

**BEFORE THE
NEW HAMPSHIRE PUBLIC UTILITIES COMMISSION**

In Re.)	
)	
2018-2020 New Hampshire Statewide)	Docket No. DE-17-136
Energy Efficiency Plan)	
)	

DIRECT TESTIMONY OF

ROGER D. COLTON

ON BEHALF OF THE

The Way Home

November 1, 2017

Table of Contents

Summary of Recommendations.....	7
Part 1. The Need to Include Non-Energy Impacts in a Benefit-Cost Analysis.....	8
Part 2. Using Adders is not Inconsistent with Evidence-Based Dollar Quantification of NEIs in New Hampshire.....	16
Part 3. The Role of an Adder in Quantifying NEIs for New Hampshire.....	23
Part 4. Lessons Learned from Other States Valuing NEIs.....	25
Part 5. The Need to Adopt a Specific Low-Income NEI Adder.....	28
Colton Schedules	
Colton Appendices	
Appendix A	Colton Vitae
Appendix B	A Review of the Valuation of NEIs in Four Selected States

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is Roger Colton. My business address is 34 Warwick Road, Belmont, MA
3 02478.

4
5 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT POSITION?**

6 A. I am a principal in the firm of Fisher Sheehan & Colton, Public Finance and General
7 Economics of Belmont, Massachusetts. In that capacity, I provide technical assistance to
8 a variety of federal and state agencies, consumer organizations and public utilities on rate
9 and customer service issues involving telephone, water/sewer, natural gas and electric
10 utilities.

11
12 **Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?**

13 A. I am testifying on behalf of The Way Home.

14
15 **Q. PLEASE DESCRIBE YOUR PROFESSIONAL BACKGROUND.**

16 A. I work primarily on low-income utility issues. This involves regulatory work on rate and
17 customer service issues, as well as research into low-income usage, payment patterns,
18 and affordability programs. At present, I am working on various projects in the states of
19 Connecticut, Maryland, Pennsylvania, Michigan, Illinois and Iowa, as well as in the
20 provinces of Ontario and British Columbia. My clients include state agencies (e.g.,
21 Pennsylvania Office of Consumer Advocate, Maryland Office of People's Counsel, Iowa
22 Department of Human Rights), federal agencies (e.g., the U.S. Department of Health and
23 Human Services), community-based organizations (e.g., Energy Outreach Colorado,

1 Action Centre Tenants Ontario), and private utilities (e.g., Unutil Corporation d/b/a
2 Fitchburg Gas and Electric Company, Entergy Services, Xcel Energy d/b/a Public
3 Service of Colorado). In addition to state- and utility-specific work, I engage in national
4 work throughout the United States. For example, in 2011, I worked with the U.S.
5 Department of Health and Human Services (the federal agency that administers the Low-
6 Income Home Energy Assistance Program, LIHEAP)¹ to create the Home Energy
7 Insecurity Scale and to advance its utilization as an outcomes measurement tool for
8 LIHEAP and other low-income utility bill affordability programs. In 2016, I was part of
9 a team that engaged in a study for the Water Research Foundation on how to reach “hard
10 to reach” customers. A description of my professional background is provided in
11 Appendix A.

12
13 **Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND.**

14 A. After receiving my undergraduate degree in 1975 (Iowa State University), I obtained
15 further training in both law and economics. I received my law degree in 1981 (University
16 of Florida). I received my Master’s Degree (regulatory economics) from the MacGregor
17 School in 1993.

18
19 **Q. HAVE YOU EVER PUBLISHED ON PUBLIC UTILITY REGULATORY**
20 **ISSUES?**

21 A. Yes. I have published three books and more than 80 articles in scholarly and trade
22 journals, primarily on low-income utility and housing issues. I have published an equal

¹ LIHEAP is the federal home energy assistance program. It is a block grant program that provides funding for states to distribute to income-eligible households.

1 number of technical reports for various clients on energy, water, telecommunications and
2 other associated low-income utility issues. A list of my publications is included in
3 Appendix A.

4
5 **Q. HAVE YOU PREVIOUSLY WORKED ON ISSUES INVOLVING THE NON-**
6 **ENERGY IMPACTS OF ENERGY EFFICIENCY PROGRAMS?**

7 A. Yes. I was one of the first persons to suggest that utility-related non-energy impacts
8 (NEIs)² should be considered in addition to traditional utility avoided energy and
9 capacity costs. My analysis stated that targeted electric energy efficiency programs had
10 advantages that went beyond the traditional energy and capacity savings associated with
11 energy efficiency measures:

12 The cost-effective reduction of system costs is relevant and important in every part
13 of the business operations of the utility, not simply to the power supply function.
14 Accordingly, a utility should be concerned with the problem of nonpayment, overdue
15 payment, and partial payment of utility bills. Bad debt arises when ratepayers
16 demand power from the system and then do not pay for it on a timely basis. . . .[A]
17 new conservation program [can be proposed] that is justified on an avoided cost
18 basis. The proposal rejects the historical view that avoided costs include only an
19 energy and a capacity component. Instead, it introduces the notion of avoided bad
20 debt. As long as the energy efficiency program costs less than the bad debt it will
21 avoid, the program is cost-justified.³
22

23 In this 1987 article, “bad debt” was defined to include all aspects of costs associated with
24 payment troubles. The term was used to include not only written-off accounts, but credit
25 and collection expenses, working capital expenses, and a host of other expenses related to

² Various phrases are used to refer to such impacts: Non-Energy Benefits (“NEBs”), Other Program Impacts (“OPIs”). I will use the term “Non-Energy Impacts” (“NEIs”) in this testimony. I intend this phrase to be synonymous with these other similar phrases.

³ Roger Colton and Michael Sheehan (1987). “A New Basis for Conservation Programs for the Poor: Expanding the Concept of Avoided Costs,” 21 *Clearinghouse Review* 135, 139.

1 nonpayment. Since that time, the existence and importance of such expanded avoided
2 costs has become generally-accepted. Analysts have since repeatedly confirmed that low-
3 income energy efficiency generates benefits beyond simply energy and capacity savings.
4 For example, energy efficiency has been found to improve customer payment patterns
5 and reduce arrearages; generate additional economic activity and create jobs; reduce
6 illnesses due to both hot and cold weather; reduce lost days of work due to both reduced
7 worker illnesses and reduced childhood illnesses requiring adult family leave; improve
8 home comfort; and reduced home noise (both internal and external). These examples are
9 far from a comprehensive listing of non-energy impacts. They are intended, instead, to
10 be illustrative.

11
12 Since my 1987 article, in the past 30 years, I have worked in various states and at the
13 federal level to document low-income NEIs and introduce these NEIs into regulatory and
14 program evaluation processes. Consider that:

- 15 ➤ In 2003, I created the Home Energy Insecurity Scale (“HEIS”) for the U.S.
16 Department of Health and Human Services (“HHS”) to quantify changes in low-
17 income tradeoffs associated with inability to pay.⁴
18
- 19 ➤ In 1995, I prepared a survey-based study of the impacts of unaffordable home
20 energy in Missouri on “frequent mobility” for the state association of Head Start
21 directors,⁵ and supplemented that research with a similar study in Missouri for the
22 National Low-Income Energy Consortium (“NLIEC”) in 2004.⁶
23
- 24 ➤ In 2006, under contract to the Georgia Department of Human Resources, in
25 evaluating a low-income weatherization program, I created the Low-Income

⁴ Roger Colton (2003). *Measuring the Outcomes of Home Energy Assistance through a Home Energy Insecurity Scale*, prepared for U.S. Department of Health and Human Services, Administration for Children and Families.

