Lessons from the Field: Practical Applications for Incorporating Non-Energy Benefits into Cost-Effectiveness Screening

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ABSTRACT

The literature on non-energy benefits (NEBs) has shifted in the past several years from the recognition of these benefits by regulators and program administrators to recommendations on how best to incorporate these benefits into cost-effectiveness screening. This new treatment of NEBs is now seen as a best practice for energy efficiency programs. The three primary classifications of NEBs—participant, utility, and societal—have varying effects in the context of the value of energy efficiency. This paper presents case studies of four different types of efficiency programs, with different regulatory structures and cost-effectiveness screening tools. The case studies show practical applications of how to account for NEBs under different regulatory regimes and programmatic guidelines. This paper examines practical applications of how these various entities were able to identify, measure, and incorporate NEBs into their cost-effectiveness screening.

Introduction

For decades, researchers have recognized that a significant portion of the value of energy efficiency programs comes not only from the energy savings, but from the programs' other impacts, their non-energy benefits. Unfortunately, these non-energy benefits are seldom counted or are frequently undercounted when assessing their value to energy efficiency programs. Thus, the costs of energy efficiency programs are factored into the equation, but many of the benefits are not. The literature argues that NEBs add value to energy efficiency programs. Researchers also classify NEBs into different collection points, according to who benefits from their effects. Other literature discusses ways to quantify NEBs and measure the value that they bring to programs. The most recent literature looks at incorporating the value of NEBs into cost-effectiveness screening and recommending those methods as best practices for evolving cost-effectiveness tests in efficiency programs.

This paper provides a brief background on the literature about NEBs and methods for their classification and quantification, and examines the "best practice" assumption of recent recommendations for incorporating NEBs into cost-effectiveness screening. Four case studies of different programs describe the processes that emerged in those programs to quantify and count NEBs. Each case study also presents lessons learned and the various challenges along the way.

Twenty Years of Progress on NEBs

Over the past 20 years, NEB research has progressed from hypothesized lists of generalized benefits that might be attributable to programs, to tentative applications in low-income programs, to full-fledged estimation work of scores of categories of NEBs for literally hundreds of programs across the nation. The key steps in this progress are (Skumatz 2013, Skumatz et al. 2009):

- **Stage 1 – Perspectives and Basic Measurement Approaches (1994-1998):** Early phases of the literature organized NEB categories into "perspectives" based on beneficiary group, and established basic measurement approaches. The NEBs were categorized into groups based on the beneficiaries of their impacts. The beneficiary groups are participants (reduced building operating costs, comfort, health, worker productivity); utilities (bill payment improvements, fewer line losses, system savings); and society (job creation, emissions reductions, infrastructure). In this period, basic tenets of NEBs were determined: (1) that NEBs can be positive or negative; (2) that programs should count only NEBs associated with the upgraded equipment and at the level of the net-to-gross factor. Also during this time, the methodologies of measuring for the particularly "hard to measures (HTM)" participant-side NEBs—using specially designed surveys—were piloted and published (Skumatz and Dickerson 1998).
- **Stage 2 – Early Estimation for Programs and Exploration of Benefit-Cost Applications (1998-2001)**: The literature began to provide derivations and estimates of NEBs in many categories, and projects examined the use of NEBs in benefit-cost tests. Papers covered more than two dozen NEBs, for low-income and commercial programs organized into beneficiary categories. The papers identified three measurement approaches for NEBs: (1) engineering or model-based estimates, including job creation from input-output estimates and emissions / climate-change modeling; (2) incremental incidence / marginal valuation estimates including factors from secondary literature (fewer calls valued at marginal utility staff rates, and at household opportunity cost rates; fewer sick days lost from work valued at marginal wage rates; fewer fires valued via insurance tables; arrearage studies) and (3) specialized comparative statistical surveys estimated household and business-accruing NEBs. Additional studies identified priority NEBs (based on size, for example), and the most volatile or uncertain NEB categories. In addition, the publications pointed out the range of potential applications of NEBs (marketing, targeting, barriers analysis) and provided examples of the change in program benefit-cost ratios that would result from including NEBs in whole or as subsets, depending on the test and application. This phase of NEB development work culminated in California's commissioning a comprehensive NEB model and associated revised Low Income Public Purpose Test (LIPPT), with recommendations on which NEBs could be appropriately incorporated into a revised benefits test, specifically for low-income programs (TecmarketWorks and Skumatz, 2001).
- **Stage 3 – Measurement and Application Expansions (2001-present):** The NEB literature expanded the estimation work to many programs, explored best practices in measurement, and expanded NEB use in marketing and other applications. Increasing

