STATE OF NEW HAMPSHIRE

BEFORE THE

PUBLIC UTILITIES COMMISSION

Docket No. DE 16-576

DEVELOPMENT OF NEW ALTERNATIVE NET METERING TARIFFS and/or
OTHER REGULATORY MECHANISM and TARIFFS FOR CUSTOMER GENERATORS

PREFILED DIRECT TESTIMONY OF

NATHAN PHELPS

ON BEHALF OF
NEW HAMPSHIRE SUSTAINABLE ENERGY ASSOCIATION

October 24, 2016

Q1. Please state your name and business address.

A1. My name is Nathan Phelps. My business address is 745 Atlantic Avenue, 7th floor, Boston, Massachusetts 02111.

Q2. On whose behalf are you submitting testimony?

A2. I am submitting testimony on behalf of New Hampshire Sustainable Energy Association ("NHSEA").

Q3. By whom are you employed and in what capacity?

A3. I serve as the Program Manager of Distributed Generation ("DG") Regulatory Policy for Vote Solar. In this capacity, I work on initiatives, development, and implementation of policy related to distributed solar generation ("DSG"). I also review regulatory filings, perform technical analyses, and testify in commission proceedings relating to DSG.

Q4. Please describe Vote Solar.

A4. Vote Solar is a non-profit grassroots organization working to foster economic opportunity, promote energy independence, and fight climate change by making solar a mainstream energy resource across the United States. Since 2002, Vote Solar has engaged in state, local, and federal advocacy campaigns to remove regulatory barriers and implement key policies needed to bring solar to scale. Vote Solar is not a trade group and does not have corporate members. Vote Solar

has more than 70,000 individual members throughout the United States and 143 members in New Hampshire.

Q5. Please describe your experience and qualifications.

A5. My primary focus at Vote Solar is utility regulatory issues related to DG. These regulatory issues include: the billing arrangement commonly known as net metering, rate design, rate recovery, and decoupling, primarily within restructured electricity markets in the Northeast. Prior to joining Vote Solar, I was a Senior Economist at the Massachusetts Department of Public Utilities for five years. While at the DPU, I was the primary staff person who worked on issues related to DG and renewable energy, including net metering, interconnection, long-term contracts for renewable energy, and rate-related issues relevant to DG. Prior to joining the DPU, I was a Policy Intern with the Massachusetts Renewable Energy Trust.

I received my undergraduate degree from Willamette University in both Environmental Studies and Politics, and I attended Tufts University for graduate studies in Urban and Environmental Policy and Planning. My resume is attached as Exhibit NHSEA-NP-1.

Q6. Have you previously testified before this Commission?

A6. No, I have not.

Q7. Have you previously testified in other states?

A7. Yes. I have testified before the Maryland Public Service Commission and the Massachusetts Department of Public Utilities. Specifically, I testified in the general rate case of National Grid (Docket D.P.U. 15-155), the proceeding concerning the proposed merger between Exelon Corporation and Pepco Holdings (Case No. 9361), and the general rate case of Southern Maryland Electric Cooperative (Case No. 9396). In addition to testimony, I have provided public comments in Iowa, Maryland, Massachusetts, New York, Oregon, and Vermont.

Q8. What is your understanding of the procedural history of Docket DE 16-576?

A8. On May 2, 2016, New Hampshire House Bill 1116, An Act Relative To Net Metering ("HB 1116") became effective. HB 1116 requires the New Hampshire Public Utilities Commission ("PUC" or "Commission") to "initiate a proceeding to develop new alternative net metering tariffs, which may include other regulatory mechanisms and tariffs for customer-generators, and determine whether and to what extent such tariffs should be limited in their availability within each electric distribution utility's service territory" (HB 1116, ¶ XVI). Accordingly, the Commission opened docket DE 16-576.

Q9. Were you involved in the development of HB 1116?

A9. No, I was not.

Q10. Have you participated in docket DE 16-576 to date?

A10. Yes, I have.

Q11. Does your testimony address all aspects in the proceeding?

A11. No, it does not.

Q12. What does your testimony address?

A12. My testimony addresses two issues: (1) the costs and benefits of DG; and (2) the possibility of cost shifts between DG customers (a.k.a. participants) and non-DG customers (a.k.a. non-participants).

Q13. Please summarize your findings.

A13. After providing information on cost and benefit analyses in Massachusetts, Vermont, and New Hampshire, I conclude that participants provide net benefits to non-participants and New Hampshire society. Furthermore, in consideration of the net benefits that result from DG, there are no cost shifts from participants to non-participants.

Q14. Does HB 1116 require the Commission to consider the costs and benefits of DG?

A14. Yes it does. Specifically, HB 1116, ¶ XVI states "[i]n developing such alternative tariffs and any limitations in their availability, the commission shall consider… the costs and benefits of customer-generator facilities."

Q15. Are "customer-generator facilities" and DG the same?