⁵ Roger Colton (1995). *The Road Oft Taken: Unaffordable Home Energy Bills, Forced Mobility, and Childhood Education in Missouri*, prepared for State Association of Head Start Directors.

⁶ Roger Colton (2004). *Paid but Unaffordable: The Consequences of Energy Poverty in Missouri*, prepared for National Low-Income Energy Consortium (“NLIEC”).

1 Energy Risk Assessment Matrix, which, like the HEIS, was designed not only to
2 recognize NEIs but to measure the NEIs.⁷

- 3
- 4 ➤ In 2003, for Entergy, a multi-state electric holding company, I undertook a study
5 of the economic development and job impacts of weatherization and fuel
6 assistance in the four Entergy states.⁸
- 7
- 8 ➤ In 2003, I undertook a study for the Colorado Energy Assistance Foundation
9 (“CEAF”), the largest fuel fund in the nation, of the affordable housing impacts of
10 low-income energy efficiency,⁹ which I updated for rental housing in
11 Pennsylvania in 2009.¹⁰
- 12
- 13 ➤ In 2008, while not focused on energy efficiency, I prepared, for the Iowa
14 Department of Human Rights, an analysis of the relationship between
15 unaffordable home energy and public health impacts, using Iowa’s Behavioral
16 Risk Factor Surveillance System (“BRFSS”) survey.¹¹
- 17
- 18 ➤ In 2011, I worked with Idaho’s state association of Community Action Agencies¹²
19 to review the Cadmus evaluation of Rocky Mountain Power’s low-income energy
20 efficiency program, including its treatment of NEIs.¹³
- 21
- 22 ➤ In January 2011, I was invited to make a presentation in Dublin (Ireland) to an
23 International Energy Agency (“IEA”) seminar on “Evaluating the Co-Benefits of
24 Low-Income Weatherisation Programmes.” My presentation focused on: (1)
25 using the Home Energy Insecurity Scale as a way to measure some participant-
26 perspective NEIs, and (2) using “Net Back” as a way to measure utility-
27 perspective NEIs flowing from improved affordability associated with
28 weatherization.¹⁴

⁷ Roger Colton (2006). *Georgia REACH Project Energize: Final Program Evaluation*, prepared for Georgia Department of Human Resources.

⁸ Roger Colton (2003). *The Economic Development Impacts of Home Energy Assistance: The Entergy States*, prepared for Entergy Services, Inc.

⁹ Roger Colton (2003). *Energy Efficiency as an Affordable Housing Tool in Colorado*, prepared for Colorado Energy Assistance Foundation (“CEAF”).

¹⁰ Roger Colton (2009). *The Contribution of Utility Bills to the Unaffordability of Low-Income Rental Housing in Pennsylvania*, prepared for Pennsylvania Utility Law Project (“PULP”).

¹¹ Roger Colton (2008). *Public Health Outcomes Associated with Energy Poverty: An Analysis of Behavioral Risk Factor Surveillance System (BRFSS) Data from Iowa*, prepared for Iowa Department of Human Rights.

¹² Community Action Partnership Association of Idaho (“CAPAI”).

¹³ Roger Colton (October 2011). *Assessing the Cost-Effectiveness of Low-Income Weatherization in Idaho: A Review of the Rocky Mountain Power Evaluation*, prepared for Community Action Partnership of Idaho.

¹⁴ Roger Colton (January 2011). “Quantification of NEBs: A Review of Two Options,” presented to International Energy Agency Fuel Poverty Workshop, Evaluating the Co-Benefits of Low-Income Weatherisation Programmes, Dublin (Ireland).

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

Just this year, I filed testimony in the pending DTE (electric) general rate case before the Michigan utility commission on behalf of a coalition of environmental intervenors (e.g., Michigan Environmental Council, Sierra Club, Natural Resources Defense Council). My testimony discussed the benefits to DTE of having that utility more closely tie its low-income energy efficiency investments with the Company's response to low-income payment troubles.¹⁵

Q. IN PREPARING YOUR TESTIMONY FOR THIS PROCEEDING, HAVE YOU REVIEWED AND CONSIDERED ANY MATERIALS OTHER THAN YOUR OWN?

A. Yes, of course. Given the vast literature on NEIs, it is impossible to list all of the materials other than my own that I have considered over the past 30 years in formulating my opinions. However, an illustrative list of written materials that I have specifically read and considered for purposes of this proceeding is presented in schedule RDC-1.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE NEW HAMPSHIRE PUBLIC UTILITIES COMMISSION?

A. Yes. I have testified before the New Hampshire PUC on numerous occasions regarding low-income programs, including low-income energy efficiency programs. I have also worked directly for the New Hampshire PUC Staff, as a consultant, on issues involving low-income program design.

¹⁵ Direct Testimony of Roger Colton. I/M/O DTE Electric Company, Case No. U-18255, filed on behalf of Environmental Intervenors (filed August 30, 2017).

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE OTHER REGULATORY COMMISSIONS AS AN EXPERT WITNESS?

A. Yes. Over the past 30+ years, I have testified in more than 250 cases throughout the United States and Canada regarding a range of issues involving low-income programs, energy efficiency programs, and other regulatory issues.

Q. PLEASE EXPLAIN THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING.

A. In this proceeding, I have been asked to assess whether it is reasonable and appropriate for the New Hampshire Public Utilities Commission (“PUC”) to adopt an “adder” to reflect the non-energy impacts (“NEIs”) of residential energy efficiency programs in any benefit-cost analysis of those programs. I have further been asked to assess the reasonableness of adopting a separate adder specific to energy efficiency programs targeted to low-income households. In the event that I were to conclude that such adders are reasonable, I have been asked to assess what level of an adder would be appropriate.

Summary of Findings and Recommendations.

Q. PLEASE SUMMARIZE YOUR FINDINGS AND RECOMMENDATIONS IN THIS PROCEEDING.

A. Based on the data and discussion presented in my Direct Testimony below, I make the following recommendations:

- The New Hampshire PUC should adopt an adder through which to quantify the dollar benefits of Non-Energy Impacts for the state’s energy utilities.

- 1
- 2 ➤ The adder to be applied to non-low-income residential customer programs
- 3 should be equal to 100% of the energy savings.
- 4
- 5 ➤ There should be a separate adder adopted to be applied specifically to
- 6 programs directed toward low-income residential customers.
- 7
- 8 ➤ The adder to be applied to low-income residential customer programs should
- 9 be equal to twice (2.0x) whatever adder is adopted for non-low-income
- 10 programs.
- 11
- 12 ➤ The low-income multiplier of two-times the non-low-income adder should be
- 13 applied irrespective of the non-low-income adder that is ultimately adopted.
- 14

15 **Part 1. The Need to Include Non-Energy Impacts in a Benefit-Cost Analysis.**

16 **Q. PLEASE EXPLAIN THE PURPOSE OF THIS SECTION OF YOUR**

17 **TESTIMONY.**

18 A. In this section of my testimony, I explain the reasons it is necessary to include a

19 recognition of NEIs in a benefit-cost analysis of New Hampshire’s ratepayer-funded

20 residential energy efficiency programs. In addition to residential programs in general, I

21 consider the role that NEIs play in programs directed toward low-income residential

22 customers in particular.

