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Non-Energy Impacts Vastly Improve Cost-Effectiveness of Low-Income Efficiency Investments. (part 1 of 3)

NOTE TO READERS

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The Benefits of Low-Income Energy Efficiency Go Beyond Traditional Energy and Capacity Reductions and Can Double (or More) Low-Income Benefit-Cost Ratios.

In 1987, FSC was one of the first, if not the first, analyst to suggest that targeted electric energy efficiency programs had advantages that went beyond the traditional energy and capacity savings associated with energy efficiency measures. Our analysis stated:

The cost-effective reduction of system costs is relevant and important in every part of the business operations of the utility, not simply to the power supply function. Accordingly, a utility should be concerned with the problem of nonpayment, overdue payment, and partial payment of utility bills. Bad debt arises when ratepayers demand power from the system and then do not pay for it on a timely basis. . . . [A] new conservation program [can be proposed] that is justified on an avoided cost basis. The proposal rejects the historical view that avoided costs include only an energy and a capacity component. Instead, it introduces the notion of avoided bad debt. As long as the energy efficiency program costs less than the bad debt it will avoid, the program is cost-justified.¹

¹ 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.

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

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

In testimony recently presented to the New Hampshire Public Utilities Commission (NHPUC), even after 30 years, FSC was called upon to justify the existence of NEIs for low-income efficiency investments. In addition, FSC was asked to assess whether it is reasonable and appropriate for the NHPUC to adopt an “add-on” to reflect the NEIs of residential energy efficiency programs in any benefit-cost analysis of those programs. FSC was further asked to assess the reasonableness of adopting a separate add-on specific to energy efficiency programs targeted to low-income households.

The Need to Include Non-Energy Impacts in a Benefit-Cost Analysis.

Non-energy impacts (“NEIs”) can be classified into three broad categories based on the perspective being studied: (1) utility impacts; (2) participant impacts; and (3) societal impacts. For example, from the utility’s perspective, a reduction in arrears (and thus the working capital associated with those arrears) is an expense reduction accruing from usage reduction and thus an NEI. Increased comfort, on the other hand, is a benefit to energy efficiency program participants and thus an NEI from the participant’s perspective. Increased job creation is a societal benefit of energy efficiency and thus an NEI from the societal perspective.

FSC identified five reasons why the NHPUC should adequately incorporate NEIs into the benefit-cost analysis of residential energy efficiency programs generally, and of low-income residential energy efficiency programs in particular.

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

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

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

For each type of impact included in a cost-effectiveness test, it is important that both the costs and the benefits be included in a symmetrical way. Otherwise, the test may be skewed and provide misleading results. . . . On the benefits side, depending on the measures or program, there may be a variety of non-energy benefits that are part of the reason a customer invested in the measure (e.g., improved comfort, improved building durability, improved business productivity, etc.). If the participant costs are included in the cost-effectiveness test, then such benefits would need to be included as well.²

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

A second reason to incorporate NEIs into the benefit-cost analysis is because utilities tend to include all energy efficiency program costs even when those costs are used to purchase non-energy benefits. The “non-energy costs” referenced here would include that portion of a total energy efficiency investment that was made for reasons other than to generate the traditional energy and capacity savings.

² NSPM, at 12.

One thing we know, for example, is that one of the primary objectives sought by residential customers investing in energy efficiency is the resulting improved comfort of the home. If 50% of the benefit being purchased through an investment, however, involves improved comfort, it would be inappropriate to include 100% of the energy efficiency costs as “energy-related” costs. Half of those costs were instead purchasing improved home comfort. It would be even more inappropriate to include the costs used to purchase improved comfort in the benefit-cost analysis while at the same time excluding the resulting comfort-related benefits. In fact, benefit-cost analyses do not seek to apportion energy efficiency program costs into their energy and non-energy components. If the non-energy costs are included in the benefit-cost analysis, the non-energy benefits must also be included. Failing to do so not only makes the benefit-cost analysis misleading, but it tends to make the benefit-cost analysis meaningless.

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

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

To exclude NEIs in their entirety, in other words, because people claim that they may be “hard to measure” or “uncertain” is to place the one value on them (\$0) that is universally agreed to be wrong. Regulators such as the New

Hampshire PUC simply do not have the analytical luxury of excluding NEIs from the benefit-cost equation. To say that NEIs will not be considered is, in effect, to include them with a value of \$0. That NEI valuation is in error.