A15. Pursuant to RSA 362-A:1-a, II-b:

> "Eligible customer-generator" or "customer-generator" means an electric utility customer who owns, operates, or purchases power from an electrical generating facility either powered by renewable energy or which employs a heat led combined heat and power system, with a total peak generating capacity of up to and including one megawatt, that is located behind a retail meter on the customer's premises, is interconnected and operates in parallel with the electric grid, and is used to offset the customer's own electricity requirements. Incremental generation added to an existing generation facility, that does not itself qualify for net metering, shall qualify if such incremental generation meets the qualifications of this paragraph and is metered separately from the nonqualifying facility."

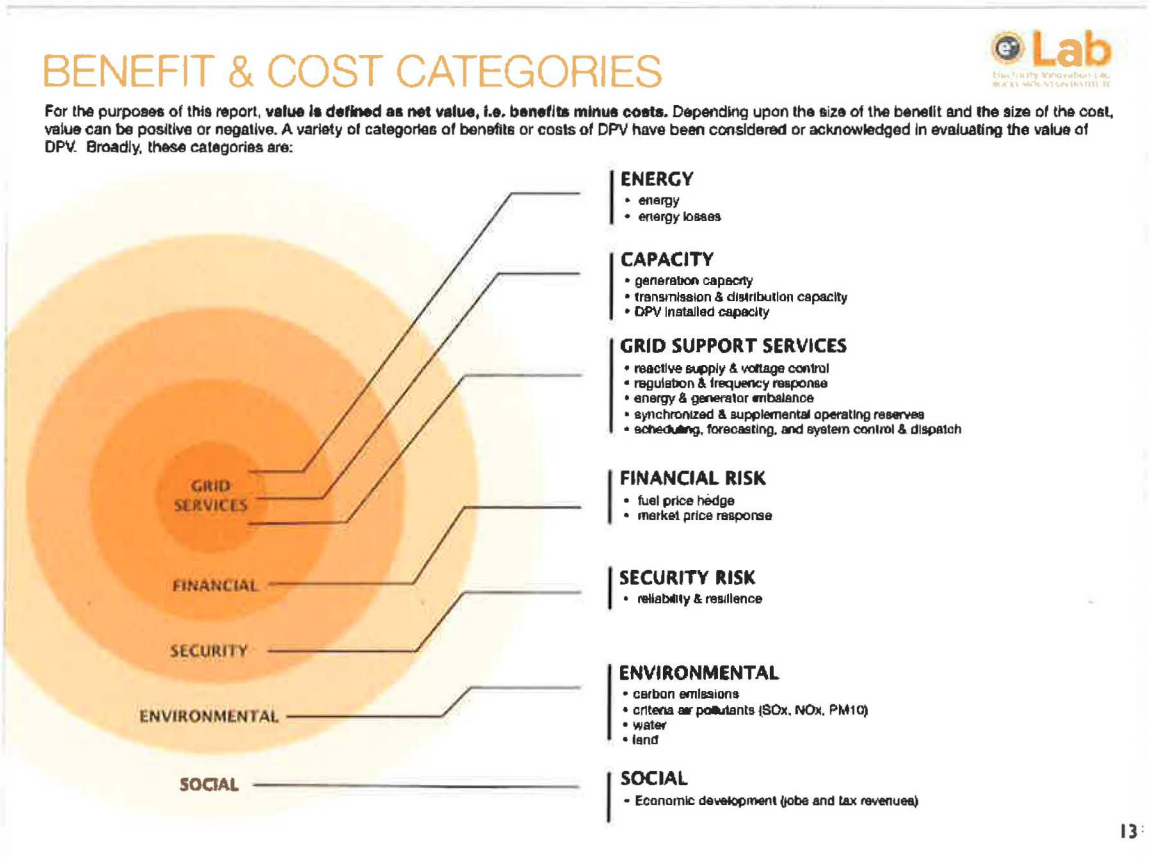
Although this information refers to "eligible customer-generator" or "customer-generator," as opposed to "customer-generator facilities," for the purposes of this testimony, the terms "customer-generator facilities" and "DG" are synonymous.

Q16. What types of costs and benefits should the Commission consider?

A16. There are many benefits of DG. The Rocky Mountain Institute ("RMI") conducted a meta-analysis of benefit and cost studies related to solar ("RMI Study").[1] As part of this analysis, RMI categorized the costs and benefits of solar. Chart 1 below is a summary of the costs and benefits from the RMI meta-analysis.

[1] Lena Hansen & Virginia Lacy, Rocky Mountain Inst., *A Review of Solar PV Benefit and Cost Studies* (2013), available at http://www.rmi.org/Knowledge-Center%2FLibrary%2F2013-13_eLabDERCostValue

Chart 1: Benefit & Cost Categories of DG



Q17. Do you agree with the categories of costs and benefits in the RMI Study?