23

24 **Q. PLEASE EXPLAIN WHAT YOU ARE REFERRING TO WHEN YOU DISCUSS**

25 **“NON-ENERGY IMPACTS.”**

26 A. Non-energy impacts (“NEIs”) can be classified into three broad categories based on the

27 perspective being studied: (1) utility impacts; (2) participant impacts; and (3) societal

28 impacts. For example, from the utility’s perspective, a reduction in arrears (and thus the

29 working capital associated with those arrears) is an expense reduction accruing from

1 usage reduction and thus an NEI. Increased comfort, on the other hand, is a benefit to
2 energy efficiency program participants and thus an NEI from the participant's
3 perspective. Increased job creation is a societal benefit of energy efficiency and thus an
4 NEI from the societal perspective.

5
6 **Q. PLEASE EXPLAIN WHY IT IS IMPORTANT TO ADEQUATELY INCLUDE**
7 **NON-ENERGY IMPACTS IN ASSESSING THE BENEFITS AND COSTS OF**
8 **RATEPAYER-FUNDED ENERGY EFFICIENCY PROGRAMS.**

9 A. First, let me acknowledge that NEIs include both costs and benefits. To date, however,
10 no study has identified a non-energy cost of any significant magnitude. Accordingly,
11 while I acknowledge them, I set non-energy costs aside as having no meaningful impact
12 on a benefit-cost assessment of a ratepayer-funded program. In addition, a growing body
13 of literature is beginning to document NEIs for commercial and industrial customers.
14 However, since the focus of my testimony is on low-income energy efficiency, I set these
15 commercial and industrial NEIs aside as beyond the purview of my inquiry. I instead
16 focus on residential NEIs as being those relevant to low-income customers.¹⁶ Having
17 made clear the limits of the scope of my testimony, I note five reasons the New
18 Hampshire Commission should adequately incorporate NEIs into the benefit-cost
19 analysis of residential energy efficiency programs generally, and of low-income
20 residential energy efficiency programs in particular.

21

¹⁶ I further set aside, as well, NEIs to owners/managers of low-income multi-family housing as beyond the purview of my testimony. Again, while I acknowledge the ongoing discussions about whether such NEIs benefit the poor, my testimony focuses on directly-billed, individually-metered, low-income customers treated with energy efficiency programs.

1 **Reason #1. Benefits as Part of Total Resource Cost (“TRC”) Test.**

2 **Q. PLEASE EXPLAIN THE RELATIONSHIP BETWEEN NON-ENERGY**
3 **IMPACTS AND USE OF THE TOTAL RESOURCE COST TEST IN BENEFIT-**
4 **COST ANALYSIS.**

5 A. The first reason to incorporate NEIs into the benefit-cost analysis of residential energy
6 efficiency is that when a state chooses to use the Total Resource Cost (“TRC”) test in its
7 assessment of benefits and costs of energy efficiency investments, by necessary
8 implication, it is choosing also to include NEIs in its future energy efficiency
9 assessments. Use of the TRC test implies that evaluators will take into account all costs
10 and thus all benefits. To consider all costs without incorporating all benefits into the
11 benefit-cost analysis will skew the TRC test against energy efficiency investments and
12 result in an under-investment in energy efficiency measures that would benefit everyone.

13
14 This necessary agreement to include NEIs when a state decides to use the TRC benefit-
15 cost test has been acknowledged in the most recent (May 2017) National Standard
16 Practice Manual for Assessing Cost-Effectiveness of Energy Efficiency Resources
17 (“NSPM”). The NSPM speaks in terms of “symmetry.” According to the NSPM:

18 For each type of impact included in a cost-effectiveness test, it is important that both
19 the costs and the benefits be included in a symmetrical way. Otherwise, the test may
20 be skewed and provide misleading results. . . On the benefits side, depending on the
21 measures or program, there may be a variety of non-energy benefits that are part of
22 the reason a customer invested in the measure (e.g., improved comfort, improved
23 building durability, improved business productivity, etc.). If the participant costs are
24 included in the cost-effectiveness test, then such benefits would need to be included
25 as well.¹⁷

¹⁷ NSPM, at 12.

1 **Reason #2. Symmetry of Treatment for Non-Energy Costs and Benefits.**

2 **Q. PLEASE EXPLAIN THE PRINCIPLE OF ALLOCATING NON-ENERGY**
3 **COSTS.**

4 A. A second reason to incorporate NEIs into the benefit-cost analysis is because utilities
5 tend to include all energy efficiency program costs even when those costs are used to
6 purchase non-energy benefits. The “non-energy costs” I reference here would include that
7 portion of a total energy efficiency investment that was made for reasons other than to
8 generate the traditional energy and capacity savings. One thing we know, for example, is
9 that one of the primary objectives sought by residential customers investing in energy
10 efficiency is the resulting improved comfort of the home. If 50% of the benefit being
11 purchased through an investment, however, involves improved comfort, it would be
12 inappropriate to include 100% of the energy efficiency costs as “energy-related” costs.
13 Half of those costs were purchasing improved home comfort. It would be even more
14 inappropriate to include the costs used to purchase improved comfort in the benefit-cost
15 analysis while at the same time excluding the resulting comfort-related benefits. In fact,
16 benefit-cost analyses do not seek to apportion energy efficiency program costs into their
17 energy and non-energy components. If the non-energy costs are included in the benefit-
18 cost analysis, the non-energy benefits must also be included. Failing to do so not merely
19 makes the benefit-cost analysis misleading, but it tends to make the benefit-cost analysis
20 meaningless.

1 **Reason #3. Value of Non-Energy Benefits is Greater than \$0.**

2 **Q. PLEASE EXPLAIN THE IMPLICIT DOLLAR VALUE GIVEN TO NON-**
3 **ENERGY BENEFITS IF THEY ARE NOT INCLUDED IN A TOTAL**
4 **RESOURCE COST TEST BENEFIT-COST ANALYSIS.**

5 A. A third reason to include NEIs in a TRC benefit-cost analysis is that it is impossible to
6 exclude them. What happens when NEIs are not considered is that the benefit-cost
7 analysis gives the NEIs an implicit value of \$0. One thing that *everyone* agrees on is that
8 while different analyses may place higher or lower values on various NEIs, those values
9 are, with certainly, greater than \$0.

10
11 To exclude NEIs in their entirety, in other words, because people claim that they may be
12 “hard to measure” or “uncertain” is to place the one value on them (\$0) that is universally
13 agreed to be wrong. Regulators such as the New Hampshire PUC simply do not have the
14 analytical luxury of excluding NEIs from the benefit-cost equation. To say that NEIs will
15 not be considered is, in effect, to include them with a value of \$0. That NEI valuation is
16 in error.