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

A fourth reason to include NEIs in New Hampshire's TRC benefit-cost analysis is that it is through NEIs that important public policies are to be pursued. From a utility perspective, for example, the improved payment patterns and reduced arrearages from targeted low-income energy efficiency investments are not incidental benefits of the energy efficiency programs. Improved bill affordability is one of the primary reasons for targeting the program toward low-income customers in the first instance.

Similarly, one of the important public policy goals of ratepayer-funded low-income energy efficiency programs is to pursue an equity in the distribution of energy efficiency funds. If low-income programs are limited due to a perceived lack of cost-effectiveness because low-income NEIs are not adequately incorporated into the TRC benefit-cost analysis, low-income ratepayers are left with paying for programs from which they are disproportionately excluded from participation. The public policy to be pursued involves the equitable distribution of energy efficiency dollars.³

Both the equitable distribution of benefits and the assurance of benefits to low-income house-

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

It has long been recognized that the market barriers which impede low-income investments in energy efficiency are far more prevalent than the market barriers that impede residential investments in general.

This public policy is not unique to the distribution of energy efficiency funds. There can be little question today but that energy usage reduction investments are an environmental amenity. They increase the comfort, safety and affordability of recipient housing. In addition, energy usage reduction is an environmental amenity in its capacity as a climate change adaptation strategy. Usage reduction increases a household's capacity to cope with the impacts of climate change. It increases a household's resilience to respond to climate change impacts.⁴

³ See generally, Roger Colton (November 2014). *The Equities of Efficiency: Distributing Utility Usage Reduction Dollars for Affordable Multi-Family Housing*.

⁴ "Climate change adaptation strategies present a particularly difficult problem for disadvantaged commu-

The environmental justice movement has long been concerned with the disproportionate lack of access to environmental amenities.⁵ If the public policy goal of equitably funding low-income energy efficiency programs is to be achieved in New Hampshire, NEIs must adequately be incorporated into the TRC benefit-cost analysis.

nities 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).

⁵ 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.

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

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

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

THE ROLE OF "ADDERS" IN ACCOUNTING FOR NEIs.

In its New Hampshire testimony, FSC did not question the PUC's desire to seek reasonable evidence-based quantification of the dollar value of NEIs. Including NEIs in a benefit-cost analysis should be reasonably accurate to the extent practicable.

However, FSC raised and addressed several concerns about this observation.

Concern #1. Accurate and Feasible.

The first concern was that the quantification of NEIs must not only be accurate, but must be practical. Regulatory discussions of lifeline utility rates for low-income customers, for example, have frequently come across similar regulatory attention to a desire for quantifiable impacts. Care must be taken in the pursuit of this objective. Law professor Michael Hennessy was cited favorably for speaking about the “myth of complete knowledge and perfect research.” Hennessy observes:

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

* * *

Such techniques of research defamation have two negative consequences. First, they give the misleading impression that unflawed research is possible. McGrath

has cogently argued that given the constraints of the research process and the inherently contradictory demands of “good research,” it is impossible to maximize all positive features in any single research design. Hence, all research will be flawed. In fact, it is not possible to do an unflawed study. . . The power of the idealized study is contrasted nicely with the flawed (but empirical) method when McCloskey discusses theory testing. He says, “a conceivable but practically impossible test takes over the prestige of the real [but flawed] test, but free of its labor.”⁶

Clearly, FSC said, there is a trade-off between simplicity and precision. However, experience dictates that the question of how to quantify the dollar value of NEIs should focus on what is reasonable, rather than on what Professor Hennessy would label as “Complete Knowledge and Perfect Prediction.”

Concern #2. Search for Unnecessary Precision.

A second concern addressed in the New Hampshire testimony is the need to avoid the search for unnecessary precision. Surrogate values for NEIs are available today that provide reasonable insights into the magnitude of the dollar value they represent from the utility and participant perspective. Even if there is a range of uncertainty surrounding those dollar values, within that range of uncertainty lies a dollar value that is more accurate than the \$0 value of NEIs that is universally found to be absolutely in error. The fact is that there are large groups of NEIs

⁶ Michael Hennessy. “The Evaluation of Lifeline Electricity Rates: Methods and Myths,” 8 *Evaluation Review* 327 (1984).

that have been measured repeatedly with fairly consistent results. The frequency of the measurement, and the consistencies in results, should be recognized by the New Hampshire PUC in incorporating NEIs into the TRC benefit-cost analysis to be applied to New Hampshire energy efficiency programs.

Concern #3. Impact on Decisionmaking.

The third concern is closely related to the concern over the search for unnecessary precision. This concern counsels that the range of certainty that the PUC can (and should) find as reasonable depends in part on the size of the NEIs and the impact which those NEIs would have on the outcome of a benefit-cost analysis.