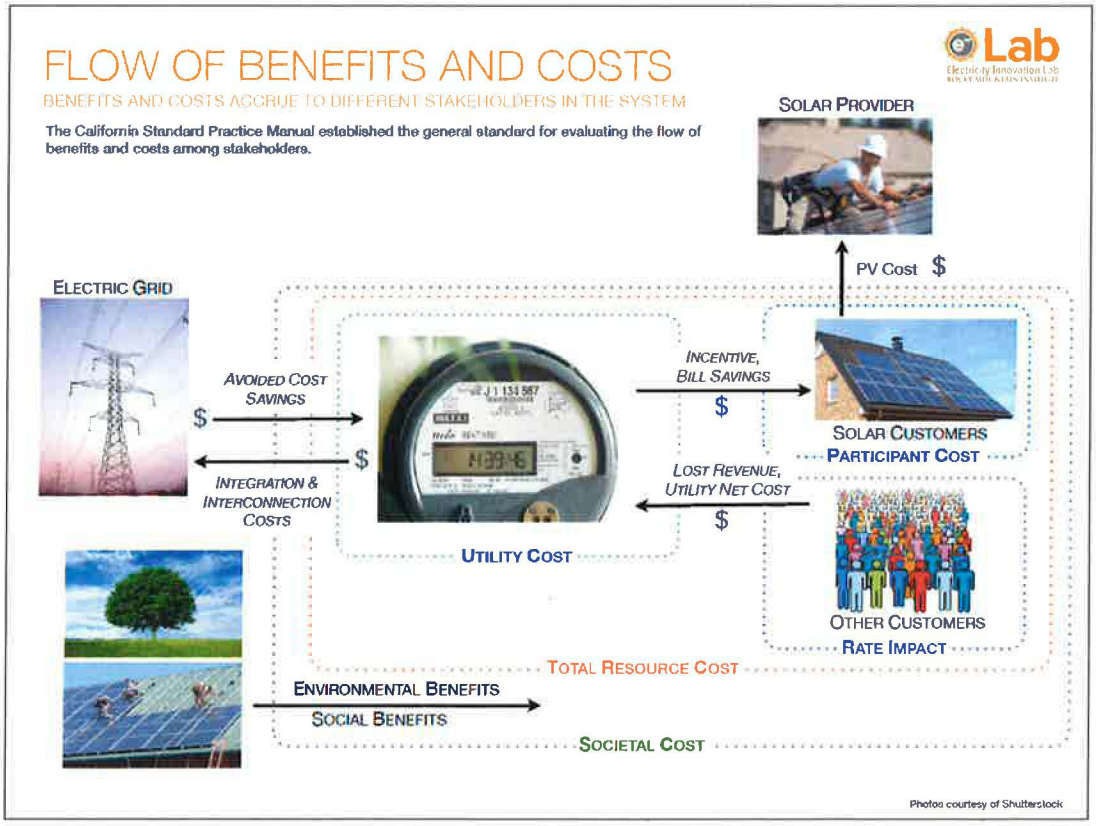
A17. Yes. The broad categories of costs and benefits in the RMI Study are very helpful in illustrating and organizing the types of costs and benefits associated with DG.

Q18. Are there additional considerations when evaluating costs and benefits of DG?

A18. Absolutely. A fundamental question when considering costs and benefits of DG is the framework of the analysis. Stated another way, what "test," "lens," or

"perspective" is being used to evaluate the costs and benefits. This question is not novel, and actually has a well-established history in the energy efficiency sphere. Specifically, *A Regulator's Guidebook: Calculating the Benefits and Costs of Distributed Solar Generation* ("A Regulator's Guidebook"), attached as Exhibit NHSEA-NP-2, looked at this very issue. A Regulator's Guidebook, on page 14, describes each of the cost and benefit tests. These tests are well covered in the California Standard Practice Manual, which is used to evaluate energy efficiency in California. In addition, Chart 2 illustrates the cost and benefit tests (RMI Study at 18).

Chart 2: Summary of Cost and Benefit Tests



Q19. What test do you propose for evaluating DG in New Hampshire?

A19. I strongly propose the societal cost test, or SCT. The SCT is the only test that considers all of the costs and benefits to all of the residents (including all ratepayers) of New Hampshire.

Q20. Can you please describe the societal cost test?

A20. Yes. The SCT takes into account all of the costs and benefits that impact New Hampshire. The SCT accounts for the impacts on: (1) the distribution company; (2) participants; (3) non-participants; (4) the electricity system; (5) the economy; (6) society; and (7) the environment. Below is a summary of the SCT:

> The SCT is similar to the TRC, but broadens the universe of affected individuals to society as a whole, rather than just those in the program administrator territory. The SCT is also a vehicle for consideration of non-monetized externalities, such as induced economic development effects, which are not considered in the TRC. (Exh. NP-3, at 14)

The SCT is the only test that provides a complete picture of the net impacts of DG. As such, the SCT provides the most balanced perspective for evaluating the costs and benefits of DG.

Q21. What do you mean by "society?"