17
18 **Reason #4. The Relationship between Policy and Non-Energy Benefits.**

19 **Q. PLEASE EXPLAIN THE RELATIONSHIP BETWEEN NON-ENERGY**
20 **IMPACTS AND PUBLIC POLICY.**

21 A. A fourth reason to include NEIs in New Hampshire’s TRC benefit-cost analysis is that it
22 is through NEIs that important public policies are to be pursued. From a utility
23 perspective, for example, the improved payment patterns and reduced arrearages from

1 targeted low-income energy efficiency investments are not incidental benefits of the
2 energy efficiency programs. Improved bill affordability is one of the primary reasons for
3 targeting the program toward low-income customers in the first instance. Similarly, one
4 of the important public policy goals of ratepayer-funded low-income energy efficiency
5 programs is to pursue an equity in the distribution of energy efficiency funds. If low-
6 income programs are limited due to a perceived lack of cost-effectiveness because low-
7 income NEIs are not adequately incorporated into the TRC benefit-cost analysis, low-
8 income ratepayers are left with paying for programs from which they are
9 disproportionately excluded from participation. The public policy to be pursued involves
10 the equitable distribution of energy efficiency dollars.¹⁸

11
12 Both the equitable distribution of benefits and the assurance of benefits to low-income
13 households have been explicitly recognized as public policy in New Hampshire statutes.
14 New Hampshire's RSA 374-F:3, for example, states that "Restructuring of the electric
15 utility industry should be implemented in a manner that benefits all consumers equitably.
16 . . . Such benefits, as approved by regulators, may include, but not necessarily be limited
17 to, programs for low-income customers . . ." (RSA 374-F:3(VI)). New Hampshire's
18 statutes continue to recognize the need for energy efficiency investments. The legislature
19 has provided that "Restructuring should be designed to reduce market barriers to
20 investments in energy efficiency and provide incentives for appropriate demand-side
21 management and not reduce cost-effective customer conservation. Utility sponsored
22 energy efficiency programs should target cost-effective opportunities that may otherwise

¹⁸ See generally, Roger Colton (November 2014). *The Equities of Efficiency: Distributing Utility Usage Reduction Dollars for Affordable Multi-Family Housing*.

1 be lost due to market barriers.” (RSA 374-F:3(X)). It has long been recognized that the
2 market barriers which impede low-income investments in energy efficiency are far more
3 prevalent than the market barriers that impede residential investments in general.
4

5 **Q. IS THIS PUBLIC POLICY UNIQUE TO THE DISTRIBUTION OF ENERGY**
6 **EFFICIENCY FUNDS?**

7 A. No. There can be little question today but that energy usage reduction investments are an
8 environmental amenity. They increase the comfort, safety and affordability of recipient
9 housing. In addition, energy usage reduction is an environmental amenity in its capacity
10 as a climate change adaptation strategy. Usage reduction increases a household’s
11 capacity to cope with the impacts of climate change. It increases a household’s resilience
12 to respond to climate change impacts.¹⁹
13

14 The environmental justice movement has long been concerned with the disproportionate
15 lack of access to environmental amenities.²⁰ If the public policy goal of equitably funding

¹⁹ “Climate change adaptation strategies present a particularly difficult problem for disadvantaged communities lacking sufficient financial and social resources to pursue such strategies. These resources are encapsulated into the community’s “capacity to cope.” “The capacity to cope is a function of such factors as a community’s financial and social resources, access to health care, and geographic mobility. In other words, the extent of adverse consequences is not only a function of geographic location and physical attributes, but of socioeconomic conditions. . .Vulnerable populations will be at much greater risk from climate change unless climate change adaptation policies grapple with the underlying socioeconomic inequities that exacerbate their vulnerability. Decreasing social vulnerability requires adaptation measures that both reduce the underlying sensitivity to harm and enhance the impacted communities resilience to harm after it has occurred.” *Equities of Efficiency*, at 12 (internal citations omitted).

²⁰ The distributional impacts arising from the access to, and pricing of, urban mass transit on low-income communities is another good example of taking account of the distributional impacts of services viewed as environmental amenities Robison, Jonathan. “Fares and Fairness in Urban Public Transportation: The Need for a Substantive Basis for Agency Rate Making.” 43 *U.Pitt. L.Rev.* 903, 912 - 916 (1982); Bullard, Robert. “Addressing Urban Transportation Equity in the United States.” 31 *Fordham Urb. L.J.* 1183, 1188 - 1191 (October 2004). In 2009, for example, Seattle University law professor Clifford Rechtschaffen documented the disparate lack of access to transportation funding by race and income. Rechtschaffen, Clifford, et al. (2d ed. 2009). *Environmental Justice: Law, Policy and Regulation*, at 58 – 64, Seattle University School of Law: Seattle (WA). While mass transit funding, specifically, may not be particularly relevant to New Hampshire, it does present a good illustration of how the distribution of funding can be seen within the context of the distribution of environmental amenities.

1 low-income energy efficiency programs is to be achieved in New Hampshire, NEIs must
2 adequately be incorporated into the TRC benefit-cost analysis.

3
4 **Reason #5. Impacts on Type of Program Services and Type of Program Delivery.**

5 **Q. PLEASE EXPLAIN THE EXPECTED IMPACT OF INCLUDING NON-ENERGY**
6 **IMPACTS ON ENERGY EFFICIENCY PLANNING AND PROGRAM**
7 **DELIVERY IN NEW HAMPSHIRE.**

8 A. A fifth reason to include NEIs in a TRC benefit-cost analysis is that the NEIs will have a
9 substantive impact not only on what energy efficiency programs are delivered (on a
10 portfolio basis), but also on how those programs are delivered. One thing we know from
11 NEI analyses performed to date, for example, is that NEI benefits frequently, if not
12 generally, exceed the energy savings accruing from an energy efficiency program.²¹

13
14 The inclusion of NEIs, therefore, in the benefit-cost analysis of New Hampshire's energy
15 efficiency programs should not only affect decisions regarding the total investment in
16 efficiency programs, but could well affect the distribution of that funding between
17 program components. For example, an increased recognition of NEIs relating to
18 unaffordability and low-income payment difficulties could well lead New Hampshire
19 utilities to increase their efforts to target usage reduction investments based not only on
20 high usage, but based on high arrearages as well.

21

²¹ See generally, Appendix B attached to this Direct Testimony.

1 **Part 2. Using Adders is not Inconsistent with Evidence-Based Dollar Quantification**
2 **of NEIs in New Hampshire.**

3 **Q. PLEASE EXPLAIN THE PURPOSE OF THIS SECTION OF YOUR**
4 **TESTIMONY.**

5 A. In this section of my testimony, I address the need to provide evidence-based dollar
6 quantifications for the inclusion of NEIs in a benefit-cost analysis of energy efficiency
7 programs. As part of this discussion, I address how NEI adders are consistent with this
8 need for evidence-based quantification.

9
10 **Q. PLEASE EXPLAIN THE NEED FOR EVIDENCE-BASED QUANTIFICATION**
11 **OF THE DOLLAR VALUE OF NON-ENERGY IMPACTS?**

12 A. I do not question the need for the New Hampshire PUC to seek reasonable evidence-
13 based quantification of the dollar value of NEIs. Including NEIs in a benefit-cost
14 analysis should be reasonably accurate to the extent practicable. However, I also have
15 several concerns about this observation.

16
17 **Concern #1. Accurate and Feasible.**

18 **Q. WHAT IS YOUR FIRST CONCERN?**

19 A. My first concern is that the quantification of NEIs must not only be accurate, but must be
20 feasible. Indeed, quantification must not only be feasible, but must be practical. In
21 regulatory discussions of lifeline utility rates for low-income customers, I have frequently
22 come across similar regulatory attention to a desire for quantifiable impacts. Care must be
23 taken in the pursuit of this objective. I agree with law professor Michael Hennessy, who
24 speaks of the “myth of complete knowledge and perfect research.” Hennessy observes:

1 This first myth often translates into a discussion of not how much we know, but how
2 much residual error there remains to be explained. More importantly, the myth of
3 perfect knowledge is often used as an implicit criticism of a particular research effort
4 rather than a measure of our general ignorance. The implication is often given that
5 *other* researchers, *other* data bases, or *other* methodologies would have provided a
6 more accurate, more complete, or more valid set of results. Of course, these
7 alternative researchers, data or methods are never produced, so the actual research is
8 always compared with some idealized concept of the possible – a sort of ideal type
9 research design with no flaws. Given this theoretical comparison, obviously any
10 particular research study can be found seriously defective.

