[20] See, e.g., U.S. Energy Information Administration, *Annual Energy Outlook 2010* at 72–73. Available at: http://www.eia.doe.gov/oiaf/aeo/pdf/trend_4.pdf.

[21] Taking the 2009 all-in price and adding the July 2010 MA REC price, results in a value of about $74/MWh. ESAI's 2013 forecast of energy, capacity and REC prices is about $120/MWh, 60% higher.

the cost impacts on National Grid ratepayers and the resulting adverse economic impacts caused by higher electric rates, must be addressed.

Even if, *arguendo*, the only legitimate cost-effectiveness comparisons were between the Cape Wind PPA and the price of other renewable generating resources, there is ample evidence of plentiful supplies of renewable generation available at much lower costs. Moreover, National Grid failed even to evaluate the cost-effectiveness of Cape Wind against other renewable generating resources that were bid in response to the Company's own RFP.

B. There are ample supplies of renewable resources in the New England region

Q NATIONAL GRID WITNESS TIERNEY TESTIFIES THAT THE QUANTITY OF MANDATED RENEWABLE GENERATION EXCEEDS AVAILABLE SUPPLIES.[22] DO YOU AGREE?

A No. First, Dr. Tierney's argument about the lack of renewable generation supplies is a "strawman" that conflates current supply in 2010 with future demand in the year 2025. She argues that there are insufficient renewable resources today to meet future renewable portfolio

[22] Tierney Direct at 71:14–16.

standard ("RPS") goals, and, thus, Cape Wind is "needed."[23] Moreover, Dr. Tierney does not confine herself to the GC Act, but instead incorporates other Massachusetts legislative goals, such as mandates that greenhouse gas emissions be reduced by 80% by the year 2050.[24] To argue that Cape Wind is needed now if the state is to meet a carbon reduction goal 40 years in the future hence is baseless.

This proceeding is solely about the cost-effectiveness of the Cape Wind PPA under the auspices of the GC Act. National Grid has not proposed to enter into the PPA so as to meet greenhouse gas reductions mandated under the *Global Warming Solutions Act*, as Dr. Tierney implies.[25] Nor has National Grid proposed to enter into the PPA so as to meet the goals of the *Oceans Act*, again as Dr. Tierney implies.[26] Nor has National Grid proposed to enter into the PPA so as to meet the goals of the *Green Jobs Act*, which Dr. Tierney yet again implies.[27] Dr. Tierney's introducing these other legislative policies is merely a smokescreen to justify the lack

---

[23] *Id.* at 71:14–16.

[24] *Id.* at 32:7–10.

[25] *Id.* at 32:5–16.

[26] *Id.* at 33:1–15.

[27] *Id.* at 33:1–11.

of any reasonable cost-effectiveness analysis comparing the Cape Wind PPA against other alternatives.

Dr. Tierney further misleadingly and wrongly limits "available" renewable resources based on existing transmission bottlenecks within ISO-NE and a false definition of "reliability." As a result, she fails to note transmission bottlenecks that either: (i) have been addressed, (ii) are in the process of being addressed, or (iii) will be addressed to integrate wind resources in New England.

Second, there are ample supplies of renewable generation available in the market today. For example, according to a report published in November 2008 by the Massachusetts Department of Energy Resources ("DOER"), "The total supply of qualified electricity from New Renewable Generation Units exceeded the demand for the first time since the program began in 2003."[28] That same DOER report also states:

> Although the quantity of electricity from renewable generation sources in Massachusetts continues to grow, that growth is exceeded by an accelerating increase in supplies from northern New England biomass plants and by imports

[28] DOER, "Massachusetts Renewable Energy Portfolio Standard, Annual RPS Compliance Report for 2007," November 2008 ("DOER 2007 Compliance Report"), at 3.

from wind farms and landfill gas projects in neighboring New York, Quebec, and the Maritime Provinces.[29]

According to DOER, as of April 2010, there were 832 MW of qualified Class I renewable resources located in Massachusetts, in addition to Cape Wind, for a total of 1,300 MW of qualified Class I resources.[30] Similarly, a report issued on April 6, 2010 by the U.S. Department of Energy ("USDOE") estimates that there are approximately 2,593 MWs of new renewable generation that could become available from proposed wind energy projects in New England.[31]

Earlier this month, NSTAR filed petitions with the DPU to enter into PPA contracts with different wind energy providers to partially fulfill the 3% load goal under the auspices of the GC Act. In its petition, NSTAR noted that, in response to its RFP for renewable generating resources, it

---

29 *Id.*

30 DOER, RPS Class I–Qualified Renewable Generation Units, April 12, 2010. Available at: http://www.mass.gov/?pageID=eoeeaterminal&L=4&L0=Home&L1=Energy%2C+Utilities+%26+Clean+Technologies&L2=Renewable+Energy&L3=Renewable+Portfolio+Standard&sid=Eoeea&b=terminalcontent&f=doer_rps_approved&csid=Eoeea.

31 *See* U.S. Dept. of Energy, Energy Efficiency & Renewable Energy, "New England Wind Projects," April 6, 2010. Available at: http://www.windpoweringamerica.gov/newengland/projects.asp. This estimate is based on all available capacity for proposed projects, excluding any projects that are already operating.

had received bids for 1,180 MW of renewable generation from 27 firms for 35 separate projects.[32]

Additionally, large amounts of renewable generation available to the New England market, and Massachusetts, are also under development in New England and eastern Canada. For example, in 2008, Hydro-Québec ("HQ") signed agreements with 15 wind developers for projects totaling 2,004 MW that will come on-line between 2011 and 2015, at an average price of C10.5 cents/kWh.[33] That price includes C1.5 cents/kWh for transmission and C0.5 cents/kWh for network balancing costs that will be provided by Hydro- Québec Production. In fact, according to the DOER 2007 Compliance Report, renewable generation from Quebec and Prince Edward Island supplied 13% of the Massachusetts Class I renewable resource requirement in 2008.[34] Similarly, in October 2009, the Maine Public Utilities Commission approved long-term PPAs between and Central Maine Power and Bangor Hydro for the output of the 60 MW

---

[32] *NSTAR Electric Company*, Docket No. 10-71, Testimony of James Daly, Exhibit NSTAR-JGD-1, July 2, 2010 at 24:21–22.

[33] R. Melbardnis, "Hydro- Québec Approves 2,004 MW of wind-power farms," Reuters, May 8, 2008. Available at: http://uk.reuters.com/article/idUKN0540400220080505.

[34] DOER 2007 Compliance Report at 10, Figure 3.

Rollins Wind Project. Under these PPAs, the purchase price will be less than the ISO-NE internal hub market price. For example, in 2013, based on the "above-market" cost value shown in Exhibit MNM-2, ESAI is forecasting an average market price—equal to the sum of the forecast round-the-clock (24x7) energy market price, the forward capacity market price, and the forecast value of renewable energy certificates (RECs)—of $119.67/MWh.[35] Even if this forecast of the combined energy, capacity, and REC price is accurate, and as I discuss in Section IV, infra, both the ESAI and the Levitan forecasts attached to Mr. Milhous's testimony are unreasonably high, then the Rollins generation will be sold at a price less than half the most optimal price of the Cape Wind PPA.[36]

HQ is also planning to build and privately finance the Northern Pass project, a high-voltage, 2,000 MW direct current transmission line

---

[35] The ESAI 24x7 above-market cost shown in Exhibit MNM-2 is $66,466,487. Subtracting this value from the contract cost in 2013 implies an overall forecast market cost of energy, capacity, and RECs is ($157,421,178 – $66,466,487) = $90,954,691. The estimated annual production of the Cape Wind project, based on 468 MW of installed capacity and a capacity factor of 37.1% capacity factor implies production of just over 1.52 million MWh. Thus, half of the project's output is 760,000 MWh. Dividing $90,954,691 by 760,000 MWh implies an average market-based price of $119.67/MWh.

[36] Maine Public Utilities Commission, Docket No. 2008-104, *Order Directing Utilities to Enter into Long-Term Contracts*, October 8, 2009, at 3.

into southern New Hampshire to boost its export capacity. And, according to Gordon van Welie, President and CEO of ISO New England, there is increasing collaboration between the New England Governors and the Eastern province Premiers "to develop the clean energy potential of the combined region."[37] Similarly, this fall, TransCanada will have a total of 132 MW of wind generation operating at Kirby Mountain, Maine once its expansion is completed. (Currently, 66 MW are in operation.) NStar will be one of the purchasers of the output from that facility.

C. National Grid did not perform any cost-effectiveness analysis or follow its own RFP evaluation guidelines

Q DID NATIONAL GRID EVALUATE THE COST-EFFECTIVENESS OF THE PROPOSED CAPE WIND PPAS IN ANY MEANINGUL OR STRUCTURED WAY?

A No. First, by its own admission, National Grid did not compare the cost-effectiveness of the Cape Wind PPAs with any other renewable generating resources located outside Massachusetts. Second, there is no evidence in this case that National Grid properly evaluated any in-state renewable resource alternatives, despite the clear availability of such

---

[37] Presentation by Gordon van Welie, "U. S.–Canada Clean Energy Dialogue Increasing Trade in Clean Electricity," May 20, 2010, at 2. Available at: http://events.energetics.com/USCanadaCleanEnergy2010/pdfs/Panel_IV_Gordon_van_Welie.pdf.

resources in the same time frame, and at a lower price, than Cape Wind.[38] Third, National Grid began contract negotiations with Cape Wind prior to even issuing the RFP required under the GC Act.[39] National Grid could not reasonably determine Cape Wind to be cost-effective without having performed any quantitative analysis of available alternatives.

A fundamental flaw in the National Grid cost-effectiveness "analysis" is its use of circular reasoning and definitions of key terms that deprives them of all meaning. National Grid asserts that Cape Wind is needed to meet energy and environmental goals, and that these goals include building Cape Wind. That is circular reasoning, not evidence of cost-effectiveness. Defining Cape Wind to be cost-effective because its output is needed to meet RPS requirements, or because it will help the "transformation" to a low-carbon economy, or because it is needed to overcome alleged market-barriers, or because it provides qualitative attributes that cannot be fully valued, as National Grid's witnesses have variously done, is straw-grasping of the worst kind. It is an attempt to

---

[38] Milhous Direct at 30:2–3.