A21. In the context of the SCT, society encompasses all of the ratepayers in New Hampshire and more. Specifically, the SCT includes all of the costs and benefits that accrue to ratepayers on their electricity bills, and all of the other costs and benefits that accrue to ratepayers and non-ratepayers (*i.e.* off-grid electricity

consumers) in New Hampshire as a result of DG, such as health impacts and economic impacts.

Q22. Can you Please describe each of the costs and benefits of DG?

A22. Yes. Below is a summary of the benefits and costs of DG.

Additional Avoided Generation: When generation is located close to load, less electricity needs to be generated. When electricity is transmitted and distributed, there is a loss of electricity due to electrical resistance. When the electricity does not have to be delivered over a significant distance, there are fewer losses, and therefore less of a need to generate as much electricity in the first place. One megawatt-hour ("MWh") of electricity from DG therefore reduces the need for electricity from wholesale generators by more than one MWh (the exact amount will depend on the situation).

Transmission Capacity: By its very nature, DG does not use the transmission system. Distributed generation therefore lowers the load on the transmission system. This provides two benefits: (1) DG reduces the need to make costly upgrades to the transmission system; and (2) DG can extend the life of the existing transmission infrastructure. If a transmission system is stressed, utilities can either build expensive new transmission or reduce the load that is causing the stress on the transmission system. DG can help alleviate the need for costly transmission system upgrades by reducing the load on the transmission system. The life of a transmission system is, in part, determined by the expected usage of

the transmission system. If the usage of the transmission system is reduced, then the life of the transmission system can be extended. As such, DG can defer the need for expensive transmission infrastructure both now and into the future.

Distribution Capacity: Similar to the transmission capacity benefits discussed above, DG can defer the need for investment in electric distribution infrastructure.

Fuel Price Hedge: New Hampshire does not have any native sources of fossil fuels and is completely at the mercy of national and/or international markets for traditional fuels. The only way to reduce New Hampshire's exposure to the price of fuel, therefore, is to reduce load overall (*i.e.*, energy efficiency) or increase fuel-free resources (*e.g.*, solar, wind, and hydro). When New Hampshire lowers the dependence on fuels for electricity, New Hampshire lowers the vulnerability of all ratepayers to the volatility of fuel prices.

Price Suppression: Each megawatt-hour ("MWh") from DG reduces the need for centralized generation. The reduced need for centralized generation lowers the wholesale price of electricity for everyone. This phenomenon is known as price suppression or Demand Reduction Induced Price Effects ("DRIPE"). DRIPE comes in two forms, energy and capacity.[2] The energy DRIPE manifests in the ISO-NE energy markets, while the capacity DRIPE expresses itself in the ISO-NE

[2] Currently, the ancillary services markets at ISO-NE do not take into account the benefits of DG. However, with the implementation of smart inverters and two-way communication controls, DG could also provide benefits in the ancillary services market too.

capacity markets. The end result is lower prices for all ratepayers as a result of DG.

Security: Distributed generation can provide value by strengthening the resilience of the electricity system. Specifically, DG can: (1) reduce local outages by alleviating congestion and providing voltage support; (2) reduce vulnerabilities to large-scale outages by increasing the number of generating assets; and (3) provide emergency services when combined with other technologies such as storage, or even when integrated into a micro-grid. As New Hampshire has recently experienced with ice storms, hurricanes, and even super storms, the availability of electricity is vital to our day-to-day operations as a society, and DG can help reinforce our electric system.

Carbon Emissions: When distributed generation displaces fossil fuel-fired generation, there is a reduction in carbon emissions. This helps New Hampshire reduce the impact of our electricity sector on the climate. In addition to the environmental impacts, reduced carbon emissions also reduce the cost of compliance with the Regional Greenhouse Gas Initiative, and would similarly reduce compliance costs with any potential future carbon-reduction regime.

Criteria Pollutant Emissions: Fossil fuel generators emit dangerous pollutants in addition to carbon. These pollutants – NOx, SOx, and particulate matter – all have impacts on human health, especially for the people that live in the closest proximity to the fossil fuel generators. DG reduces the need for these power plants to operate, and therefore overall emissions. The reduced emissions have

positive health impacts on the citizens of New Hampshire, and often manifest in the form of reduced frequency of doctor and hospital visits, and fewer sick days.

Land Use: Although not universal, many distributed generation projects utilize marginalized land (*e.g.*, capped landfills and brownfields) or are a secondary use (*e.g.*, roofs or canopies on parking lots). Centralized generation requires land (potentially very valuable land) that could be utilized for other economic or public purpose activities.

Water Use: Although not universal, many central generators require water for cooling. As New England and other parts of the United States have experienced recently, water shortages can have devastating impacts on the economy, quality of life, and recreation. The reduction of dependency on water for electricity generation can therefore help secure the grid and benefit society.

Economic Impact: Economic impact of electricity generation can be difficult to measure. Nonetheless, the measurement of direct, indirect and induced impacts of DG provides a very real picture of net economic benefits. In order to properly account for economic benefits, any cost associated with economic activity (*i.e.*, reduced run time of traditional central generation) must also be accounted for in the economic analysis.