11 * * *

12
13
14 Such techniques of research defamation have two negative consequences. First, they
15 give the misleading impression that unflawed research is possible. McGrath has
16 cogently argued that given the constraints of the research process and the inherently
17 contradictory demands of “good research,” it is impossible to maximize all positive
18 features in any single research design. Hence, all research will be flawed. In fact, it
19 is not possible to do an unflawed study. . . The power of the idealized study is
20 contrasted nicely with the flawed (but empirical) method when McCloskey discusses
21 theory testing. He says, “a conceivable but practically impossible test takes over the
22 prestige of the real [but flawed] test, but free of its labor.”²²

23
24 Clearly, there is a trade-off between simplicity and precision. I do not conclude that
25 simplicity is always the best choice in approach. However, given my experience, and
26 given the information presented above, I do conclude that the question of how to quantify
27 the dollar value of NEIs should focus on what is reasonable, rather than on what
28 Professor Hennessy would label as “Complete Knowledge and Perfect Prediction.”

29

²² Michael Hennessy. “The Evaluation of Lifeline Electricity Rates: Methods and Myths,” 8 *Evaluation Review* 327 (1984).

1 **Concern #2. Search for Unnecessary Precision.**

2 **Q. WHAT IS YOUR SECOND CONCERN ON THE PURSUIT OF EVIDENCE-**
3 **BASED NON-ENERGY IMPACTS?**

4 A. A second concern I would advance is that, having reached the conclusion that the search
5 is for reasonable answers to the quantification of NEIs rather than for “Complete
6 Knowledge and Perfect Prediction,” I note also that New Hampshire should avoid the
7 search for unnecessary precision. Surrogate values for NEIs are available today that
8 provide reasonable insights into the magnitude of the dollar value they represent from the
9 utility and participant perspective. Even if there is a range of uncertainty surrounding
10 those dollar values, within that range of uncertainty lies a dollar value that is more
11 accurate than the \$0 value of NEIs that is universally found to be absolutely in error. The
12 fact is that there are large groups of NEIs that have been measured repeatedly with fairly
13 consistent results. The frequency of the measurement, and the consistencies in results,
14 should be recognized by the New Hampshire PUC in incorporating NEIs into the TRC
15 benefit-cost analysis to be applied to New Hampshire energy efficiency programs.

16
17 **Concern #3. Impact on Decisionmaking.**

18 **Q. WHAT IS YOUR THIRD CONCERN ON THE PURSUIT OF EVIDENCE-BASED**
19 **NON-ENERGY IMPACTS?**

20 A. My third concern is closely related to my concern over the search for unnecessary
21 precision. This concern counsels that the range of certainty that the PUC can (and
22 should) find as reasonable depends in part on the size of the NEIs and the impact which
23 those NEIs would have on the outcome of a benefit-cost analysis. As I will discuss in

1 more detail in my testimony below, many NEIs have been identified and quantified to a
2 reasonable degree of certainty. Many of these NEIs are quite large (including, but not
3 limited to, comfort, lost wages, some aspects of health and safety). They have a
4 substantial impact on a benefit-cost ratio using the TRC test. Other NEIs are much
5 smaller (including, but not limited to, reductions in bad debt and credit and collection
6 expenses flowing from reduced arrears) and would have a much lesser impact on the
7 TRC benefit-cost analysis. I recommend that the New Hampshire PUC approach its
8 search for a “range of reasonableness” for NEI valuations by asking the following three
9 questions:

- 10 ➤ What NEI categories are the most valuable?
- 11 ➤ What values arise from the low/high values in existing research?
- 12 ➤ Do those low/high values lead program administrators to a different conclusion
13 (e.g., to include rather than to exclude) or to a change in the program design?

14 A related set of questions has been recommended in a paper prepared for the Northeast
15 Energy Efficiency Project (“NEEP”) in assessing NEI valuations:

- 16 ➤ What NEIs are most likely to have an impact on the results of a benefit-cost
17 analysis?
- 18 ➤ Of those, what NEIs are easiest to quantify in dollar terms?
- 19 ➤ Of the remaining, what NEIs can be reasonably represented by proxies?²³

²³ See generally, Tom Woolf, et al. (2014). *Cost Effectiveness Screening Principles and Guidelines: For Alignment with Policy Goals, Non-Energy Impacts, Discount Rates, and Environmental Compliance Costs*, at 25 – 31. Prepared for Northeast Energy Efficiency Partnership, Regional Evaluation, Measurement and Verification Forum.

1 If particular NEIs are not valuable, or within those NEIs found to be valuable, the NEIs
2 would not change a benefit-cost conclusion (based on either the “low” or “high” end of
3 existing research), then devoting substantial resources to debating its existence and/or
4 value provides no value-added benefit. Resolution of the debate does not pass the “so-
5 what?” test. Moreover, of the NEIs that are found likely to have an impact on the result,
6 there should be an inquiry into which ones have been reasonably quantified and which
7 others could be represented by a proxy (such as an adder). By necessary converse
8 implications, if NEIs are *not* likely to “have an impact on the result,” they can reasonably
9 be set aside for the time-being or valued through a proxy such as an adder.

10
11 **Concern #4. Avoid Imposing Higher Standard on NEIs.**

12 **Q. PLEASE EXPLAIN HOW THE ADOPTION OF NON-ENERGY IMPACT**
13 **VALUES WITHIN A RANGE OF UNCERTAINTY RELATES TO OTHER**
14 **ASPECTS OF A UTILITY’S BENEFIT-COST ANALYSIS OF AN ENERGY**
15 **EFFICIENCY PROGRAM.**

16 A. My fourth concern about the search for evidence-based NEI dollar valuation is that the
17 New Hampshire PUC should not require of NEIs what is not required for other aspects of
18 an energy efficiency benefit-cost analysis. It is important to recognize that all elements
19 of a benefit-cost analysis for a ratepayer-funded energy efficiency program have aspects
20 of uncertainty to them. In particular, three inherently important areas stand out in their
21 levels of uncertainty within the preparation of an energy efficiency benefit-cost analysis:
22 (1) determining the service lives of energy efficiency measures; (2) choosing the
23 appropriate discount rate to use in determining the net present value of benefits accruing

1 over time; and (3) determining net-to-gross (“NTG”) ratios. According to Skumatz,
2 differences in values assigned to the expected life, in the NTG, and in the chosen
3 discount rate can make a 70% or more difference in the quantification of benefits in a
4 benefit-cost analysis, even without considering NEIs.²⁴

5
6 I agree with Skumatz when she concludes:

7 In summary, many elements in the B/C equations have uncertainties, and NEBs are
8 not necessarily the weakest link in the equation. The introduction of an estimated
9 value for NEBs automatically serves to decrease bias in the B/C test, because to omit
10 a value effectively introduces a value of zero. The literature clearly indicates the
11 value is positive and substantial – and definitely non-zero. . . NEB estimates include
12 uncertainty, with different errors associated with estimates from modeling sources,
13 impact sources, surveys, etc. NEBs have been measured repeatedly, consistently, and
14 with good rigor. Most importantly, NEBs should not be held to an artificially higher
15 standard than the other elements of the benefit-cost test, which are also necessarily
16 imperfect.

17
18 I urge the New Hampshire PUC to adopt this approach in considering NEIs in this
19 proceeding. The PUC should not impose more stringent standards on the quantification
20 of NEIs than it imposes on other “necessarily imperfect” inputs into the benefit-cost test
21 for the state’s residential energy efficiency programs.