[39] Milhous Direct at 6:10–21.

avoid the obvious conclusion that the PPA is not cost-effective in any economic or ratemaking sense.

Q DID NATIONAL GRID DEVELOP MEANINGFUL DEFINITIONS OF "CONTRIBUTE TO RELIABILITY" AND "MITIGATE PEAK LOADS" FOR ITS ANALYSIS OF THE CAPE WIND PPA?

A No. National Grid developed its own results-oriented definitions of "contributing to reliability" and "mitigating peak loads." As these terms are defined by National Grid, any renewable generating resources delivering energy into Massachusetts would contribute to reliability, mitigate peak loads, and contribute to fuel diversity. Yet, National Grid provides no comparative analysis between Cape Wind and any other renewable resources to show that Cape Wind somehow provides these benefits more cost-effectively than other renewable resources.

Statements by National Grid witnesses that Cape Wind is preferable to other renewable resource alternatives because there is no need to build expensive new transmission lines to deliver the power are also unsupported and factually incorrect. The large-scale wind development contemplated for New England will require significant

investments in transmission to fully integrate wind resources into the ISO-NE grid and reduce the impacts of inherently variable wind output.[40]

When addressing the impacts of wind power on system reliability, system integration of wind generation is the most critical factor. The reason is that, without such transmission system investment, wind power can have an adverse impact on system reliability because of the inherent variability of output and the potential for wind generation to suddenly "cut-out" if wind speeds drop or increase beyond the speed at which wind turbines can safely operate. Without such transmission system investment, Cape Wind will adversely affect system reliability, not improve it. Moreover, the additional spinning and non-spinning reserves that must be made available are often high-cost, inefficient, fossil-fuel generating resources, which can negate anticipated reductions in air pollution.

Specifically, ISO-NE must have sufficient transmission capacity available throughout the region in order to provide back-up generation when the output from Cape Wind, and other intermittent resources, falls

---

[40] National Renewable Energy Laboratory, *Eastern Wind Integration and Transmission Study*, January 2010 ("NREL Integration Study) at 27.

off. For example, the NREL Integration Study estimated the increase in spinning reserves needed to provide regulation services in ISO-NE and other zones within the Eastern Interconnect, especially at higher levels of total installed wind generation.[41] As such, the proper analysis should not focus solely on the cost of transmission facilities needed to physically interconnect the Cape Wind project with the ISO-NE grid, but should also consider how much new transmission construction will be needed to bring other capacity resources into Massachusetts and New England to back-stop Cape Wind when it is unavailable.

For example, Cape Wind estimates it will have an annual capacity factor of 37.1%, but a capacity factor of only 26.9% in during summer peak hours.[42] This means that, on average, during almost two-thirds of all hours in the year, and almost three-fourths of all hours in the summer peak season, additional transmission capacity will be needed to bring in replacement electricity supplies to back-stop Cape Wind. This reduces the value of Cape Wind's output. Yet, National Grid witnesses Tierney and Milhous fail to even consider this fact.

---

[41] NREL Integration Study at 152–153.

[42] Milhous Direct at 10:9.

Q. CAN AN INTERMITTENT RESOURCE, SUCH AS WIND OR SOLAR POWER, EVER MEET THE REQUIREMENT TO "PROVIDE ENHANCED ELECTRIC RELIABILITY WITHIN THE COMMONWEALTH" AS YOU DEFINE IT? IF SO, HOW?

A Yes. System reliability can be thought of as consisting of long-term resource adequacy and short-term system security. Intermittent resources clearly can contribute to resource adequacy in the long run. Their effect on short-term system security is problematic because of their intermittency. This is why such resources must be backed up with regulation reserves. Thus, while intermittent resources can contribute to reliability, they simply are not as good at doing so as dispatchable renewable resources such as biomass.

Q. CAN AN INTERMITTENT RESOURCE, SUCH AS WIND OR SOLAR POWER, EVER CONTRIBUTE TO "MODERATING SYSTEM PEAK LOAD REQUIREMENTS" AS YOU DEFINE IT? IF SO, HOW?

A Yes. Solar generation tends to provide peak output in summer, when loads are highest in New England.[43] Thus, to the extent that there is a positive correlation between solar output and peak loads in the summer, solar can help contribute to meeting peak load. Wind generation is more problematic, since wind capacity factors are lower in summer than in

[43] The 10-year forecast of summer and winter peak loads is published annually by ISO-NE. *See* "2010-2019 Forecast Report of Capacity, Energy, Loads, and Transmission," ISO-NE, April 2010.

winter. Thus, there is a negative correlation between wind generation and summer peak loads.

Q HAS ISO-NE ESTIMATED THE COST OF NEW TRANSMISSION FACILITIES THAT WILL BE NEEDED TO FULLY INTEGRATE WIND ENERGY INTO THE NEW ENGLAND GRID?

A Yes. A recent ISO-NE Study prepared for the New England Governors showed, these costs are extremely high—in the billions of dollars. For example, ISO-NE's 4,000 wind generation MW scenario, with half onshore and half offshore, is estimated to require $25 billion in transmission upgrades.[44] Nowhere in the National Grid or Cape Wind testimony are these high costs quantified or even acknowledged.

Q DID THE NATIONAL GRID RFP STATE HOW THE COMPANY WOULD EVALUATE RENEWABLE RESOURCE BIDS?

A Yes. National Grid proposed an evaluation process for RFP resources that would have weighted price and non-price attributes. In their petition to the DPU regarding the RFP solicitation, petitioners, who included National Grid, proposed to solicit bids for 1.5% of their total

---

[44] ISO-NE, *New England 2030 Power System Study: Report to the New England Governors, 2009 Economic Study: Scenario Analysis of Renewable Resource Development* ("ISO RTS"), February 2010, at 21.

annual load for a period of ten to 15 years and to evaluate received bids using a weighting scheme of 80% price and 20% on non-price factors.[45]

Q DID NATIONAL GRID COMPARE THE COST-EFFECTIVENESS OF THE CAPE WIND PPA AGAINST OTHER RENEWABLE GENERATION THAT WAS BID IN RESPONSE TO THE RFP USING THIS WEIGHTING SCHEME?

A No. There is no evidence that National Grid evaluated responses to its own RFP based on these factors, nor evidence that it analyzed Cape Wind based on these factors, which the Company itself proposed. Clearly, National Grid could have performed this analysis to determine whether the Cape Wind PPA is cost-effective relative to other available renewable resources that were bid in response to the RFP. The fact that the Company did not perform this analysis, or any other actual cost-effectiveness analysis, is clear evidence that it has failed to meet its burden of proof that the PPA is cost-effective.

Q ARE YOU SAYING THAT NATIONAL GRID IS REQUIRED TO CHOOSE THE LEAST-COST ALTERNATIVE?

A No. Nothing in the GC Act mandates that a utility must select one or more of the renewable resources offered to it. Rather, Section 83 of the GC Act states that the DPU "shall approve a contract only upon a finding

[45] RFP Order, at 3–4.

that it is a cost effective mechanism for procuring renewable energy on a long-term basis."

As I discuss in Section III, infra, there are comprehensive and accepted methodologies by which price and non-price factors can be combined into an overall resource ranking. If resource alternatives are ranked using such an approach, then *Good Utility Practice* strongly suggests selecting the highest-ranked alternatives first.[46]

Q ARE YOU AWARE OF OTHER UTILITIES THAT HAVE USED AN RFP PROCESS TO EVALUATE RENEWABLE RESOURCES?

A Yes. In 2006, Delmarva Power solicited responses through an RFP for both renewable and conventional generation, as required by the Delaware Electric Utility Retail Customer Supply Act of 2006.[47] The Bid Evaluation Report submitted by Delmarva Power discusses in detail how the bids were evaluated using both price and non-price factors.[48] The

---

[46] A discussion of "Good Utility Practice" can be found in J. Lesser and L. Giacchino, *Fundamentals of Energy Regulation*, (Vienna, VA: Public Utilities Reports, Inc. 2007), at 41-42.

[47] 26 Del. C. § 1007(d).

[48] *In the Matter of Integrated Resource Planning for the Provision of Standard Offer Supply Service by Delmarva Power & Light Company Under 26 Del. C. § 1007(c) & (d): Review and Approval of the Request for Proposals for the Construction of New Generation Resources Under 26 Del. C. § 1007(c)* (Opened July 25, 2006), Docket No., 06-241,and *In the Matter of Integrated Resource Planning for the Provision of Standard Offer Service by*

differences between Delmarva's approach and the approach taken by National Grid are striking. First, an Independent Consultant ("IC"), hired jointly by the Delaware Public Service Commission and three other state agencies, evaluated the bids. Second, the RFP process was designed to solicit as many bids as possible. Third, the review process was highly structured. As stated in the Delmarva RFP Evaluation Report,

> The Reviewing parties coordinated on the approach to scoring for each of the price and non-price factors to ensure that the evaluation of bids would reflect the values and goals of the Act and would lead to the appropriate ranking of bids. This factor-by-factor evaluation approach allowed the Reviewing Parties to ensure that each criterion was evaluated by experts in the relevant field. For the non-price factors in particular, Delmarva and the Public Agencies, with their respective consultants, conducted wholly independent evaluations, developing their own scores based on their assessment of the merits of each proposal.[49]

In contrast, National Grid began its negotiations with Cape Wind before any RFP bids were received. Moreover, since National Grid receives a 4%

(cont.)

Delmarva Power & Light Company Under 26 Del. C. § 1007(c) & (d): Review of the Initial Resource Plan Submitted December 1, 2006 (Opened January 23, 2007), Docket No. 07-20, Delmarva Power and Light Company's RFP Bid Evaluation Report, February 21, 2007 ("Delmarva RFP Evaluation Report").

[49] *Id.* at 8.

adder—that accrues directly to its earnings—on top of the final negotiated price, the negotiations could hardly be considered "arms-length."

Q NATIONAL GRID WITNESS TIERNEY ASSERTS THAT MANY NON-PRICE FACTORS SIMPLY CANNOT BE VALUED.[50] DO YOU AGREE?

A No. National Grid witness Tierney's assertion that non-price factors cannot be valued is patently false. It is possible to fully quantify and value the non-price attributes of the PPA. Moreover, as the Delmarva bid evaluation report shows, non-price factors can be evaluated in a sound structural way that permits different projects to be ranked.