Q23. Does evidence from other states suggest that net metering results in net benefits for society?

A23. Yes. Evidence from other states actually suggests that the value of solar may exceed the retail rate. The results of DG benefit and cost analyses can differ greatly depending on the assumptions and perspective of the entity sponsoring the study. As a result, it is important to look at studies sponsored or performed by an independent party, such as a state agency. A number of studies have been sponsored by independent state entities, and they conclude that the benefits provided by distributed generation are substantial.

Table below summarizes the results of recent studies performed by or for state governments.

Table 1: Recent Solar Studies

State	Date	Sponsor	Resulting Value
MA	30-Apr-2015	DOER	23.1¢/kWh levelized[3]
ME	14-Apr-2015 (rev'd)	Legislature	33.7¢/kWh levelized[4]
VT	7-Nov-2014 (rev'd)	Legislature	23.7¢/kWh levelized[5]
MS	19-Sep-2014	PSC	17.0¢/kWh levelized[6]
NV	Jul-2014	PUC	18.5¢/kWh levelized[7]
MN	13-Feb-2014	Dept. of Commerce	14.5¢/kWh levelized[8]

The experiences in the states included in Table 1 demonstrate that DG represents significant value.

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[3] Massachusetts Net Metering and Solar Task Force, *Final Report to the Legislature, Appendix B* (2015), Attached as Exhibit NP-4

[4] Me. Pub. Utils. Comm'n, *Maine Distributed Solar Valuation Study* 6 (Apr. 2015), available at http://www.maine.gov/mpuc/electricity/elect_generation/documents/MainePUCVOS-FullRevisedReport_4_15_15.pdf.

[5] Vt. Pub. Serv. Dep't, *Evaluation of Net Metering in Vermont Conducted Pursuant to Act 99 of 2014* 17 (Nov. 2014), Attached as Exhibit NP-5.

[6] Elizabeth A. Stanton et al., Synapse Energy Econ., Inc., *Net Metering in Mississippi: Costs, Benefits, and Policy Considerations* 43 (Sept. 2014), available at http://www.synapse-energy.com/sites/default/files/Net%20Metering%20in%20Mississippi.pdf.

[7] Energy & Envtl. Econ., *Nevada Net Energy Metering Impacts Evaluation* 93 (July 2014), available at http://puc.nv.gov/uploadedFiles/pucnvgov/Content/About/Media_Outreach/Announcements/Announcements/E3%20PUCN%20NEM%20Report%202014.pdf?pdf=Net-Metering-Study.

[8] Peter Fairley, *Minnesota Finds Net Metering Undervalues Rooftop Solar*, IEEE Spectrum (Mar. 24, 2014), available at http://spectrum.ieee.org/energywise/green-tech/solar/minnesota-finds-net-metering-undervalues-rooftop-solar.

Q24. Is a "value of solar" analysis the same as a cost and benefit analysis?

A24. No. A "Value of Solar" analysis ("VOS") only looks at the benefits of solar. In this regard, it is only part of the equation. In order to better understand the *net* impacts of DG (*i.e.* benefits minus costs), a complete cost and benefit analysis must be completed.

Q25. Are there relevant cost and benefit analyses to this docket?

A25. Yes. Both Massachusetts and Vermont have completed cost and benefit analysis for DG.

Q26. Please describe the cost and benefit analysis completed in Massachussets.

A26. On August 6, 2014, an act was signed into law that created a net metering task force ("Task Force"). The Task Force was directed to "review the long-term viability of net metering and develop recommendations on incentives and programs to support the deployment of 1,600 megawatts ("MW") of solar generation facilities in the Commonwealth" (Massachusetts Chapter 251 of the Acts of 2014). As part of this directive, the Task Force commissioned a cost and benefit analysis, paid for by the Massachusetts Department of Energy Resources. The cost and benefit analysis looks at multiple scenarios (*e.g.* net metering and incentive scenarios, including (1) a continuation of the solar renewable energy certificate incentive ("SREC"), (2) a declining-block and performance-based incentive ("Policy A"), and (3) a combination of an upfront incentive and a

declining-block and performance-based incentive ("Policy B")) and multiple cost and benefit tests (e.g. non-owner participants, customer generator, non-participating ratepayers, and Citizens of the Commonwealth). In this testimony, I refer to the analysis of Policy B through the perspective of the citizens of the Commonwealth test.

Q27. Why do you look at Policy B?

A27. None of the policy scenarios are directly similar to New Hampshire, but Policy B is the closest. Policy B represents the lowest-cost incentive program in the Task Force analysis.

Q28. Are the costs of Policy B similar to the incentive costs in New Hampshire?

A28. No. The incentive in New Hampshire is significantly smaller than in Policy B. As such, the costs of the incentive program are much less. The means that total costs associated with DG in New Hampshire are less than is calculated in Policy B.