22
23 **Concern #5. The “Chicken-and-Egg” Problem.**

24 **Q. PLEASE EXPLAIN YOUR FINAL CONCERN ABOUT THE DESIRE TO HAVE**
25 **EVIDENCE-BASED QUANTIFICATION OF NON-ENERGY IMPACTS.**

²⁴ Lisa Skumatz (2016). *Non-Energy Benefits / NEBs – Winning at Cost-Effectiveness Dominos: State Progress and TRMs*, at 6-8, 2016 ACEEE Summer Study on Energy Efficiency in Buildings.

1 A. In seeking evidence-based quantification of the dollar values of NEIs for New
2 Hampshire, the PUC should be wary of contributing to the chicken-and-egg problem for
3 energy efficiency benefit-cost analyses. Requiring an excessively precise valuation of
4 NEIs before including those NEIs in a benefit-cost ratio would likely result in creating an
5 impediment to NEI valuation rather than an incentive for NEI valuation. Under such an
6 approach, the incorporation of NEIs into utility benefit-cost analyses lags because of
7 expressed concerns about the quality of the data. However, utilities refuse to invest
8 funding into NEI research because the results of that research have not been incorporated
9 into regulatory decisionmaking (and thus into utility planning and decisionmaking).
10 Given that the research was not being put to use, in other words, additional research was
11 not pursued. Moreover, given that additional research was not pursued, existing research
12 was not put to use. To break this cycle, New Hampshire should incorporate existing
13 knowledge of NEIs attributable to residential (and low-income residential) programs
14 within the reasonable ranges identified by existing research. One thing we know about
15 the existing research is that the value of NEIs is not \$0. Another thing we know is that
16 the value of NEIs often equals or exceeds the value of energy savings arising from
17 residential (and low-income residential) programs.²⁵

18

²⁵See generally, Appendix B to this Direct Testimony.

1 **Part 3. The Role of an Adder in Quantifying NEIs for New Hampshire.**
2

3 **Q. PLEASE EXPLAIN THE PURPOSE OF THIS SECTION OF YOUR**
4 **TESTIMONY.**

5 A. In this section of my testimony, I examine whether NEI adders would be appropriate to
6 use in the benefit-cost analyses for residential and low-income residential energy
7 efficiency programs in New Hampshire. I conclude that adders are reasonable, and I
8 make recommendations on what level of adder would be reasonable to adopt.
9

10 **Q. ARE THERE PARTICULAR CONDITIONS THE EXISTENCE OF WHICH**
11 **COUNSELS THE USE OF AN “ADDER” TO QUANTIFY NON-ENERGY**
12 **IMPACTS?**

13 A. Yes. One set of circumstances involves when an evaluator (or planner or other
14 decisionmaker) wants to bundle the dollar values of NEIs without apportioning those
15 impacts to particular individual impacts. This is one reason that stakeholders beginning
16 the process of incorporating NEIs rely upon adders. A utility, or utility commission, can
17 know with certainty, as we all know in New Hampshire, that the value of NEIs is greater
18 than \$0. They can know with substantial certainty that the aggregated value of the NEIs
19 approaches, if not exceeds, the aggregate value of the energy savings. That knowledge,
20 however, does not necessarily allow the stakeholder to allocate a particular dollar value to
21 comfort; a different dollar value to health and safety; and yet a different dollar value to
22 avoided wage losses, whether attributable to health reasons or to frequent mobility.
23

1 **Q. IS THERE A SECOND SET OF CIRCUMSTANCES APPLICABLE TO NEW**
2 **HAMPSHIRE WHICH MAKES THE USE OF AN ADDER APPROPRIATE?**

3 A. Yes. The use of an adder is appropriate when the user wanting to account for NEIs is
4 unsure of how to account for the fact that the whole is often less than the sum of its parts.
5 This impact is commonly referred to as the “part-whole bias.”²⁶ Part-whole bias is not
6 unique to the valuation of NEIs. This principle reflects the proposition that individuals
7 often place a greater value on individual components of a transaction than they do on the
8 transaction as a whole.²⁷ As this principle shows, in other words, even when one can
9 quantify the dollar values for individual NEIs, you do not necessarily know what the
10 appropriate value would be for NEIs as a whole. Under such circumstances, the use of an
11 adder would be an appropriate decision.

12
13 **Q. PLEASE EXPLAIN YOUR THIRD REASON FOR SUPPORTING THE USE OF**
14 **AN ADDER THROUGH WHICH TO VALUE NON-ENERGY IMPACTS IN**
15 **NEW HAMPSHIRE.**

16 A. A third situation in which the use of adders is appropriate is when one state seeks to
17 import the use of a quantification of NEIs from a different state. While the specific dollar
18 value found to exist in one state may not be entirely transferable to another state, the
19 value of the NEIs relative to the value of program energy savings can be. It has
20 frequently been found that NEIs are sufficiently well-studied and well-documented that
21 the NEIs as a percentage of savings are reasonably consistent.

²⁶ It is also sometimes referred to as the “sub-additivity effect.” Not everyone agrees that such a bias exists in research on contingent valuations or that it cannot be reasonably remedied through proper design of the survey instrument.

²⁷ The classic “test” of part-whole bias involved an experiment during which respondents placed greater values on vouchers for different components of a meal at a restaurant than they placed on the meal as a whole.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23

Q. DO YOU HAVE A FINAL OBSERVATION ABOUT THE USE OF ADDERS AS A MECHANISM TO VALUE NON-ENERGY IMPACTS?

A. Yes. The use of adders can be appropriate if/when a state is seeking to implement specific public policies. One such public policy, for example, is to promote the delivery of energy efficiency services to low-income households. The importance of that policy can be weighed against the uncertainty inhering in the adder. The greater the importance of the policy, the closer the PUC can weight the adder to 100% of expected NEIs. The lesser the importance of the policy, the more the NEI adder can be discounted to less than 100% of its expected value. This process of weighting the importance of public policy considerations against the desire for precision in the NEI documentation is more easily implemented through the use of an adder for NEIs.

Part 4. Lessons Learned from Other States Valuing NEIs.

Q. PLEASE EXPLAIN THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY.

A. In this section of my testimony, I review some of the lessons learned from recent NEI research to identify NEI values. I find that there is a growing consistency in results that would allow New Hampshire decisionmakers to adopt such values as reasonably applicable to New Hampshire. I have included, as Appendix B, an examination of the states of Colorado, Massachusetts, Connecticut and Maryland upon which I rely for this analysis.

1 **Q. WHAT LESSONS CAN BE DERIVED FROM THE EXPERIENCE OF THE**
2 **FOUR STATES YOU PRESENT IN APPENDIX B?**

3 A. I draw the following conclusions from the data and discussion above presented in
4 Appendix B:

5
6 First, I conclude that exclusively from the participant perspective, the non-energy impacts
7 of ratepayer-funded energy efficiency programs are substantial. Indeed, these participant
8 perspective NEIs can generally be expected to equal or exceed, frequently substantially,
9 the energy savings generated by the program. At least three of the states in Appendix B
10 support this conclusion (CO, MA, MD).

11
12 Second, I conclude that the value of the participant-perspective NEIs can be expected to
13 dwarf the value of the utility-perspective NEIs. This is not to say that the utility-
14 perspective NEIs are “insubstantial” or even “small.” This conclusion is simply that the
15 utility-perspective NEIs are considerably smaller in value relative to participant-
16 perspective NEIs. All four states in Appendix B (CO, MA, MD, CT) support this
17 conclusion.