As I discuss in more detail in Section IV, infra, economists routinely assign values to non-price attributes, such as the value of emissions reductions.[51] Moreover, in many cases, markets for these non-price attributes exist, allowing them to be valued directly. For example, reductions in emissions of sulfur dioxide and nitrogen oxides that would theoretically occur because of injection of Cape Wind energy into the ISO-NE grid can be valued based on the price of emissions allowances for

---

[50] Tierney Direct at 118:12–16.

[51] For an introduction to these valuation methodologies, see J. Lesser, D. Dodds, and R. Zerbe, *Environmental Economics and Policy* (New York: Addison Wesley Longman 1997) ("LDZ 1997"), at 268–314.

those pollutants. Similarly, there is an active market today for carbon emissions overseen by the Chicago Climate Exchange. Similarly, the value of reduced exposure to fuel price volatility can be determined relative to the price of fuel hedging contracts traded on NYMEX. And, as Cape Wind witness Stoddard discusses, the price premium for long-term, fixed-price contracts can be estimated.[52] Finally, the value of reliability, as defined under the GC Act is based on the number of hours that transmission into Massachusetts is constrained and the difference in market-clearing prices during those hours.[53] None of the witnesses provide any monetary values for these attributes despite the fact that such values are readily available.

Q DID NATIONAL GRID WITNESSES MILHOUS OR TIERNEY ATTEMPT TO VALUE ANY NON-PRICE ATTRIBUTES OF THE CAPE WIND PPAS?

A No. Neither Dr. Tierney nor Mr. Milhous made any effort to value any non-price attributes, such as reductions in carbon emissions and other air pollutants. Nor did they compare the relative cost-effectiveness of the Cape Wind PPAs against any other renewable generation alternatives.

---

[52] Stoddard Direct at 19:12–17.

[53] National Grid defines "contribution to reliability" as local generation. Nothing in the GC Act addresses changes in loss of load probability ("LOLP").

Q DOES THE VALUE OF RENEWABLE ENERGY CERTIFICATES ("RECS") INCORPORATE THE VALUE OF ALL NON-PRICE ATTRIBUTES?

A Yes. RECs by their very nature incorporate the value of all non-price attributes. Since Massachusetts policymakers themselves established renewable energy certificate ("REC") requirements, the market value of those RECs implicitly incorporates all of the non-price attributes of renewable resources that policy makers value, such as reduced exposure to fuel price volatility, reduced dependence on foreign oil, reductions in air pollution emissions, and so forth. According to the U.S. Department of Energy ("USDOE"), for example, RECs "represent the environmental attributes of the power produced from renewable energy projects."[54] Such "environmental attributes" include greater resource diversity, reduced exposure to fossil fuel price volatility, greater energy independence, and so forth.

Moreover, the state has established maximum REC values in the form of alternative compliance payments ("ACP"). In 2010, for example,

---

[54] Source: USDOE. http://apps3.eere.energy.gov/greenpower/markets/certificates.shtml?page=0.

the Class I ACP is $60.93/MWh.[55] These ACP values, which by law increase at the rate of growth in the consumer price index ("CPI"), establish an upper bound value for RECs.[56]

Q DR. TIERNEY TESTIFIES THAT RECS DO NOT INCORPORATE ALL OF THE NON-PRICE ATTRIBUTES OF THE CAPE WIND PROJECT. DO YOU AGREE?

A No. Dr. Tierney testifies that

> [t]here is nothing in today's market that reflects fully the costs that would be required to support a new project with comparable reliability, peak-load moderation, renewable energy output, and with the ability to help stimulate the market for renewable resource development, there is no monetary benchmark that exists today that reflects these benefits.[57]

What Dr. Tierney is, in fact, arguing, is that the costs of the Cape Wind project are so high that, even with a federal investment tax credit and state RECs to subsidize the project's cost, Cape Wind is not economically viable. That is an entirely different argument from concluding that RECs do not incorporate all of these attributes. Moreover, by the definitions Dr.

---

[55] DOER, "Adjustment of the Alternative Compliance Payment (ACP) Rate for Compliance Year 2010," January 31, 2010. Available at: http://www.mass.gov/Eoeea/docs/doer/rps/rps-acp10.pdf.

[56] 225 CMR 14.08(3)(a)2.

[57] Tierney Direct at 118:12–16.

Tierney herself adopts, all renewable energy facilities contribute to reliability, moderate peak loads, and "stimulate" the market for renewable energy resources. The entire idea behind RECs is to subsidize renewable generation development so as to meet state policy goals.

To argue otherwise, as Dr. Tierney does, implies that policymakers purposefully established a lower REC requirement than they collectively wished to establish, which is impossible by definition.[58] Even though individual state policy makers may differ in their REC preferences, collectively the REC requirements they establish reflect societal preferences.

Q DOES THE LANGUAGE IN SECTION 83 OF THE GC ACT SUGGEST THAT POLICY MAKERS BELIEVE CURRENT REC REQUIREMENTS ARE TOO LOW TO FACILITATE THE FINANCING OF SUFFICIENT RENEWABLE RESOURCE'S TO MEET THE COMMONWEALTH'S GOALS?

A No. In fact, the economic effect of Section 83 of the GC Act is consistent with the decline in REC prices. To the extent that REC suppliers expect new renewable resources to be developed under the auspices of Section 83, the value of future RECs would decline, which would tend to hinder renewable generation development outside of the

[58] Tierney Direct at 76:1–3.

auspices of Section 83. Thus, a far simpler policy approach to increasing REC requirements would be to increase RPS requirements directly.

Q ARE THERE OTHER EXAMPLES OF POLICY MAKERS CREATING MARKETS FOR NON-PRICE ATTRIBUTES?

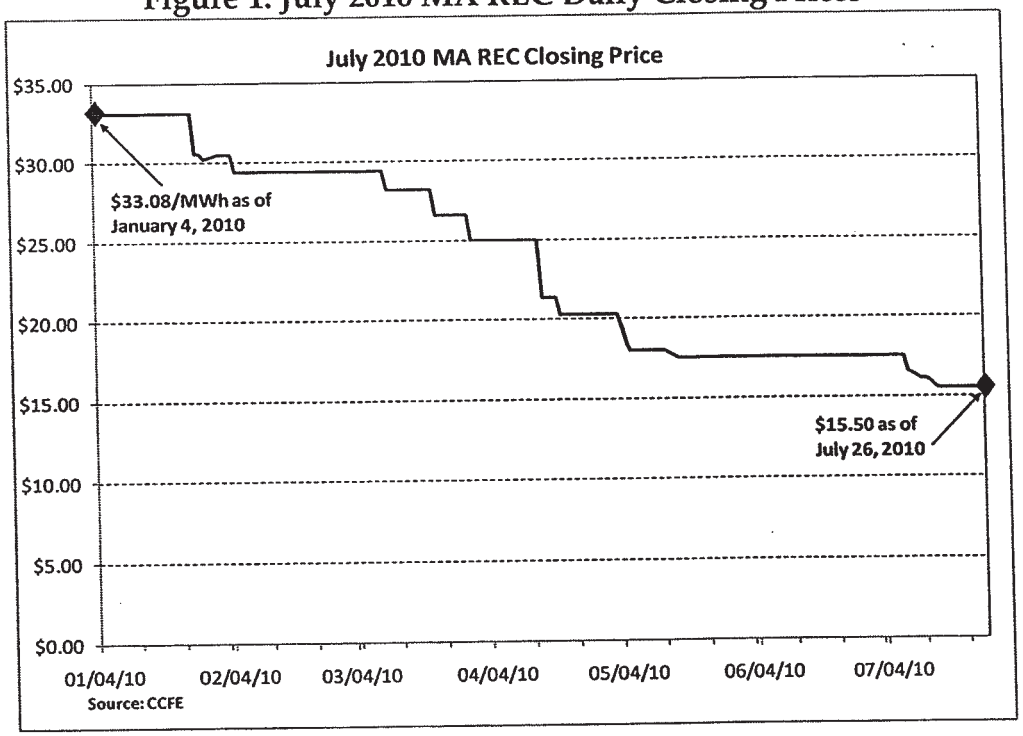
A Yes. For example, consider the Clean Air Act Amendments of 1990, which established a tradable emissions program for sulfur dioxide (SO2) and nitrogen oxides (NOx). Congress established annual allowance caps for the program, with one allowance conferring the right to emit one ton of SO2 or NOx. Based on the "supply" of allowances and emissions levels, the market price of allowances is determined every year. All other things assumed equal, as the maximum number of allowances decreases, the market price of an allowance increases. In the most recent auction held by the U.S. Environmental Protection Agency (EPA), for example, the 2010 auction spot allowance market clearing price for SO2 was $36.20.[59] As such, the value of reduced SO2 emissions in 2010 is $36.20/ton. Economists refer to this as "internalizing" an environmental externality.

In the same way, REC markets have been established in numerous states. These REC markets establish the market value for different types

[59] Source: EPA. Available at: http://www.epa.gov/airmarkets/trading/2010/10summary.html.

of renewable energy resources. For example, figure 1 below shows the daily closing price for one REC in Massachusetts for delivery in July 2010, as published on the Chicago Climate Futures Exchange.[60] Similarly, figure 2 shows the average daily REC prices for 2013, and figure 3 shows the average daily REC prices for 2015. These REC futures price are the best indicator of the value of RECs, because they reflect the expectations of suppliers and buyers.

Figure 1: July 2010 MA REC Daily Closing Prices



[60] Average of January, April, July, and October 2011 prices. Available at: http://www.ccfe.com/mktdata_ccfe/sfi/historical/Historical_Prices.xls. The specification sheet for Massachusetts RECs traded on CCFE is available at: http://www.ccfe.com/about_ccfe/products/rec-ma/CCFE_REC-MA_Specification.pdf.