Q29. Why do you look at the Citizens of the Commonwealth test?

A29. The Citizens of the Commonwealth test is the closest to the societal cost test in the Task Force analysis.

Q30. Is the Citizens of the Commonwealth test the same as the Societal Cost Test?

A30. No, but it is close. The Citizens of the Commonwealth test does not capture the economic impacts of DG. It does, however, capture the other impacts of the SCT.

Q31. What are the net impacts of Policy B using the Citizens of the Commonwealth test?

A31. In the Task Force analysis, the net benefits of Policy B using the Citizens of the Commonwealth test are 13.55 cents per kilowatt-hour ("kWh"). Stated another way, for every kWh generated by solar under Policy B, Massachusetts receives 13.55 cents worth of benefits *after accounting for the costs of solar.*

However, if the costs of Policy B are removed, the net benefits of solar are 21.68 cents per kWh. Obviously, there is a cost associated with the New Hampshire rebate program. Nonetheless, the costs of the New Hampshire rebate program ($0.50/watt) are significantly less than the costs of Policy B (8.13 cents/kWh). Accordingly, if the Task Force analysis were equated to the situation in New Hampshire after accounting for the difference in incentive, the net benefits of solar would be less than 21.68 cents per kWh, but due to the small amount of the incentive in New Hampshire, the net benefits would be much closer to 21.68 cents per kWh than 13.55 cents per kWh.[9] Using the same assumptions of the Task

[9] To be clear, the incentive in New Hampshire is equivalent to $0.0212/kWh, and the calculated incentive in Massachusetts in Policy B is $0.0813/kWh. Both of these calculations use the same assumptions.

Force, the cost of the incentive in New Hampshire is 2.12 cents per kWh. The conversion from $0.50/watt to $0.0212/kWh is summarized in Table 2 below.

Table 2: Illustrative Calculation of NH Incentive Cost per kWh

Capacity (Watts)	4,000
Rebate ($/W)	$0.50
Total Rebate	$2,000.00
Expected production per kW (kWh)	1,180
Expected production per year (kWh)	4,720
Expected life of project (years)	20
Lifetime production (kWh)	94,400
Incentive per kWh	$0.0212

The end result is that if the Task Force analysis were equated to the situation in New Hampshire after accounting for the difference in incentive, the net benefits of solar would be 19.56 cents per kWh.

Q32. Is the analysis in Massachusetts perfectly comparable to the situation in New Hampshire?

A32. No. While the states border each other, and are both in ISO-NE, they are different. For instance, the states have different load characteristics and generation assets. Perhaps most notably, the states have very different penetration levels of DG. Massachusetts has much greater penetration of solar than New Hampshire. While New Hampshire has slightly more than 50 megawatts ("MW") of DG, Massachusetts has over 1,200 MW of solar alone. As the installed capacity of DG increases, the benefits per kW of new installed capacity start to decrease. So while

the states have many differences, the biggest difference in this docket is probably the total installed capacity of DG.

Q33. Please describe the cost and benefit analysis completed in Vermont.

A33. Act 99 of the 2014 Vermont Legislature directed the Public Service Department ("VT DPS") to complete an evaluation of net metering in Vermont. On November 7, 2014, the VT DPS released a revised report. Table 3 describes the costs and benefits of DG in Vermont as determined by the VT DPS. Please note that this analysis was conducted with the then-existing compensation rate of $0.20 per kWh for systems less than or equal to 15 kilowatts ("kW"), and $0.19 per kWh for systems over 15 kW, which is more than the retail rate of electricity in Vermont.

Table 3: Costs and Benefits of DG as Determined by the VT DPS

Costs	Lost revenue
	Vermont solar credit, for solar PV systems
	Net metering-related administrative costs
Benefits	Avoided energy costs, including avoided costs of line losses and avoided internalized greenhouse gas emission costs
	Avoided capacity costs, including avoided costs of line losses
	Avoided regional transmission costs
	Avoided in-state transmission and distribution costs
	Market price suppression in both energy and capacity markets
	Potential future regulatory value associated with retention of renewable energy credits in Vermont

(Exhibit NP-5, at 9)

Q34. Did the VT DPS use the Societal Cost Test?

A34. No, they did not. The methodology of the VT DPS does not fix squarely into any of the aforementioned tests. The test most closely resembles the Total Resource Cost test, but the test used by the VT DPS does not include participant costs. Furthermore, the test is different from the societal cost test in that it doesn't include environmental[10] and societal benefits. Accordingly, the methodology of the VT DPS understates the total benefits that accrue to Vermont society.

Q35. Did the VT DPS conduct one analysis for the whole state?

A35. No. The VT DPS evaluated DG for each of the service territories in Vermont, and with five different technologies: (1) a 4 kilowatt kW tracking solar photovoltaic ("PV") system at a residence; (2) a 4 kW wind generator at a single residence; (3) a 100 kW fixed solar PV system; (4) a 100 kW tracking solar PV system; and (5) a 100 kW wind generator. For the purposes of simplicity, I've summarized, in Table 4 below, the results for the statewide findings.