18
19 Third, I conclude that a sufficient number of studies generating relatively consistent
20 results, allow New Hampshire to establish considerable NEIs with some certainty of
21 result. Just the limited number of participant-perspective NEIs I discuss in this
22 testimony²⁸ would support the conclusion that the values of these participant-perspective

²⁸ These include: increased comfort (MA), increased noise reduction (MA), health and safety (MA), and control over bills (MD).

1 NEIs exceed 100% of energy savings. At least three of the states in Appendix B support
2 this conclusion (CO, MA, MD).

3
4 Fourth, I conclude that the value of low-income participant-perspective NEIs can be
5 expected to exceed the value of non-low-income participant-perspective NEIs on a
6 percentage of energy savings basis. All four states in Appendix B support this conclusion
7 (CO, MA, MD, CT).

8
9 Fifth, I conclude that the participant-perspective NEIs that have been documented in New
10 England (and elsewhere) are not internalized in the avoided costs of energy and capacity.
11 Accordingly, these NEIs must be separately accounted for in the benefit-cost analysis.
12 All four states in Appendix B would support this conclusion (CO, MA, MD, CT).

13
14 More broadly than the specific conclusions I articulate above, I conclude that the
15 preparation of a benefit-cost analysis has considerable uncertainty in many of its
16 component parts, whether one looks at the calculation of net-to-gross ratios, or measure
17 service lives, or the discount rate to apply to net present value analysis. The valuation of
18 NEIs, in fact, is not necessarily the most uncertain link in this set of uncertain values.

19
20 In addition, I conclude that the use of a TRC benefit-cost test necessarily implies the
21 incorporation of NEIs into the benefit-cost analysis. To include all program costs without
22 incorporating all program benefits is to skew the benefit-cost analysis against energy
23 efficiency investments. This results in an under-investment in energy efficiency.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

Ultimately, I conclude that the use of an adder is a reasonable mechanism to employ in incorporating participant-perspective NEIs into a TRC benefit-cost analysis.

Q. DO YOU HAVE A SPECIFIC RECOMMENDATION FOR NEW HAMPSHIRE BASED ON THE DATA AND DISCUSSION ABOVE?

A. Yes. The limited participant-perspective NEIs I document above clearly exceed 100% of energy savings.²⁹ Accordingly, I recommend that, as a reasonable approach to initiating the incorporation of dollar values for NEIs in New Hampshire’s benefit-cost analysis, the PUC should cap total NEI values at 100% (i.e., not to exceed energy savings). This number reflects a reasonable proxy for the full value of NEIs and presents a symmetrical treatment of costs and benefits. If New Hampshire undertakes a measured NEI study at some point in the future, this number could be higher.

Part 5. The Need to Adopt a Specific Low-Income NEI Adder.

Q. PLEASE EXPLAIN THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY.

A. In this section of my testimony, I consider whether New Hampshire would be justified in adopting a larger NEI adder specifically to address the NEIs arising from the state’s low-income energy efficiency programs.

²⁹ Consistent with my recommendation earlier in my testimony, I do not undertake to value all NEIs. Placing a value on additional NEIs would not change my conclusion that participant perspective NEIs equal or exceed 100% of energy savings.

1 **Q. DO YOU HAVE REASON TO BELIEVE THAT LOW-INCOME NON-ENERGY**
2 **IMPACTS IN NEW HAMPSHIRE EXCEED NON-LOW-INCOME NON-**
3 **ENERGY IMPACTS ON A PERCENTAGE BASIS?**

4 A. Yes. At least in New England, the fact that low-income NEIs not only exceed non-low-
5 income NEIs, but do so by a substantial extent, is generally accepted. Consider the NEI
6 values set forth in the Direct Testimony of Michael Goldman. With the exception of
7 Vermont, which uses a small adder, the low-income NEIs exceed the non-low-income
8 NEIs by a factor of 200% to 700%. The comparison taken from Mr. Goldman’s Table 1
9 is set forth below:³⁰

	Non-Low-Income NEIs	Low-Income NEIs	Ratio (LI to NLI)
MA	21.46%	80.58%	3.75:1
CT	43.70%	88.20%	2.02:1
RI	24.50%	177.06%	7.23:1
VT	60.88%	67.85%	1.11:1

10

11 **Q. ARE THERE OTHER REASONS YOU FIND THAT WOULD SUPPORT A**
12 **HIGHER NON-ENERGY IMPACT FOR LOW-INCOME ENERGY**
13 **EFFICIENCY?**

14 A. Yes. The determination of an NEI is a multi-tier process. One of those steps is to assign a
15 value to a particular attribute. Another of those steps is to determine the incidence of the
16 attribute in the low-income energy efficiency recipient population. I discussed in some
17 detail above, for example, how the most recent Massachusetts valuation of Health and
18 Safety NEIs acknowledges in the text of its report how it under-estimated certain values,

³⁰ It is, of course, important to remember that not all states have quantified the same NEIs or done so in a uniform fashion.

1 particularly as they relate to low-income households. In my testimony below, I introduce
2 several more illustrations (this is certainly not a comprehensive listing) of how low-
3 income NEIs have been under-stated. My discussion focuses below on (1) the health and
4 safety benefits of avoided fires; (2) on the value of reduced forced absences from a home;
5 and (3) on the participant-perspective benefits of reduced disconnections and
6 reconnections.

7
8 **Q. PLEASE EXPLAIN HOW THE BENEFITS OF REDUCED FIRES (BOTH**
9 **PERSONAL INJURY AND PROPERTY DAMAGE) REDOUND TO THE**
10 **BENEFIT OF LOW-INCOME HOUSEHOLDS THAT HAVE NOT YET BEEN**
11 **ADEQUATELY CONSIDERED IN NON-ENERGY IMPACTS.**

12 A. The benefits of reduced fires, along with the accompanying reduction in personal injury
13 and property damage, have been well-documented in research regarding NEIs. The
14 quantification of reduced numbers of fires, however, has focused exclusively on how
15 energy efficiency investments improve the equipment that is being replaced through the
16 efficiency programs.

17
18 In the low-income community, however, fire hazards also arise from the loss of service
19 due to nonpayment or due to the increased use of space heaters because the use of central
20 heating systems is perceived to be too expensive. Alternatives that low-income
21 households use to disconnected lights also present fire hazards. The periodic survey that
22 the National Energy Assistance Directors Association (“NEADA”) performs for
23 Congress provides the data. The 2011 NEADA survey reports that more than one-quarter

1 of low-income households, for example, used candles or lanterns in the last year because
2 their electric service had been disconnected.

3
4 Moreover, a study that I performed for the National Fuel Funds Network (“NFFN”) in
5 2001 reported that many low-income customers who lose their primary heating service
6 due to nonpayment turn to secondary sources of heating such as portable space heaters. I
7 found:

8 While portable space heaters are not the major cause of home heating fires, they play
9 a much more substantial role in deaths and injuries. Portable and fixed space heaters
10 (and their related equipment such as fireplaces, chimneys and chimney collectors)
11 accounted for roughly two of every three (65%) home heating fires in 1998 and three
12 of every four (76%) associated deaths. Each of these devices has a higher death rate
13 per million households using them than do the various types of central heating units
14 or water heaters. Indeed, portable electric heaters have accounted for the highest
15 home heating fire death toll in 10 of the past 14 years.¹¹ No other cause of home
16 heating fires comes even close to the fatality rate caused by portable heaters and
17 fixed space heaters. In usage-weighted terms, while portable heaters do not cause
18 more fires than central heating units, they are associated with significantly more
19 deaths, more injuries, and more direct property damage, than are central units.³¹
20

21 As is evident, the literature quantifying fewer deaths, personal injuries, and property
22 damages due to the replacement of defective home heating systems through energy
23 efficiency programs, while accurate to the extent that it goes, under-values the extent of
24 fire reduction that can be attributed to energy efficiency for low-income customers. This
25 conclusion was not simply my own. The National Fire Prevention Association (“NFPA”)

³¹ Roger Colton (2001). *In Harm’s Way: Home Heating, Fire Hazards, and Low-Income Households*, at 1-2 (internal notes omitted).