Figure 2: CY 2013 Average Daily REC Closing Price

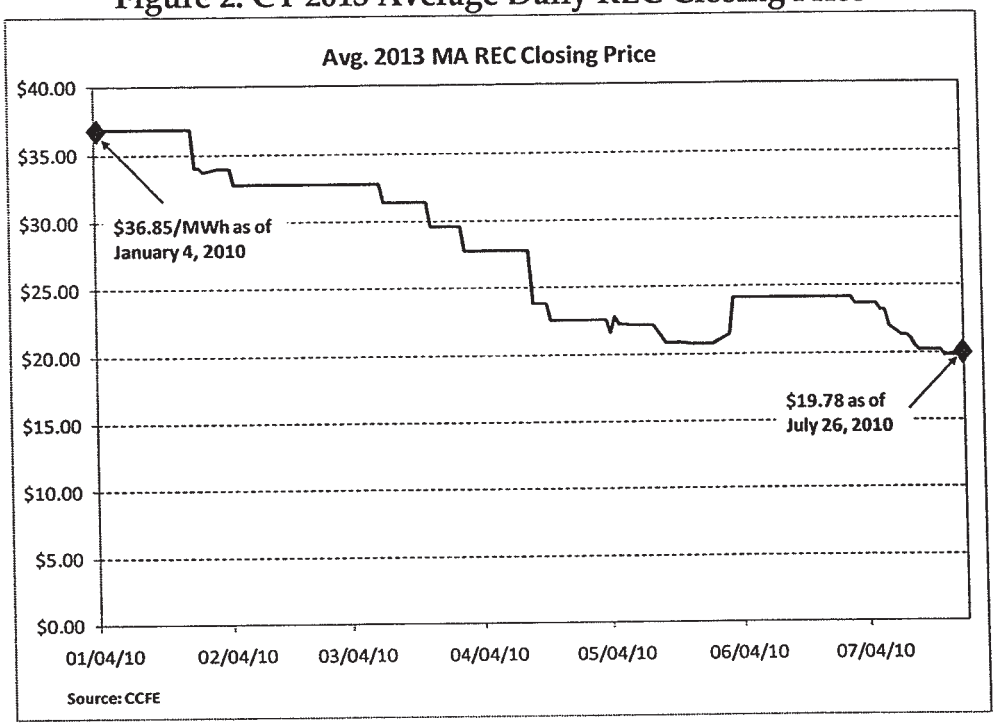
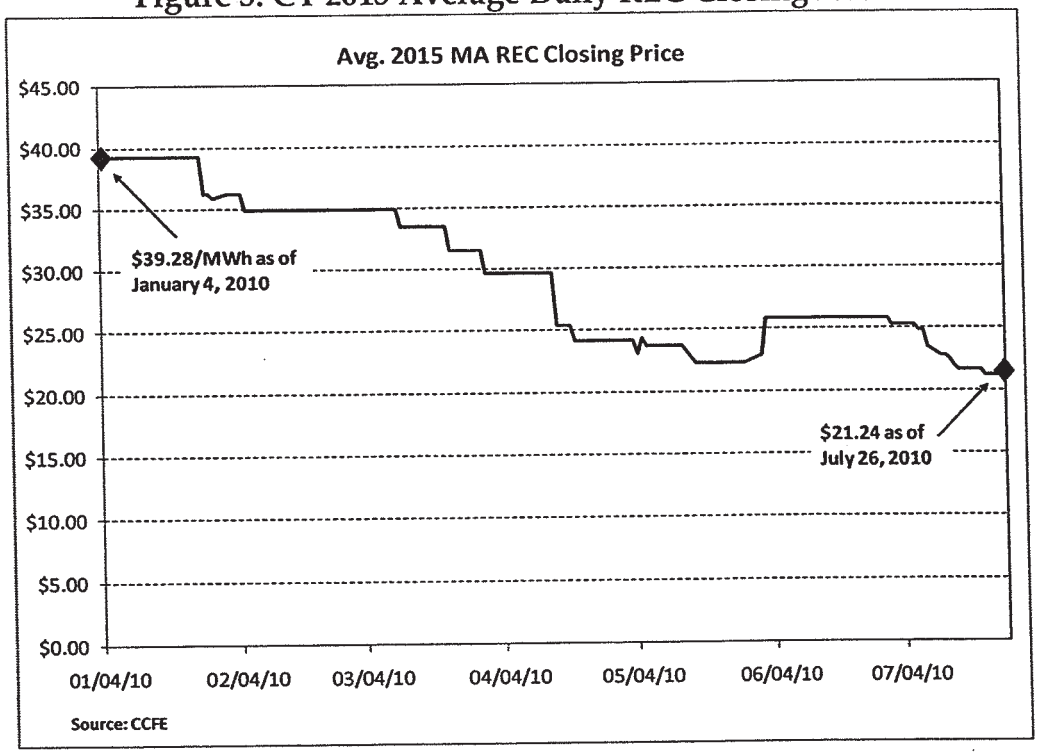


Figure 3: CY 2015 Average Daily REC Closing Price



Q **PLEASE EXPLAIN THE SIGNIFICANCE OF THESE THREE CHARTS SHOWING MASSACHUSETTS REC PRICES.**

A Figures 1 through 3 all reveal the same expectations of much greater qualifying renewable generation supplies. Figure 1, for example, shows that, in January of this year, the July 2010 REC price was just over $33.[61] However, as of July 26, 2010, close to the end-of-month settlement date, the REC price has fallen by more than half to $15.50/MWh. This price drop reflects larger quantities of renewable generation supplies than had been anticipated at the beginning of the year, especially as the July closing reflects RECs generated this year. If the $15.50/MWh price is the final settlement price at the end of July, then the market value of the REC—and the environmental and policy attributes that value is designed to reflect—is by definition $15.50/MWh.

Similarly, the average MA REC price for calendar year 2013 has fallen this year by over 45%, from $36.85/MWh to just $19.78/MWh. Again, the drop in price reflects an expectation of much greater renewable generation supplies. The same pattern holds for 2015 REC prices, which

---

[61] CCFE trades REC contracts on a quarterly basis. For the January and April contract expirations, RECs acceptable for delivery are those having been generated during the calendar year prior to the year of the expiring contract. For the July and October contracts, RECs acceptable for delivery are those having been generated during the calendar year of the expiring contract.

have fallen from $39.28/MWh at the start of this year to $21.24/MWh as of July 26, 2010.

Q IS IT POSSIBLE FOR THESE REC PRICES TO INCREASE AGAIN?

A Yes. Just as natural gas futures prices can fluctuate, so can REC prices or any other futures market prices. However, it is critical to understand that the futures market price reflects the most current expectation of the market as to the value of RECs and is thus superior to a "manufactured" forecast that does not rely on market information.

Q DR. TIERNEY TESTIFIES THAT THESE REC PRICES DO NOT FULLY CAPTURE THE VALUE OF NON-PRICE FACTORS FOR RENEWABLE GENERATION. DO YOU AGREE?

A No. To assert, as Dr. Tierney does,[62] that these REC prices do not fully reflect the value of renewable resources, is baseless. Again, REC markets were created by policy makers specifically to capture the value of all of the attributes they wished to capture, otherwise they would have

---

62 Dr. Tierney identifies two such "other" sources of value non captured by REC prices: "(a) locational attributes that affect the extent to which the fuel supply may emanates from domestic or in-region resources ... and (b) fuel supply and price attributes that may make the resource less vulnerable to risk over the long term related to the potential for supply disruptions ..." Tierney Direct at 76:4–8. In fact, these two sources of value are the same thing and, in establishing REC markets, policy makers clearly sought to promote the development of domestic renewable resources to reduce supply-risk disruptions.

established higher REC requirements. Dr. Tierney's unsubstantiated assessments are simply an attempt to overvalue the Cape Wind resource by ignoring the readily available market data for environmental attributes, including RECs, which have shown a steady to declining value.

Q BOTH NATIONAL GRID WITNESS MILHOUS AND CAPE WIND WITNESS STODDARD PRESENT ESTIMATES OF THE PRICE "SUPPRESSION" BENEFITS THAT WILL BE MADE POSSIBLE BY CAPE WIND. DO YOU AGREE WITH THESE ESTIMATES?

A No. First, price "suppression" is not an economic benefit at all. It is what economists call a "transfer payment." The estimates of the price "suppression" benefits put forth by National Grid witness Milhous, based on a study prepared by ESAI, and the study prepared by Cape Wind witness Stoddard, misleadingly characterize such transfer payments as "benefits." Second, all new generating supplies, not just Cape Wind similarly "suppress" prices. Any generating resource assumed to bid into the market at a zero price will achieve the same "price suppression" effect as Cape Wind. This is a consequence of basic supply and demand. Third, the price "suppression" studies proffered by these witnesses' testimony are entirely speculative and based on outdated information.

Q **WILL THE CAPE WIND PROJECT AND THE PPA PROVIDE ECONOMIC BENEFITS, SUCH AS NET JOB CREATION, FOR MASSACHUSETTS?**

A No. As I discuss in Section IV, infra, the job-killing impacts of Cape Wind, which stem from the higher electric prices it will force National Grid ratepayers to pay, will far outstrip the job creation impacts of operating the facility. Using the minimum possible price under the PPA and the forecast of future market prices, I estimate the PPA will result in the loss of 590 state jobs per year in the first year of the contract, and increasing to over 800 jobs per year by the year 2020, because of the higher cost National Grid ratepayers will be forced to pay for the electricity they consume. Moreover, this estimate does not include the job losses the second Cape Wind PPA will cause. Nowhere do either National Grid witness Tierney or Cape Wind witness Duffy discuss these adverse economic impacts, which will far outstrip the few maintenance jobs that Cape Wind will provide. Furthermore, a study prepared by the Beacon Hill Institute of Suffolk University concluded that the project would also

result in a significant loss of tourism-related jobs, even after accounting for the permanent maintenance job additions provided by Cape Wind.[63]

Q BASED ON YOUR REVIEW OF THE EVIDENCE PRESENTED BY NATIONAL GRID AND CAPE WIND WITNESSES, AS WELL AS YOUR OWN INDEPENDENT ANALYSIS, IS THE CAPE WIND PPA COST-EFFECTIVE?

A No. First, it is clear there are other, less costly renewable resources that National Grid could have entered into agreements with, based on the responses to the Company's own RFP. Moreover, the fact that Massachusetts forward REC prices have declined significantly indicates significant anticipated increases in renewable energy resource supplies. Second, the fact that the Cape Wind PPA is more than double the projected market price of electricity provided by National Grid over the 15-year contract term, and far greater than the sum of market prices and REC prices, is *per se* evidence that the PPA is not cost-effective. Third, contrary to the claims that the project will benefit the state's economy, it will instead impose a massive and adverse economic cost on the state

---

[63] *See* J. Haughton, et al., "An Economic Analysis of a Wind Farm in Nantucket Sound," Beacon Hill Institute, at 23, March 2004 ("Beacon Hill Study") (available at http://www.beaconhill.org/BHIstudies.html) (finding that, "even if we allow for the 154 new permanent jobs predicted by the Global Insight study, the net effect would be *that the Cape and Islands could be expected to lose at least 1,000 jobs.*"

economy because of the multi-billion tax the PPA forces Massachusetts residential ratepayers and businesses to pay.