Many NEIs have been identified and quantified to a reasonable degree of certainty. Many of these NEIs are quite large (including, but not limited to, comfort, lost wages, some aspects of health and safety). They have a substantial impact on a benefit-cost ratio using the TRC test. Other NEIs are much smaller (including, but not limited to, reductions in bad debt and credit and collection expenses flowing from reduced arrears) and would have a much lesser impact on the TRC benefit-cost analysis.

FSC recommended that the New Hampshire PUC approach its search for a “range of reasonableness” for NEI valuations by asking the following three questions: (1) what NEI categories are the most valuable? (2) what values arise from the low/high values in existing research? And (3) do those low/high values lead program administrators to a different conclusion (e.g., to include rather than to exclude) or to a change in the program design?

A related set of questions has been recommended in a paper prepared for the Northeast Energy Efficiency Project (“NEEP”) in assessing NEI valuations: (1) what NEIs are most likely to have an impact on the results of a benefit-cost analysis? (2) of those, what NEIs are easiest to quantify in dollar terms? and (3) of the remaining, what NEIs can be reasonably represented by proxies?⁷

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

Concern #4. Avoid Imposing Higher Standard on NEIs.

The fourth concern about the search for evidence-based NEI dollar valuation is that the New Hampshire PUC should not require of NEIs that which is not required for other aspects of an

⁷ See generally, Tim 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.

energy efficiency benefit-cost analysis. It is important to recognize that all elements of a benefit-cost analysis for a ratepayer-funded energy efficiency program have aspects of uncertainty to them. In particular, three inherently important areas stand out in their levels of uncertainty within the preparation of an energy efficiency benefit-cost analysis: (1) determining the service lives of energy efficiency measures; (2) choosing the appropriate discount rate to use in determining the net present value of benefits accruing over time; and (3) determining net-to-gross (“NTG”) ratios.

According to Skumatz, differences in values assigned to the expected life, in the NTG, and in the chosen discount rate can make a 70% or more difference in the quantification of benefits in a benefit-cost analysis, even without considering NEIs.⁸ FSC agrees with Skumatz when she concluded:

In summary, many elements in the B/C equations have uncertainties, and NEBs are not necessarily the weakest link in the equation. The introduction of an estimated value for NEBs automatically serves to decrease bias in the B/C test, because to omit a value effectively introduces a value of zero. The literature clearly indicates the value is positive and substantial – and definitely non-zero. . . NEB estimates include uncertainty, with different errors associated with estimates from modeling sources, impact sources, surveys, etc. NEBs have been measured repeatedly, consistently, and with good rigor. Most importantly, NEBs should

not be held to an artificially higher standard than the other elements of the benefit-cost test, which are also necessarily imperfect.

FSC urged the NHPUC to adopt this approach in considering NEIs. The NHPUC should not impose more stringent standards on the quantification of NEIs than it imposes on other “necessarily imperfect” inputs into the benefit-cost test for the state’s residential energy efficiency programs.

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

Finally, FSC warned that in seeking evidence-based quantification of the dollar values of NEIs, the NHPUC should be wary of contributing to the chicken-and-egg problem for energy efficiency benefit-cost analyses. Requiring an excessively precise valuation of NEIs before including those NEIs in a benefit-cost ratio would likely result in creating an impediment to NEI valuation rather than an incentive for NEI valuation.

Under such an approach, the incorporation of NEIs into utility benefit-cost analyses lags because of expressed concerns about the quality of the data. However, utilities refuse to invest funding into NEI research because the results of that research have not been incorporated into regulatory decisionmaking (and thus into utility planning and decisionmaking). Given that the research was not being put to use, in other words, additional research was not pursued. Moreover, given that additional research was not pursued, existing research was not put to use.

To break this cycle, New Hampshire should incorporate existing knowledge of NEIs attributa-

⁸ 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.

ble to residential (and low-income residential) programs within the reasonable ranges identified by existing research. One thing known from the existing research is that the value of NEIs is not \$0. Another thing known is that the value of NEIs often equals or exceeds the value of energy savings arising from residential (and low-income residential) programs.

Summary and Conclusions

Based on the above data and analysis, FSC concluded that the New Hampshire PUC should incorporate NEIs into the state's analysis of the cost-effectiveness of low-income energy efficiency programs. FSC further concluded that the use of adders was an appropriate mechanism through which NEIs can be quantified and incorporated.

For more information regarding low-income Non-Energy Impacts, or for a copy of Colton's New Hampshire 2017 testimony, please write:

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