1 reports that “not being able to afford utilities” is one of the “major factors of increased
2 fire risks” for low-income households.³²

3
4 Moreover, the literature quantifying the dollar value of reduced fire hazards attributable
5 to energy efficiency does not account for the special exposure that low-income
6 households have to personal injury and death. The NFPA reports that fires in low-
7 income homes are more likely to result in death and/or injury, particularly of children,
8 because of: (1) not always being able to afford child care and leaving children unattended
9 or unsupervised; (2) not being able to afford a telephone; and (3) living in less fire
10 resistant housing, as well as using less fire resistant furniture and mattresses.³³

11
12 It is important to understand that these fire risks do not arise simply from the
13 disconnection of utility service, but rather from the unaffordability of utility service.
14 Reducing bills through energy efficiency will help reduce these fire risks and will give
15 rise to increased NEIs. This occurs as a result of the energy efficiency apart from the
16 replacement or repair of home heating systems.

17
18 **Q. PLEASE DISCUSS YOUR REFERENCE TO THE FORCED ABSENCE FROM A**
19 **HOME.**

20 A. The literature quantifying NEIs has been found to develop methodologically sound, and
21 reasonably consistent, dollar values for the frequent mobility caused by unaffordable
22 home energy and the loss of home utility service. These values are more likely to

³² “Burning Issues,” *NFPA Journal*, at 104 (January/February 1996).

³³ Rita Fahy and Alison Norton, “How Being Poor Affects Fire Risk. . .” *Fire Journal*, at 29:34 (January/February 1989).

1 appertain to low-income households. What the literature does *not* address is how energy
2 efficiency, by making home energy service more affordable, can be used to reduce the
3 forced absences that low-income households experience. That reduction in forced
4 absences will have a value greater than \$0.³⁴

5
6 The existence of this forced absence has been well-documented. The most recent
7 NEADA survey of fuel assistance recipients reported that more than one-in-five
8 respondents reported that, within the previous year, they left home for all or part of a day
9 because the home was too hot or too cold due to their inability to pay their home energy
10 bill. To the extent that energy efficiency can improve the home energy affordability, the
11 incidence of this forced absence will be reduced. Again, however, more than
12 documenting a precise value for this non-energy impact, my purpose here is simply to
13 note that the value is greater than \$0 and that it is uniquely associated with low-income
14 (rather than non-low-income) efficiency recipients.

15
16 **Q. PLEASE EXPLAIN THE UNDER-ESTIMATION OF THE BENEFITS OF**
17 **REDUCED NUMBER OF DISCONNECTIONS FOR NONPAYMENT AND THE**
18 **SUBSEQUENT RECONNECTION OF SERVICE.**

19 A. A participant-perspective NEI has been calculated for the reconnection of service
20 subsequent to the disconnection of service for nonpayment. The value that has been
21 placed on the reconnection of service, however, has been limited to the dollar value of the
22 reconnection fee imposed by the utility.

³⁴ My objective here is not to establish the increased value, but rather to simply document that there are factors that make the participant perspective NEIs for low-income households higher than the participant perspective NEIs for non-low-income.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

The actual value of a reduced number of reconnections is greater than that. As I found in my study of the economic development impacts of fuel assistance and weatherization, “the reconnection of service does not ‘just happen’ after service has been terminated for nonpayment. The actions a customer must take to find money, contact the utility, make payment arrangements, and await the physical reconnection all take time. The lost work time devoted to the reconnection of service represents lost wages to the household. Previous studies of the lost work time devoted to the reconnection of service after a disconnection have found that households lose eight hours of work time.”³⁵ The value of the non-energy impact of reduced numbers of disconnection (and thus reconnections) extends well beyond only the dollar value of any reconnection fee. The value extends, also, to the avoided time devoted to arranging the payment resulting in the reconnection.

Q. DO THE UTILITY-PERSPECTIVE NON-ENERGY IMPACTS SUPPORT A LARGER NON-ENERGY IMPACT ADDER FOR LOW-INCOME CUSTOMERS?

A. Yes. As the NMR Massachusetts study documents, many of the utility-perspective NEIs relate primarily, if not exclusively, to low-income programs. The adder components relating to avoided working capital, avoided bad debt, avoided disconnection and reconnection costs, and avoided collection call costs, are related to addressing the payment problems of low-income customers. In addition, of course, since New Hampshire offers a low-income electric discount, a low-income adder would need to

³⁵ Roger Colton (2003). *The Economic Development Impacts of Energy Assistance: The Entergy States*, at 15, prepared for Entergy Services (internal citations omitted).

1 reflect the avoided costs of the discounts that would have been provided on the reduced
2 consumption. Each of these additional NEIs specific to low-income customers counsels
3 for an increased adder when applied to low-income energy efficiency programs.
4

5 **Q. IS THERE A FINAL SEPARATE AND INDEPENDENT REASON FOR**
6 **ADOPTING A HIGHER ADDER FOR LOW-INCOME NON-ENERGY**
7 **IMPACTS THAN FOR NON-LOW-INCOME NON-ENERGY IMPACTS?**

8 A. Yes. As I discuss in more detail above, the use of an adder to reflect NEIs would allow
9 the New Hampshire PUC to incorporate the public policy favoring the delivery of energy
10 efficiency to low-income households into the NEI determination. The public policy
11 favoring low-income energy efficiency is predicated on promoting an equitable
12 distribution of efficiency investments, the improved affordability resulting from low-
13 income efficiency investments, and the increased efficiency of low-income bill
14 affordability programs provided through usage reduction rather than through the need for
15 repetitive fuel assistance (or rate discounts). The presence of these public policies allows
16 the New Hampshire PUC to weight the benefits of quantifying NEIs against the possible
17 imprecision of establishing an NEI value differently for low-income and for non-low-
18 income customers.
19

20 **Q. PLEASE EXPLAIN YOUR FINDINGS AND CONCLUSIONS WITH RESPECT**
21 **TO THE USE OF A LOW-INCOME ADDER FOR NON-ENERGY IMPACTS.**

22 A. Based on the data and discussion presented in my testimony, including but not limited to
23 the specific data in this section, I conclude that the monetized participant-perspective

1 non-energy impacts arising from energy efficiency investments will be greater for low-
2 income than for non-low-income households. In addition, the utility-perspective
3 payment-related non-energy impacts are greater for low-income than for non-low-income
4 efficiency recipients. Accordingly, I conclude that to the extent that the non-energy
5 impacts are accounted for through the use of an NEI adder, a separate and larger NEI
6 adder is appropriate for low-income customers.

7

8 **Q. WHAT DO YOU RECOMMEND?**

9 A. In New England, setting aside Vermont as an outlier, the smallest ratio of low-income to
10 non-low-income NEIs was roughly 200% (2:1). Accordingly, I recommend that a
11 separate NEI adder be established for low-income customers. I recommend further that
12 this low-income NEI adder be set equal to twice the value of the non-low-income NEI.

13

14 **Q. DOES THIS COMPLETE YOUR TESTIMONY?**

15 A. Yes, it does.