III. THERE ARE AMPLE SUPPLIES OF RENEWABLE RESOURCES

A. Dr. Tierney wrongly compares existing supplies of renewable resources with projected demand for such resources in the year 2025

Q HOW DOES NATIONAL GRID WITNESS TIERNEY JUSTIFY HER CONCLUSION THAT THE DEMAND FOR RENEWABLE GENERATING RESOURCES EXCEEDS THE AVAILABLE SUPPLY?

A Dr. Tierney constructs a strawman argument to reach her conclusion. She states that, "I analyzed the minimum RPS requirements in New England and New York, and the announced supply of renewable projects that might be able to supply renewable power eligible for these regions' RPS requirements."[64] Specifically, she evaluates RPS requirements in the year 2025 and compares the implied demand for renewable generation in that year to the supply of renewable generation that has already been announced.[65] Finding that the expected demand in the year 2025 exceeds today's supply, she concludes there is a renewable resource "gap," for which Cape Wind must be developed to bridge. Such a comparison is wholly invalid.

---

64 Tierney Direct at 71:14–16.

65 *Id.* at 71:18–72:8.

Q **PLEASE EXPLAIN WHY DR. TIERNEY'S COMPARISON IS INVALID.**

A Dr. Tierney's conclusions regarding the inadequacy of renewable generation supplies assumes that the demand for renewable resources in the year 2025 must be met by projects that have already been announced, and ignores new renewable resources that will be built in response to increasing RPS requirements over the next 15 years. In other words, because she finds there are insufficient renewable generating resources in the ISO-NE generation "queue" today to meet the projected demand for renewable energy in the year 2025 (15 years from now), she concludes there is a "shortage" or "gap" of renewable generating resources. Hence, she concludes that Cape Wind's output is needed to bridge that gap. Hence, Cape Wind PPA is cost-effective.

Dr. Tierney testifies that, unless the PPA is approved and Cape Wind is built, there will be insufficient renewable generation to fill the gap between renewable supply and renewable demand under RPS requirements. "I conclude that Cape Wind is needed because its output will help fill the gap in the region's supply of RPS resources and do so in an attractive location in Southern New England."[66]

---

[66] *Id.* at 74:13-15.

Dr. Tierney's argument is intellectual sophistry. It presumes that, in response to increasing RPS requirements over the next 15 years, no new renewable generation development will be announced. Basic economic principles clearly suggest otherwise. As the demand for renewable generation increases, so will the incentive to build new generating resources.[67]

Thus, the renewable generation "gap" is entirely an artificial creation by Dr. Tierney. By comparing announced renewable generating supplies in 2010 to projected renewable demand in 2025, of course there is a "gap." No doubt, there is also a "gap" in the number of cell phones that will be needed to meet projected demand in the year 2025 compared with existing supplies of cell phones, a "gap" in the number of flat-screen televisions, and a "gap" in the number of automobiles that will be needed to replace ones that wear out.

Q HAS DR. TIERNEY ARTIFICIALLY RESTRICTED THE SUPPLY OF RENEWABLE RESOURCES IN ANY OTHER WAYS?

A Yes. In discussing Cape Wind's "contribution to reliability, Dr. Tierney testifies

---

[67] The ESAI report attached to Mr. Milhous's testimony as Exhibit MNM-5 recognizes this fact. See, Milhous Direct, Exhibit MNM-5 at 15.

> First, let me be clear that we are talking about new projects that need to be financed and not existing renewable energy projects. There are many other renewable power projects that might be able to provide a reliability contribution similar to the Cape Wind Project, but such benefits might not occur unless there were sufficient transmission facilities built to support the capability of a remotely located facility to physically deliver its power into Massachusetts.[68]

Dr. Tierney has made an artificial distinction between existing and yet-to-be-financed projects. Projects may have financing arranged, yet not physically exist. The sole purpose of this distinction is to limit the "qualifying" supply of renewable generation by excluding renewables that have either been built since January 1, 2008, are under construction, or have already obtained financing. In this way, Dr. Tierney and National Grid can bootstrap arguments regarding the lack of "qualifying" renewable generation. However, there is no language in Section 83 of the GC Act that restricts consideration of renewable generation to projects that have not secured financing or cannot be financed but for securing a long-term PPA.

Even if, *arguendo*, projects that had already obtained financing were ineligible under Section 83, the costs of such projects would be necessary

---

[68] Tierney Direct at 100:26–101:3.

to use for comparative purposes. As the first paragraph of Section 83 states, in part, "each distribution company ... shall be required ... to solicit proposals from renewable energy developers and, provided reasonable proposals have been received, enter into cost-effective long-term contracts to facilitate the financing of renewable energy generation..."[69] If only projects that had not obtained financing are eligible to considered, the ability to determine whether such proposals are "reasonable" and "cost-effective" is severely compromised, to the detriment or Massachusetts ratepayers. Moreover, since the ultimate goal of Section 83 is to encourage development of new renewable resources, restricting potential resources to yet-to-be-developed alternatives that require the financial assurance of a long-term PPA serves only to hinder that goal.

In addition to such a process lacking any transparency, and violating fundamental principles of fairness, the inherent arbitrariness of this language will discourage participation by bidders. How such an outcome can be consistent with the goals of Section 83 of the GC Act is unclear, to say the least.

---

[69] GC Act, Section 83 (emph. added).

Q HAS THE MASSACHUSETTS DOER ADDRESSED THE SUPPLY OF QUALIFIED RENEWABLES?

A Yes. In November 2008, the DOER concluded that, "The total supply of qualified electricity from New Renewable Generation Units exceeded the demand for the first time since the program began in 2003."[70] In April 2010, DOER found that there were 832 MW of qualified Class I renewable resources located in Massachusetts, excluding Cape Wind.[71] Earlier this month, NSTAR announced it signed contracts for on-shore wind resources and received almost 1,200 MW of renewable generation solicitations in response to its RFP. And, NSTAR's RFP was limited to renewable generating resources located only in Massachusetts.

Q DID DR. TIERNEY CONSIDER ANY RENEWABLE GENERATION THAT IS BEING DEVELOPED IN QUEBEC?

A No. Dr. Tierney admits that she excludes all existing or planned renewable generation in the Eastern Canadian provinces of Québec and New Brunswick, despite the large quantities of wind generation under development in those provinces, such as the 2,004 MW of wind generation

---

70 DOER, "Massachusetts Renewable Energy Portfolio Standard, Annual RPS Compliance Report for 2007," November 2008, at 3.

71 DOER, RPS Class I–Qualified Renewable Generation Units, April 12, 2010, *op. cit.*

that Hydro-Québec contracted for over 2 years ago.[72] This generation is readily available to meet renewable energy needs in Massachusetts and New England. In fact, according to 2007 DOER Compliance Report, wind resources from Quebec and Prince Edward Island are already qualified as Class I renewables and supplying renewable energy into Massachusetts and, in 2007, supplied 13% of Class I RPS resources.[73]

Q WHY DOES DR. TIERNEY IGNORE ALL OF THIS RENEWABLE GENERATION?

A Dr. Tierney argues that there is inadequate transmission capacity today to deliver this generation into New England in the future. Specifically, she states,

> I did not incorporate resources from eastern Canada into my analysis in the first instance, although I have examined options for renewable supply that could be met by increasing the capacity of transmission facilities to provide firm deliveries of power from eastern Canada into New England.[74]

---

[72] See R. Melbardnis, "Hydro- Québec Approves 2,004 MW of wind-power farms," Reuters, May 8, 2008. Available at: http://uk.reuters.com/article/idUKN0540400220080505.

[73] DOER 2007 Compliance Report, Appendix 5.

[74] Tierney Direct at 70:17–21.

In essence, Dr. Tierney justifies her exclusion of renewable resources from Canada because of the need for significant upgrades in transmission infrastructure.[75] This is another strawman argument.

First, Dr. Tierney again wrongly and artificially conflates the future demand for renewable generation with existing supplies and infrastructure. Second, Dr. Tierney ignores several large transmission projects that are already under development or in advanced planning stages. For example, Dr. Tierney ignores the fact that HQ is planning to build and privately finance the Northern Pass project, a high-voltage, 2,000 MW direct current transmission line into southern New Hampshire to boost its export capacity, and the increasing collaboration between the New England Governors and the Eastern province Premiers "to develop the clean energy potential of the combined region."[76]

Third, and perhaps most importantly, Dr. Tierney ignores the fact that significant new transmission capacity must be developed to fully integrate wind generation in the ISO-NE transmission grid, regardless of

---

[75] *Id.* at 71:6–9.

[76] Presentation by Gordon van Welie, "U. S.–Canada Clean Energy Dialogue Increasing Trade in Clean Electricity," May 20, 2010, at 2. Available at: http://events.energetics.com/USCanadaCleanEnergy2010/pdfs/Panel_IV_Gordon_van_Welie.pdf.

the location of wind generation.[77] In other words, without new transmission capacity, the inherently variable output from Cape Wind will adversely affect system reliability.

*******Begin Confidential Material *******

[redacted]

*******End Confidential Material *******

[77] I discuss wind integration, transmission, and reliability issues in more detail in Section III.B, infra.

[redacted]

[redacted][78]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

78 Calculated as 468 MW x 8,760 hours x 37.1% capacity factor.

[redacted][79]

*******End Confidential Material *******

[79] *See* PPA Agreements, Section 3.1(c).

Q IN RESPONSE TO ITS RFP, DID NATIONAL GRID RECEIVE BIDS FROM ANY RENEWABLE GENERATION SUPPLIERS THAT WERE LESS COSTLY THAN CAPE WIND?

A Yes. And National Grid's rejection of those resources belies the renewables "gap" argument proffered by both Dr. Tierney and Mr. Milhous.

Q PLEASE EXPLAIN.