Table 4: Costs and Benefits Analyses by the VT DPS

Technology	Cost	Benefit	Net Benefit
4 kW Fixed PV	$0.230	$0.256	$0.026
4 kW Tracking PV	$0.229	$0.238	$0.009
4 kW Wind	$0.201	$0.204	$0.003
100 kW Fixed PV	$0.227	$0.256	$0.028
100 kW Tracking PV	$0.226	$0.238	$0.012

(Exhibit NP-5, at 17-27)

[10] The test used by the VT DPS does include the internalized costs of greenhouse gases, pursuant to the Regional Greenhouse Gas Initiative.

Q36. What do the results of the VT DPS Analyses mean?

A36. The analyses conclude that there was a net benefit for each of the analyzed scenarios. Notably, there was a net benefit even with the retail-plus-incentive model that Vermont had in place at the time.

Q37. Is the analysis in Vermont perfectly comparable to the situation in New Hampshire?

A37. No. Just as with Massachusetts, while the states border each other, they are different. There are two notable differences between Vermont and New Hampshire in regard to net metering costs and benefits: (1) Vermont is a vertically integrated state, while New Hampshire is a restructured market; and (2) the states have very different penetration levels of DG. Although Vermont does not have as great a penetration of DG as Massachusetts, Vermont does have a high penetration on a per capita basis. According to the Solar Energy Industries Association, Vermont has the eighth highest solar capacity per capita at 171 watts per person, while Massachusetts has the ninth highest solar capacity per capita at 150 watts per person.[11] New Hampshire is not ranked as a top 10 state, so the penetration levels on a per capita basis are not listed by SEIA. Nonetheless, just as with Massachusetts, as the installed capacity of DG increases, the benefits per kW

[11] Solar Energy Industries Association, Top 10 Solar States (2015), available at: http://www.seia.org/research-resources/top-10-solar-states

of new installed capacity start to decrease. As such, the net benefits of DG in New Hampshire are probably greater than the net benefits of DG in Vermont, at this point in time.

Q38. Have you had a chance to review the cost and benefit Analysis conducted by Crossborder Energy for the Alliance For Solar Choice?

A38. Yes, I have.

Q39. Can you please summarize the results?

A39. For residential systems using the societal cost test, the analysis concludes that there is a benefit to cost ratio of approximately 1.6. For commercial systems using the societal cost test, the analysis concludes that there is a benefit to cost ratio of approximately 2.0. Finally, for both residential and commercial systems using the societal cost test, the combined analysis concludes that there is a benefit to cost ratio of approximately 1.7 to 1.8. Stated another way, for every dollar that is invested in residential systems, New Hampshire as a whole receives $1.60 worth of benefits. From the perspective of society, DG results in net benefits.

Q40. Do you agree with the methodology used by Crossborder Energy?

A40. I do. The analyses for the residential and commercial sectors are consistent with the well-established frameworks used for energy efficiency.

Q41. What do you conclude about the costs and benefits of DG to New Hampshire?

A41. After reviewing cost and benefit analyses for Massachusetts, Vermont, and New Hampshire, the data indicates net benefits from retail net metering. Non-participants and society as a whole receive a net benefit from the actions of individuals that install DG.

Q42. If there are net benefits from DG, shouldn't participating customers be fully compensated for the benefits that they provide?

A42. Not necessarily. If participating customers were fully compensated for all of the benefits that they provide, then the benefit-cost ratio would inherently equal one. This would mean that non-participating ratepayers and society would be indifferent as to the actions of participating ratepayers. However, if there is a sharing of the benefits of DG between participating customers and non-participating ratepayers, then all parties enjoy the benefits of DG either directly or indirectly. Such an outcome is a win-win result for participants and non-participants alike.

Q43. Currently, is there adequate sharing of the benefits of DG for customers that install small systems, and customers that install large systems?

A43. Unfortunately, no. Smaller systems (*i.e.* systems up to 100 kW) can avail themselves of retail net metering, which is a win-win for participants and non-participants. However, large systems (*i.e.* systems over 100 kW) only receive the energy portion of a customer's bill in the net metering credit calculation. This results in non-participating customers and society receiving a significant share of the benefits of these systems. This is best illustrated in the benefit-cost ratios in the analyses of Crossborder Energy. While residential systems have a benefit-cost ratio of approximately 1.6, commercial systems have a benefit-cost ratio of approximately 2.0. The benefits of larger systems should be more reasonably shared between participants and non-participants.

Q44. Does HB 1116 require the COmmission to consider cost shifting?

A44. Yes. HB 1116, ¶ XVI states "[i]n developing such alternative tariffs and any limitations in their availability, the commission shall consider…an avoidance of unjust and unreasonable cost shifting; rate effects on all customers." Therefore, for the purposes of this testimony, I consider this requirement to mean that participants should not unduly shift costs to non-participants.