interest in NEBs by program staff, utilities, and interveners led evaluation firms nationwide to conduct NEB studies for more utilities. The work included low-income programs, programs in all sectors (residential, multifamily, commercial and industrial, schools, public buildings) and on all types of programs and measures (rebates, weatherization, appliance replacement, retro-commissioning, solar programs, real time pricing). Publications specialized in studies drilling down on one NEB or one measure in detail, disaggregation of program-wide NEBs to allow association of NEB values with individual measures, comparisons and contrasts of valuation methods, and explorations of enhanced measurement approaches. Researchers gave literally hundreds of presentations at national and international conferences. The literature became more robust, and the topic became virtually its own track at the ACEEE Summer Study on Buildings Conference. The literature estimated that monetized NEBs range from 50% to more than 300% of the annual energy bill savings (depending on program and included or omitted NEBs categories), which clearly suggested NEBs represented substantial omitted effects (Skumatz et al. 2009).

- **Stage 4 - Refocusing on the Role of NEBs in Regulatory and Benefit-Cost Applications (2008-present)**: With expanded and matured NEB literature that used methods tested by many researchers, and with NEB values demonstrated, it became clear that NEBs represented significant omitted program benefits. It also became clear that traditional regulatory tests excluding NEBs were biased and might not lead to optimal program investment. Program staff, utilities, regulators, interveners, and evaluators became more comfortable with NEBs, opening the door to revisiting the issue of updating benefit-cost tests to incorporate more comprehensive values. Essays on re-crafting tests appeared. This work is under way, with some states sticking with the status quo, others revisiting "adders," and some considering significant changes. (Skumatz, et.al. 2009, Skumatz 2014).

With more than 20 years of literature, NEBs have been the subjected to deep research, the development of application of methodologies, testing in different programs, sectors, and regions, presentation at formal conferences, and associated peer and academic review. In particular, this evolution and development of the literature have moved the perception of NEBs among program staff, administrators, and regulators from that of general unfamiliarity and skepticism; to acknowledgement that some NEBs are "real," measureable, and useful. Stakeholders now have a larger appetite for considering NEBs in uses beyond "soft" applications like marketing, and for re-considering their use in benefit-cost applications. Four case studies follow, showing how states have addressed NEBs in formal, regulatory cost-effectiveness testing.

The Case for NEBs, and National Review of NEBs in Cost-Effectiveness Testing Framework

Many regulatory cost-effectiveness tests are used to compare the cost-effectiveness of programs and optimize program investment. These are essentially the Total Resource Cost (TRC) or Societal Test, which represent the utilities and their customers; the Participant Test, representing the perspective of the participating customers; the Utility Cost Test (UCT), measuring costs and benefits to the utility; and the Ratepayer Impact Measure test (RIM), measuring impacts on rates. The NEBs perspectives (societal, participant, and utility) overlap all other tests, and *if a true representation of costs and benefits is desired, elements of NEBs represent exactly the missing factors in the benefit-cost calculation that reduce bias and better guide investment between and among programs and portfolios. NEBs analysis reduces bias in benefit-cost tests.* The practical discussion usually centers on enhancing versions of the TRC (societal) test, given its broad scope. The TRC generally compares benefits in terms of avoided energy costs against program costs (involving both utility and participant costs). The theoretical consistency of the test(s) can be best improved by:

- Including monetized estimates of the NEBs (net positive and negative) in the TRC computation; or
- Excluding all NEBs and the costs associated with achieving the NEBs, or use the UCT that involves only the costs paid by the utility.