A In his testimony, Mr. Milhous states

> we do not consider the choice now to be whether to purchase Cape Wind or land-based wind. As explained in great depth in Dr. Tierney's testimony, the Cape Wind project is needed in any event to help meet the regional RPS requirements and to advance the off-shore wind industry as an integral part of the renewable energy future for Massachusetts and the region.[80]

This argument has no economic merit whatsoever. First, there is no language in Section 83 of the GC Act that mandates development of an offshore wind industry.

Mr. Milhous's statement contradicts his own testimony that National Grid evaluated the renewable resources offered in response to the RFP and determined that Cape Wind was better-suited. Specifically, Mr. Milhous testified that

---

[80] Milhous Direct at 30:10–14.

> [a]n assessment of the amounts, technologies, development status and location of the renewable projects offered, and an assessment of how the Cape Wind project furthers other objectives stated in the law, persuaded National Grid that Cape Wind was the one project most likely to significantly advance the objective of a strong renewable energy future for Massachusetts and the region.[81]

Nowhere in his testimony does Mr. Milhous describe how National Grid made this assessment. Yet, contracting with other lower-cost renewable resources would, by definition, further the goal of meeting the regional RPS requirement, would further diversify energy resources and reduce dependence on fossil fuels, just as Mr. Milhous testifies will be accomplished by Cape Wind.[82]

Similarly, nowhere in his testimony does Mr. Milhous state whether National Grid compared Cape Wind and the renewable resources bid in response to its RFP using the RFP evaluation guidelines that the Company itself developed. Moreover, Mr. Milhous testifies that "land-based wind proposals were generally the lowest unit cost, followed by

---

[81] Milhous Direct at 29:12–17.

[82] *Id.* at 10:16–17.

biomass energy."[83] If National Grid has concluded that it will need to purchase Cape Wind and land-based wind and biomass resources to meet the renewable resource "gap" alleged by Dr. Tierney and Mr. Milhous, why did the Company not contract with these less costly, Massachusetts-based, wind and biomass resources that were offered to it in response to the RFP? Even if said resources were not available immediately, neither is Cape Wind. Moreover, these alternative resources would be available long before Dr. Tierney's 2025 deadline.

Q **HOW DID THE ON-SHORE WIND AND BIOMASS RESOURCES BID IN RESPONSE TO THE RFP COMPARE TO CAPE WIND?**

A According to Milhous Exhibit MNM-8, the combined capacity of the conforming on-shore wind and biomass resources offered in response to National Grid's RFP was 289.1 MW. The estimated annual renewable energy production from these renewable resources is shown to be 1,626,746 MWh. This level of production is more than double the 760,000 MWh that National Grid estimates to be the annual purchases associated with its share of Cape Wind. The biomass bid alone is shown to provide an estimated 1,279,159 MWh, almost 70% more generation than Cape

[83] Milhous Direct at 29:8–9.

Wind. Therefore, under National Grid's own definition of "contributing to reliability," the output from the biomass facilities that were bid in response to the RFP would provide a much larger contribution to reliability than Cape Wind, and at a lower cost. As such, for purposes of contributions to reliability, the biomass resources are clearly more cost-effective than Cape Wind. Moreover, the RFP was limited to Massachusetts-based generation resources. Had the RFP solicited bids from out-of-state resources, as is now required by the DPU, the amount of lower-cost resources would surely have been far greater.

Regarding "mitigating peak loads," unlike Cape Wind, biomass energy is fully dispatchable, making it a far more valuable resource from a reliability standpoint than either on-shore or off-shore wind. Furthermore, under ISO-NE's forward capacity market (FCM) rules, the 164.6 MW of biomass shown by Mr. Milhous in his Exhibit MNM-8 would receive full capacity credit, whereas the 234 MW of Cape Wind contracted for under the proposed PPA, and having an expected summer peak availability of 29.1%, might be granted only about 68 MW of capacity credit, based on its

projected summer capability.[84] Again, the biomass resources bid in response to National Grid's RFP has a lower cost and would contribute more to mitigating peak loads. Thus, from the standpoint of mitigating peak loads, the biomass bid was clearly superior to Cape Wind.

Q IF, AS MR. MILHOUS TESTIFIES, LAND-BASED WIND AND BIOMASS RESOURCES BID IN RESPONSE TO NATIONAL GRID'S RFP WERE LESS COSTLY AND, IN THE CASE OF BIOMASS, PROVIDE GREATER PEAK MITIGATION AND RELIABILITY BENEFITS, WHY DID NATIONAL GRID NOT SELECT THESE RESOURCES?

A In arguing why the PPA is cost-effective relative to other renewable resources that are less costly and clearly available, Mr. Milhous testifies that, "the Cape Wind project was the only viable, large scale off-shore wind project in the region with the ability to complete construction in the next few years and supply renewable power to National Grid's customers.[85] Again, this is a strawman argument.

---

84 Intermittent generation like wind must file with ISO-NE both summer and winter claimed capability, based on "measured and recorded site-specific summer and winter data relevant to the expected performance of the Intermittent Power Resource." See ISO-NE, Market Rule I, Section III.13.1.1.2.2.6(b).

85 Milhous Direct at 11:12–14. Cape Wind witness Duffy makes the same false argument, stating "although there are no off-shore wind-energy facilities currently in operation in the United States, the pricing negotiated by National Grid with Cape Wind compares favorably to the off-shore wind-energy facilities that are now in operation in Europe." Duffy Direct at 23:15–18.

Q **PLEASE EXPLAIN.**

A Mr. Milhous is arguing that the proper evaluation framework is between Cape Wind and other offshore wind resources, knowing full well that: (1) there are no other off-shore wind resources, and (2) nothing in the GC Act limits cost-effectiveness comparisons to between the same type of renewable generation (e.g., offshore wind to offshore wind, biomass to biomass, etc.). As he states in his response to Information Request APNS 1-6(a) (previously attached as Exhibit JAL-2), "National Grid concluded that the pricing in the PPAs was within an 'acceptable' range for offshore wind projects."

Q **DOES MR. MILHOUS PROVIDE ANY ACTUAL $/MWH VALUES FOR THAT "ACCEPTABLE" RANGE OF PRICES FOR OFFSHORE WIND PROJECTS?**

A No. Thus, Mr. Milhous's statement is simply not credible. Moreover, in his response to Information Request AG 2-3 (previously attached as Exhibit JAL-3), Mr. Milhous refers to testimony filed by Mr. Clif Hamal on behalf of Deepwater Wind.[86] Mr. Hamal summarized a number of renewable energy project costs, including offshore wind projects. Exhibits 3 and 4 of Mr. Hamal's testimony provide pricing for a

[86] *In Re: Review of New Shoreham Project Pursuant to R.I. Gen Laws § 39-26.1-7*, Docket No. 4111, Direct Testimony of Clif Hamal, December 9, 2009.

number of offshore wind projects, as well as other renewable generation projects.[87]

Thus, even if one accepted, *arguendo*, Mr. Milhous's assumption that the appropriate cost comparison for cost-effectiveness purposes under Section 83 of the GC Act is against other offshore wind projects, Mr. Hamal's Exhibit 3 shows that the feed-in tariff prices for offshore wind projects in Germany and Ontario, as well as the proposed price for the Bluewater Wind Project, are all equal to or less than the minimum PPA price for Cape Wind in the year 2013 and, since none of the former escalate at 3.5% annually, are all far lower than the price of the Cape Wind PPA in the year 2023.

For comparison purposes, the minimum Cape Wind PPA price in the year 2023, including National Grid's 4% premium, is $303.67/MWh.[88] By comparison, according to Mr. Hamal, the 2023 feed-in tariff price in Germany will be between $202/MWh and $233/MWh. The 2023 feed-in tariff price in Ontario will be $190/MWh, 10% less than the minimum

---

87 Attached as Exhibit JAL-5.

88 Equals $207.00/MWh x $(1.035)^{10}$ x (1.04).

Cape Wind PPA price in 2013. And, the Bluewater Wind contract price in 2023 will be $177/MWh.

Given these prices, which are referenced by Mr. Milhous himself, it is difficult to fathom how Mr. Milhous concludes that the Cape Wind PPA prices were within an "acceptable" range of other offshore wind prices. The plain evidence is that the Cape Wind PPA price is far higher than any of these offshore wind alternatives.

Q PLEASE DISCUSS THE ESAI ANALYSIS OF RENEWABLE GENERATION SUPPLIES, WHICH IS ATTACHED TO MR. MILHOUS'S TESTIMONY AS EXHIBIT MNM-5.

A The report prepared by Energy Security Analysis, Inc. ("ESAI") and attached to Mr. Milhous's testimony as his exhibit MNM-5, purports to show that the demand for renewable resources will outstrip available supplies beginning in 2015 until 2026.[89] However, the ESAI report's conclusions are based on a highly flawed analysis of the ISO-NE generating resource queue.

For its analysis, ESAI estimated the probability that individual renewable generation projects in the queue would be brought on-line, based on an analysis performed by ISO-NE of completion performance of

[89] Exhibit MNM-5 at 18, Figure 5.

all generating resources in queue between 1997 and 2008.[90] There are a number of problems with this approach, beginning with ESAI's assumption that the probability of bringing a renewable resource on-line is identical to the probability of bringing any generating resource on-line. Second, ESAI misuses the ISO-NE data, by failing to include projects that are still active in the queue, but are not yet on-line. As the very ISO-NE report that ESAI relies on states. "Since the queue's inception, proposed projects totaling approximately 35,600 MW have been withdrawn, reflecting a megawatt attrition rate of close to 60%."[91] Thus, even if one accepts, *arguendo*, the underlying assumption that the completion probability of renewable resources is no different than all resources combined, then a more accurate probability value to use is 40% (100% – 60%), rather than the 20% value used by ESAI. In other words, the actual probability of completion is double what ESAI assumed.

Q **PLEASE CONTINUE.**

A It is also instructive to examine the change in renewable resources in the queue over time. For example, in 2008, there were a total of 1,845

---

90 Exhibit MNM-5 at 12–13.

91 ISO-NE, *2008 Regional System Plan* at 50–51 (fn. omitted).

MW of wind generation in the ISO-NE queue. In 2009, that amount increased by almost 700 MW, to 2,533 MW, a 37% increase. [92] As of April 2010, the wind generation amount in the queue had increased to 2,652 MW, a 44% increase over 2008.[93] Wind generation now comprises 30% of the entire ISO-NE generation queue.