Q45. From what perspective should any potential Cost-Shift be analyzed?

A45. Any analysis of a potential cost-shift must be viewed from the perspective of the total impact of DG. Any attempt to narrow the perspective of a potential cost-shift would distort the real impacts of DG. For instance, any attempt to look at a potential cost shift on just one portion of an electricity bill (*e.g.* generation, transmission, or distribution) inherently ignores the benefits that accrue to everyone on the other parts of an electricity bill and the benefits that accrue to everyone that are not included on an electricity bill. Simply put, any potential cost-shift must be viewed from the perspective of the total impacts on everyone.

Q46. Is there a cost-shift in New Hampshire as a result of DG?

A46. If there is a cost-shift in New Hampshire as a result of DG, then the cost-shift is from non-participating residents to participants. As demonstrated in the benefit and cost section of my testimony, customers with DG provide net benefits to New Hampshire society. Stated differently, customers with DG result in *negative* net costs for everyone in New Hampshire. As such, customers with DG are not fully compensated for the benefits that they provide, and non-participating customers are not paying for all the benefits that they receive.

Q47. How does your description relate to Chart 2 of your testimony?

A47. Chart 2 is a visual depiction of cost and benefit analyses. Using the societal cost test, Chart 2 depicts that non-participants would help pay for lost utility revenue,

and non-participants receive the benefits of electric grid avoided costs, environmental benefits, and social benefits.

Q48. If non-participating customers are not paying for the benefits they receive, should this cost-shift be addressed?

A48. No, not necessarily. As I stated before related residential customers (100 kW or less), the end result of this outcome is a win-win for participants and non-participants. Non-participants receive more in benefits than they pay in costs, which makes DG a good investment for them. Participating customers, presumably, wouldn't install DG if they didn't also receive a net benefit. Even though there is a cost-shift from non-participants to participants, both come out ahead.

Q49. Are there corollaries to the situation you just described?

A49. Yes. Energy efficiency has the same dynamic. When there are net benefits from energy efficiency, both participants and non-participants are winners, and non-participants (normally) don't pay the full value of the benefits that they receive.

Q50. What do you conclude about potential cost-shifts in New Hampshire as a result of DG?

A50. A potential cost shift from non-participants to participants exists. However, this cost-shift is a sharing of the net benefits that result from DG. Sharing of the net benefits is a win-win for both participants and non-participants.

Q51. What do you recommend the Commission do to balance potential cost shifting as a result of net metering?

A51. Using the societal cost test, participating ratepayers clearly provide net benefits to non-participating ratepayers and New Hampshire society. Accordingly, there is currently no cost shift from participants to non-participants. However, costs and benefits can – and will – change over time; especially at higher levels of DG. Recognizing this reality, I propose that the Commission formalize a methodology for a benefit and cost analysis, and predetermine intervals to run the benefit and cost analysis.

Q52. What do you recommend for predetermined intervals?

A52. There are two options for intervals: (1) time based; or (2) capacity based. If the Commission elects a time-based interval, I would propose the benefit and cost analysis is run every three years. If the Commission elects a capacity-based interval, I would recommend that the benefit and cost analysis is run every five percent of installed capacity of DG (compared to peak capacity for the state).

Regardless, I would also recommend that the Commission reserve the ability to run the methodology at a sooner date if they deem necessary.

Q53. What methodology do you recommend?

A53. Consistent with my testimony, I recommend that the Commission establish the societal cost test for the valuation of costs and benefits of DG.

Q54. How would the Commission use the results of the methodology and the results of the benefit and cost analyses?

A54. Once the methodology is established, the Commission would collect the necessary information to run the methodology. If the results are that the benefits exceed the costs of net metering, the Commission should retain retail net metering. However, if the costs exceed the benefits of net metering, then the Commission should reduce the net metering credit compensation rate for net excess generation. The objective would be to ensure that the benefits are always equal to or exceed the costs of net metering.

Q55. Please summarize your findings and recommendations.

A55. After reviewing cost and benefit analyses for Massachusetts, Vermont, and New Hampshire, the data indicates net benefits from retail net metering. Non-participants and society as a whole receive a net benefit from the actions of individuals that install DG. Currently, all parties enjoy the benefits of DG either

directly or indirectly. Nonetheless, the benefits of larger systems should be more reasonably shared between participants and non-participants.

In regard to cost shifting, a potential cost shift from non-participants to participants currently exists; this cost-shift is a sharing of the net benefits that result from DG. However, costs and benefits will change over time. As such, I propose that the Commission formalize the societal cost test as the methodology for a benefit and cost analysis, and run the benefit and cost analysis at predetermined intervals. In the future, if the results are that the benefits exceed the costs of net metering, the Commission should retain retail net metering; if the costs exceed the benefits of net metering, then the Commission should reduce the net metering credit compensation rate for net excess generation.

Q56. Does this conclude your testimony?

A56. Yes, it does