Improving the tests comes down to the costs and benefits, and the associated accuracy, of the *improvements* in values or components. Utilities and regulatory agencies struggle with how to achieve that balance. What additional NEB categories can be accurately estimated within a reasonable evaluation budget? Practically, the question should be three-fold: (1) Which NEB categories are most valuable? (2) What value range arises from its reasonable-cost measurement? and (3) Does the inclusion of this *range* of values change the benefit-cost conclusion (to include or exclude the program or measure)? If the inclusion of the high and low end of the ranges results in different benefit-cost decisions, more money might be invested in refining the measurement calculation (assuming the program investment decision is valuable, and up to just shy of the value of that potentially wrong decision) *(*Skumatz et.al. 2009*)*. If the use of the high and low value of the NEB range results in the same program decision, no further investment to improve the estimate is justified. Investing a lot of money to refine estimates of a low-value NEB is money less well spent than refining estimates for a large NEB. These concepts are a type of value-based decision-making that is basic to most economists. However, regulators tend to like simple rules, not multi-part decisions. To deal with this cost-and-accuracy issue, states are taking one of several approaches:

- incorporating a simple, conservative “adder” to the benefits. Most suggest they are trying to incorporate factors related to omitted environmental or emissions effects;
- incorporating “easy to measure” NEBs into the benefits. Several states are adopting this flexible approach, with the “easy to measure” benefits varying among programs (for example, including easier-to-measure water bill savings from clothes washer programs, and omitting “softer” NEBs such as comfort, measured from surveys);
- trying to measure all NEBs, or the leading from among several dozen NEBs; or
- a hybrid approach: using an adder and measuring either easy-to-measure benefits, or as many benefits as possible beyond what is included in the adder.

A recent comparison of states in terms of the extent to which they are considering NEBs is presented in Table 1. The status of NEBs in these jurisdictions is constantly changing, as illustrated by the case studies.

Table 1. Comparison of NEB treatment in regulatory environment, by state

Regulatory / screening application	Utilities / regions	MORE AGGRESSIVE ==>
Program marketing	Fairly widespread use in utilities / states across the country	
Test / program screen: Adder	• Iowa (10% electric, 7.5% gas, 1999) • **Colorado (10% adder, 25% low income, 2008)** • Oregon (carbon $15 / ton; 10% adder, 2008) • Washington (10% adder, 2008) • **Vermont (15% + 15% low income)** • **District of Columbia (10%)** • **New York($15 adder for carbon)** • NW (15%) For low income or <1 (CA*, ID, OR, WA*, UT, WY, NH, **NY**, CT)	
Test / program screen: Readily measured	• Massachusetts (NEBs must be "reliable and with real economic value"; utility, prop, health and safety comfort; low income; equipment, utility, all costs of complying with foreseeable environmental regulations) • California (low income) • **Vermont (maintenance, equipment replacement, low income, comfort, H&S, prop, utility, societal)** • **Colorado (measureable with current market values)** • New Hampshire (as adder; low income) • BC Hydro (maintenance, greenhouse gases, lifetime, product loss, productivity, floorspace) • **District of Columbia (equipment, comfort, health and safety, prop, societal)** • Oregon (especially C&I; carbon value on societal test, PV deferred plant extension, water / sewer savings, laundry soap); • Connecticut (low income) • Rhode Island (low income; quantify utility, societal; health and safety, equipment, prop, comfort) • **New York (low income, equipment)**	
Test / hybrid (potential adder and measured)	• **Colorado (measureable with current market values)** • Oregon (especially C&I; carbon value on societal test, PV deferred plant extension, water / sewer savings, laundry soap); • **DC** • **Vermont**	
Test / program screen:Broad	With quantification: MA, RI. MA decision broadening, counted in residential and ICI; demonstrable via surveys (not yet economic); broad inclusion of NEBs as official screen: not yet found.	

Source: Skumatz 2009, updated Skumatz 2014

The New York Case Study

Included in this paper, are four case studies of how non-energy benefits became incorporated into cost-effectiveness screening. If one looks at these cases chronologically, they appear to operate like a set of dominoes. In this analogy, New York is the case that started it all. In the mid-2000s, New York State Energy Research and Development Authority (NYSERDA) undertook detailed studies of NEBs as part of its revamped program evaluation work. It also commissioned research in localized state estimates of the economic and job impacts of NYSERDA programs. As part of their program performance reporting, they presented their program impact information along with net-to-gross (NTG) and NEB estimates, and their reports presented the impacts in "scenarios" of 0%, 50%, and 100% NEBs inclusion (including participant NEBs and some societal NEBs, including jobs). Although this analysis was not formally considered in the cost-effectiveness evaluation, it was illustrative, and it showed the effects of including different rates of NEB adders. This was especially valuable for programs that were close to the threshold for screening cost-effectively.