Furthermore, like Dr. Tierney, ESAI ignores renewable resources being developed in Canada. Given that over 2,000 MW of wind power has already been contracted for by Hydro-Québec, the likelihood of continued wind resource development in Quebec and New Brunswick, and the construction of new transmission capacity to deliver this power into the New England market, excluding these renewable supplies is arbitrary, biased, and serves only to artificially overvalue the Cape Wind resource.

Q DID THE ESAI ANALYSIS ADDRESS HOW THE PROBABILITY OF RENEWABLE RESOURCE DEVELOPMENT WILL BE AFFECTED BY THE INCREASED DEMAND FOR RECS?

---

92 ISO-NE, *2009 Regional System Plan* at 51, Figure 4-4.

93 ISO-NE, *ISO New England Interconnection Queue*, Presentation to the PAC Meeting, May 25, 2010, at 4. Available at: http://www.iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/pac/mtrls/2010/may252010/queue.pdf.

A No, and this is a critical flaw of the ESAI analysis. From an economic standpoint, the probability that renewable resources that are in the queue will be completed is also driven by the value of renewable attributes. Thus, as the demand for RECs increases over time and with it, the market price of RECs, the economic incentive to bring new renewable generating capacity on-line will also increase. Ironically, the ESAI report itself recognizes this economic incentive, stating: "Higher Alternative Compliance Payments will drive additional development."[94] However, the ESAI analysis fails to reflect this fact in projecting the amount of resources that will come on-line in future years.[95] This means that ESAI's analysis is understating future supplies of renewable resources, whose developers will respond to the economic signals that RECs have been designed to provide.

B. Transmission Infrastructure Additions in New England are Irrelevant for Evaluating the Cost-Effectiveness of Cape Wind Based on Alternative Renewable Generation Supplies

Q DR. TIERNEY TESTIFIES THAT CAPE WIND IS PREFERABLE TO OTHER RENEWABLE GENERATION BECAUSE IT IS NEAR A LOAD

---

94 Exhibit MNM-5 at 15.

95 *Id.*

CENTER AND DOES NOT REQUIRE MAJOR TRANSMISSION INFRASTRUCTURE ADDITIONS. DO YOU AGREE?

A No. Dr. Tierney testifies that, "[a] renewable project located in southern New England has the advantage of being close to customers and thus more likely to be able to be integrated into the system without the need for significant (and potentially costly) expansion of the region's transmission system."[96] This statement completely ignores several facts. First, without additional transmission infrastructure built in New England, wind power cannot be fully integrated into the ISO-NE system and, as such, will adversely affect system reliability. Thus, Dr. Tierney's statement is simply wrong. Second, because new transmission infrastructure will be developed to integrate wind power in New England, the locational advantage she attributes to Cape Wind is irrelevant from a cost-effectiveness standpoint.

Q **THE ISO-NE RENEWABLE TRANSMISSION STUDY STATES THAT FOCUSING ON OFFSHORE WIND WILL RESULT IN THE MOST COST-EFFECTIVE USE OF NEW AND EXISTING TRANSMISSION FACILITIES. DOES THIS MEAN CAPE WIND IS COST-EFFECTIVE?**

A No. The ISO RTS prepared for the New England Governors Association states that

---

[96] Tierney Direct at 12:15–18.

> The analysis of transmission development required to support the integration of New England wind resources indicates that focusing on offshore wind resource integration results in the most cost effective use of new and existing transmission. This transmission configuration also allows for the integration of some near-shore inland wind resources.[97]

The cost of the transmission infrastructure needed under ISO-NE's offshore wind scenario was estimated to be $6.1 billion (2009$).[98] However, although this transmission infrastructure cost is lower than some of the other scenarios evaluated, it is irrelevant for the purpose of evaluating the Cape Wind PPA in this proceeding.

Q **PLEASE EXPLAIN WHY THE COST OF NEW TRANSMISSION INFRASTRUCTURE ADDITIONS IN NEW ENGLAND ARE IRRELEVANT FOR EVALUATING THE COST-EFFECTIVENESS OF CAPE WIND.**

A First, it is not reasonable to base a cost-effectiveness analysis of the PPA on a generic ISO-NE scenario. There is no guarantee that the specific off-shore wind scenario, or any of the other scenarios posited by ISO-NE, will occur. ISO-NE assigned no probabilities whatsoever to any of the scenarios developed. Second, the fact that ISO-NE determined that a

---

[97] ISO RTS at 3.

[98] *Id.* at 21, Table 6.

focus on offshore wind development would "result in the most cost effective use of new and existing transmission" is completely different from a conclusion that the Cape Wind PPA is cost-effective. The only useful test of cost-effectiveness is one based on the combined cost of generation and transmission development throughout New England, including greater interconnection with New York, PJM, and eastern Canada. National Grid clearly has not performed any such analysis on which to determine Cape Wind is cost-effective.

Q **WHY WOULD CAPE WIND REQUIRE ADDITIONAL TRANSMISSION INFRASTRUCTURE DEVELOPMENT BESIDES A LOCAL INTERCONNECTION TO THE ISO-NE GRID?**

A Wind power is inherently variable. Therefore, extensive transmission construction must be undertaken to connect geographically dispersed alternative generation resources to back-stop the large intermittent resource that will be unavailable for approximately two-thirds of all hours, and three-fourths of all hours during the summer peak season, and which can be unavailable at any time. For example, a study published in January 2010 by the National Renewable Energy Laboratory ("NREL) states that "New transmission will be required for all the future

wind scenarios in the Eastern Interconnection, including the Reference Case."[99]

The report also discusses how adding wind capacity will require significant additions of operating reserves. "With large amounts of wind generation, additional operating reserves (see sidebar) are needed to support interconnection frequency and maintain balance between generation and load."[100] These reserves include contingency, operating, and regulation reserves, and can be extremely expensive to obtain.[101] For example, in the Summer 2010 forward reserve auctions, the clearing price in the Connecticut (CT) load zone was $13,900/MW-month.[102] By comparison, the price of capacity established for this summer is $4,500/MW-month, less than one-third the forward reserve price.

---

99 NREL Integration Study at 27.

100 NREL Integration Study at 41.

101 For example, in some cases, generating resources must be paid to continue operations at above-market rates for reliability purposes. Such "reliability must run" ("RMR") generation is reimbursed based on operating costs.

102 ISO-NE, Forward Reserve Auction Results Report, April 30, 2010. Available at: http://www.iso-ne.com/markets/othrmkts_data/res_mkt/summ/2010/forward_reserve_auction_results.pdf.

Q **CAN YOU EXPLAIN THE SIGNIFICANCE OF REGULATION RESERVES AND WHY THEY ARE IMPORTANT FOR INTEGRATING WIND GENERATION?**

A Yes. Regulation reserves are used to maintain the entire transmission system at the correct operating frequency. Regulation reserves take the form of automatic generation control ("AGC"), which ramps the output of individual generators up and down automatically to meet instantaneous changes in demand and supply. Massachusetts ratepayers will bear additional costs that are not included in the PPA price because of the additional regulation reserves needed to ensure that Cape Wind does not adversely affect system stability.

Second, as the ISO RTS that Dr. Tierney cites in her testimony makes clear, new transmission infrastructure projects will need to be built to integrate additional renewable generation, whether or not Cape Wind is built.[103] For example, the Base Case scenario in the ISO RTS assumes 4,000 MW of onshore and offshore wind resources and concludes

> For all configurations contemplating 4,000 MW or more of wind, the energy is assumed to be delivered by new backbone transmission to the same four locations in southern New England: the Southington and Manchester substations in Connecticut, and the Millbury and Tewksbury

[103] Tierney Direct at 65:1–12.

> substations in Massachusetts. If future detailed planning studies show that this scenario cannot be implemented at the 345 kV level, 500 kV transmission would be used. This configuration would require approximately 3,615 circuit miles of new transmission."[104]

What this means is that, with or without Cape Wind, new transmission infrastructure must be developed to support the supply of renewable resources in New England that Dr. Tierney testifies must be developed to meet future renewables demand and to ensure system reliability. Thus, for Dr. Tierney to conclude, as she does, that Cape Wind is cost advantageous because it does not require transmission upgrades is completely false.

Q HAS NATIONAL GRID ADDRESSED RELIABILITY CONCERNS ABOUT WIND GENERATION IN OTHER PROCEEDINGS?

A Yes. In comments submitted to FERC on April 12, 2010, National Grid itself noted the potential adverse impacts on system reliability caused by intermittent resources like wind, stating the following:

> One of the challenges from the intermittent nature of these resources is an increase in overall system variability, as measured by net load variability. Balancing authorities need to continue to monitor ramping and net load following

[104] ISO RTS at 16.

> performance to ensure sufficient regulating reserves. While power systems are inherently designed to respond to system net load variability, an unanticipated large increase in system net load variability could present difficulties for system operations and adversely impact system reliability.
>
> ...
>
> In the near term, increasing the amount of VERs that can be reliably integrated into the system and delivered to load may require new operating procedures, market rules, new storage technologies, and dynamic demand response, as well as transmission reinforcements.
>
> ...
>
> While National Grid supports reductions in carbon emissions and the increased role of VERs to accomplish national environmental policy goals, it does not favor the integration of VERs without due consideration of rate impacts and/or the cost of alternatives.[105]

A "large increase is system net load variability"[106] is precisely what Cape Wind will create on the ISO-NE grid, and which will force ratepayers to bear the costs of additional regulation reserves. Yet, for purposes of this proceeding, National Grid completely ignores this issue and instead had adopted a definition of "contribution to reliability"—generation delivered into Massachusetts—that is simplistic and inaccurate.

---

105 *Integration of Variable Energy Resources*, Docket No. RM10-11-000, Comments of National Grid USA, April 12, 2010 ("VER Comments") at 3–5.

106 "Net load variability" is the combination of load and intermittent generation variability.

Similarly, in *Westar Energy*, the Commission agreed with Westar that variable energy resources like wind impose a significantly higher regulation burden on its transmission system.

> Westar asserts that intermittent generation places a heavier burden on its system than dispatchable generation and has provided data supporting this claim. Specifically, Westar's analysis submitted in response to the deficiency letter provides data showing, among other things, that intermittent generators' deviations from the deployment signal are more than three times greater than those of dispatchable generators. Accordingly, the Commission finds that Westar's proposal reasonably assesses intermittent generation a higher regulation requirement consistent with cost causation principles.[107]

In an April 16, 2010, Compliance Filing, Westar's revised tariff states,

> The obligation to the Transmission Provider for providing this Generator Regulation and Frequency Response Service shall be 0.94% for dispatchable resources or 4.01% for wind generation and other non-dispatchable resources times the amount of generation inside the Westar Balancing Area times the applicable charge set forth below.[108]

The applicable annual charge for this service is $53,358.74 per MW.

---

[107] *Westar Energy, Inc.*, 130 FERC ¶ 61,215 (2010), at P 36 (fn. omitted).

[108] *Westar Energy, Inc.*, Docket No. ER09-1273- 001, Compliance Filing, April 16, 2010, at 2-3.

Oddly, though, despite findings of the Commission, and National Grid's own comments to the Commission on integrating VERs, National Grid now completely ignores its findings.

Q DR. TIERNEY ALSO CITED TRANSMISSION CONSTRAINTS INTO THE SOUTHEAST MASSACHUSETTS ("SEMA") LOAD ZONE AS ANOTHER BENEFIT OF CAPE WIND. DO YOU AGREE?

A No. To further her arguments that the location of Cape Wind provides special advantages, Dr. Tierney discusses transmission congestion into the Southeast Massachusetts ("SEMA") load zone. Specifically, she states that SEMA, "is a portion of the regional grid where reliability constraints in 2009 caused the grid operator to operate another generating station out-of-economic merit order for reliability reasons during many hours."[109]

What Dr. Tierney does not state, but which ISO-NE discusses in its *2009 Annual Markets Report*, is that congestion into the SEMA load zone dropped significantly because of the Tremont East transmission improvements that went into service in Lower SEMA at the end of the second quarter of 2009.[110] According to ISO-NE. those improvements, "all

---

[109] Tierney Direct at 95:17–96:3.

[110] ISO-NE, *2009 Annual Markets Report*, May 18, 2010, at 9.

but eliminated the need to commit a Canal unit,"[111] and "allowed a tightening of real-time commitment practice, which further reduced the amount of capacity committed above minimum requirements, improving dispatch and pricing."[112] What this means is that the value of having additional local generation in the SEMA zone to address transmission constraints has been all but eliminated.

Furthermore, Dr. Tierney's testimony is contradicted by National Grid witness Milhous, who states that, "National Grid believes in the continued need to build-out the New England transmission system to access renewable resources outside of Massachusetts to meet RPS obligations."[113] If such transmission will be built regardless of whether Cape Wind is developed then, from a cost-effectiveness determination standpoint, the costs associated with that additional transmission infrastructure is irrelevant. Since the costs of these transmission upgrades appear in all of the alternatives, they do not affect the relative cost-effectiveness rankings of the alternatives.

---

[111] *Id.* at 14.

[112] *Id.* at 6.

[113] Milhous Direct at 30:21–31:1.

D. "Market-barriers" and Renewable Generation Development

Q PLEASE DESCRIBE THE CONTEXT IN WHICH NATIONAL GRID WITNESS TIERNEY RAISED THE ISSUE OF "MARKET BARRIERS" TO JUSTIFY THE CAPE WIND PPA.

A In her testimony, Dr. Tierney attempts to bootstrap the cost-effectiveness of the Cape Wind PPA by raising the specter of "market barriers" that prevent renewable resource development. Specifically, she testifies that

> the Green Communities Act envisions a cost-effectiveness concept that is designed to overcome certain non-monetary barriers to entry for early-mover projects. These barriers are impeding the development of a vibrant renewable energy market in the region.[114]

In essence, Dr. Tierney is arguing that the Cape Wind PPA must be approved despite its cost because, if it is not approved, market barriers will prevent developing the supply of renewable resources needed to meet the demand established by policy makers through RPS requirements. In addition to being circular, her argument has no economic validity because high cost, in itself, is <u>not</u> a market barrier, as I discuss below.

Q HOW DOES DR. TIERNEY DEFINE "MARKET BARRIER?"

---

[114] Tierney Direct at 23:3–6.

A Dr. Tierney defines market barriers, or "barriers to entry," as comprising non-monetary attributes that may not be fully valued,[115] such as locational aspects,[116] fuel supply and price characteristics that reduce volatility,[117] the technical and economic potential of renewable resources,[118] permitting,[119] and the inability to obtain long-term financing because of capital–intensiveness.[120] Of these purported "barriers to entry," the only possible legitimate barrier she cites is permitting, in which existing suppliers may influence the permitting process to inhibit competition.

By adopting this definition of "market barriers," Dr. Tierney can then argue that the Cape Wind PPAs' high cost relative to other renewable resources, to say nothing of its high cost relative to the wholesale market price of electricity, is justified because development of Cape Wind will help overcome these market barriers.

---

115 *Id.* at 75:16–18.

116 *Id.* at 76:4–6.

117 *Id.* at 76:7-10.

118 *Id.* at 76:15–20.

119 *Id.* at 77:4–6.

120 *Id.* at 79:4–7.

Q **PLEASE PROVIDE AN ECONOMIC DEFINITION OF "MARKET BARRIER?"**

A The terms "market barrier" and "barrier to entry" are used interchangeably. The Nobel-prize winning economist George Stigler defined a "barrier to entry" as "A cost of producing which must be borne by a firm which seeks to enter an industry but is not borne by firms already in the industry."[121] What this means is that a firm with a product whose cost is high relative to the market does not face a barrier to entry solely because its product is costly.

For example, the fact that not everyone can afford to purchase a Rolls-Royce does not mean Rolls-Royce faces market barriers that, to overcome, require policies specifying the minimum percentage of Rolls-Royce cars that must comprise the entire automobile stock.

One may object to this analogy because Rolls-Royce vehicles do not provide various external social benefits, such as public goods like a park or national defense. Suppose, therefore, we consider renewable energy to be a type of public good, having attributes that society values, but for which not all of the attributes are priced in the market. The appropriate

---

[121] G. Stigler, *The Organization of Industry*, (Chicago, IL: University of Chicago Press, 1968).

economic solution, and one which already has been instituted, is to establish a market for these non-market attributes, such as reductions in fuel price volatility, reduced dependence on foreign oil, and so forth. Once such a market (or markets) has been established, the market will fully value the public good.

Q **WHAT MARKETS HAVE BEEN ESTABLISHED THAT VALUE THESE NON-MARKET ATTRIBUTES OF RENEWABLE RESOURCES?**

A For renewable resources, the policy tool that has been used to establish this market mechanism is RECs. Massachusetts and other state policy makers have established REC requirements, which implicitly place a monetary value on all renewable resource attributes beyond the value of the electricity produced. At the federal level, the government has established investment and production tax credits. Furthermore, some form of national RPS standard has been discussed in Congress.

The value of the RECs produced by a renewable generating resource can be fully capitalized over time. In other words, a lender can determine that RECs will have an expected monetary value over time. That stream of value can be discounted back to the present, just like the expected value of the electricity a generating resource will produce over

its lifetime, and just like the value of a stock reflects the present value of future expected cash flows in the form of dividends and price appreciation. Similarly, one can discount the expected future stream of revenues from reductions in carbon emissions, sulfur dioxide, and NOx.

With the additional value of the renewable resource incorporated as a value, a lender can evaluate the full costs and benefits of the resource. This is particularly easy in the case of a renewable resource like wind generation, since it has no fuel cost and minimal operating costs. If the present value of the stream of future revenues exceeds the present value cost by an amount equal to or greater than the lender's opportunity cost of capital for projects having comparable risk, then the project will be financed. This is true for any capital investment.

Q DOES DR. TIERNEY AGREE THAT RECS PROVIDE THIS MARKET AND THUS ELIMINATE BARRIERS TO ENTRY FOR RENEWABLE RESOURCES?

A No. What Dr. Tierney argues is that the capitalized value of RECs, tax credits, and emissions reductions is still insufficient to finance a project like Cape Wind. Perhaps this is why National Grid witness Milhous testifies that the negotiated PPA price included contingencies for National Grid and its ratepayers to guarantee the value of federal investment and

production tax credits: "The tax credits have a significant impact on the economics of the project. National Grid was advised by Cape Wind and was persuaded that the project could not have moved forward with project financing without them."[122]

What these witnesses are really saying is that the present value of the expected stream of revenues from sales of Cape Wind's output into the New England electric market, plus the present value of future revenues from the sale of RECs, plus the present value of the investment tax credit or production tax credit the project will receive (or, in lieu of those credits, a higher contract price), is less than the cost to construct Cape Wind, plus the present value of future operating costs. Dr. Tierney considers such an outcome to be *prima facie* evidence of "market barriers." This is entirely wrong. It simply means that Cape Wind is too expensive.

Q PLEASE EXPLAIN.

A The testimony of Mr. Milhous actually implies that Cape Wind faces no market barriers. Mr. Milhous testifies that, "With the recent federal approval of the project announced by US Secretary of the Interior Salazar, Cape Wind, for all material purposes, is permitted and ready for

[122] Milhous Direct at 19:9–11.

construction."[123] I conclude from this statement that Mr. Milhous is testifying that Cape Wind faces no barriers to entry from the permitting process. Since this is the only legitimate market barrier Cape Wind can face, there are no other market barriers.

Thus, once the price of RECs, emissions reductions, and the various tax credits are accounted for, if Cape Wind still requires an above-market price PPA, then it is simply too costly given how federal and Commonwealth policy makers have themselves determined the value of the non-market attributes.[124] We thus have a situation no different from the expensive Rolls-Royce, which not everyone can afford.

What National Grid witnesses are arguing is that, because Cape Wind's cost is greater than the sum of expected future market prices plus of all of the additional revenues Cape Wind will obtain through tax credits and REC payments, it cannot obtain financing. That is not evidence of a market barrier. Rather, it is basic economics, and is the same reason that a

---

[123] *Id.* at 7:16–18.

[124] Massachusetts policy makers can always mandate higher levels of RECs, effectively increasing the demand for RECs. In that case, the value of RECs produced by Cape Wind will increase in value. Once again, one could compare the stream of revenues from the sale of power, plus the stream of revenues from the sale of RECs, and the value of the investment or production tax credits with the project's present value cost.