For reporting related to the system benefit charge (SBC) and energy efficiency portfolio standard (EEPS), NYSERDA presents annual retrospectives of cost-effectiveness. It runs scenarios for TRC and program administration cost tests: (1) standard; (2) standard plus NEBs excluding job impacts, and (3) scenario with job impacts. These allow viewing of the impacts these programs have beyond simple energy savings, and include low-income programs that make reference to their NEB values. NYSERDA continues to study NEBs, because they enhance its understanding of how programs drive consumers. The NEBs work is used in marketing.

However, NEBs are not formally included in the consideration or calculation of cost-effectiveness by the Department of Public Service in New York. Cost-effectiveness screening currently involves a carbon credit value ($15 adder) related to long-run avoided cost, but traditional participant NEB impacts like health and safety and other "hard-to-measure" benefits are neither calculated nor used. Non-energy benefits are also not in the TRC.

But the story is not over. On December 26, 2013, the Public Service Commission issued an order for a review and restructuring of the TRC policy. Criticisms particularly relate to a New York requirement that every measure pass the test, rather than allowing program-wide cost-effectiveness testing. However, further discussion will open the door for broader criticisms of the TRC, including arguments for including NEBs. Interveners successful in other states are expected to come forward (potentially PACE, NRDC, and others).

It is ironic that NYSERDA has invested substantially in supporting comprehensive quantitative research on NEBs, when other states cite its research as supporting their own incorporation of NEBs—in a manner in which New York does not. The research supplied by New York was the first domino supporting decisions in Colorado to incorporate an NEB adder, which led to the decision in Vermont to incorporate a NEB adder.

Lessons Learned

Research is critically important in quantifying and validating the value of NEBs in energy efficiency programs. NYSERDA invested considerably in NEB research on all of its programs, and developed tailored, local models to estimate the job and economic multiplier effects of its programs. This research has helped refine programs and their marketing; however, without programmatic and political support, these data might provide more benefit to other states.

The Colorado Case Study

Two main factors led to Colorado's 2008 decision to adopt an NEB adder for electric and low-income electric programs: evidence from research and the engagement of interveners. Evidence in research contributed greatly to both the 2008 proceeding and a 2011 proceeding (Docket No. 07A-420E, Decision No. C08-0560) that examined non-energy benefits within the context of cost-effectiveness screening. A large group of interveners in the dockets supported both Colorado's first and second decisions to count the benefits associated with NEBs, as an adder for electric (and later gas) cost-effectiveness screening.

Colorado's first comprehensive consideration of NEBs in cost-effectiveness screening resulted in a 2008 decision by the Colorado Public Utilities Commission (PUC) to incorporate an NEB adder into a Modified Total Resource Cost Test (modified because it incorporates consideration of NEBs). The 2008 deliberations led to the 2009/10 DSM Plan in which Public Service used proxy values of 10% for electric programs, 20% of avoided costs for its electric low-income programs, and a multiplier of 1.05 times the Total Resource Cost test ratio for its natural gas energy efficiency programs as an NEB adder in its cost-effectiveness analyses (5% adder). The company was ordered to use these values by the PUC[1] (Skumatz 2010a). However, the proxy values were not tied directly to estimates of values for specific lists of NEBs. The final order in the first Demand Side Management docket (07A-420E), addressed general policy matters, and addressed low-income cost-effectiveness. Special consideration was given to the TRC calculation for low-income programs (using a UCT in the event the TRC is less than 1.0).

> 136. For those low-income DSM programs that do not yield a 1.0 or greater TRC value, we direct Public Service to apply a modified utility cost test calculation and communicate the results via the biennial plan testimony. Specifically, we direct Public Service to seek out situations where the utility-provided low-income DSM expenses can take advantage of service delivery and overhead resources that already exist in the marketplace through public funding. In such situations, a "modified utility cost test" is to be applied. This will assess the total benefits resulting from such partnerships against the utility costs (versus total costs), under the rationale that the existing publicly funded infrastructure is a "public good" already in place and paid for, analogous to the roads and bridges used to reach a customer's home (Docket 07A-420E Decision No. C0-0560 page 39, paragraph 136).

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[1] In Docket No. 07A-420E, Decision No.C08-0560 , the Colorado PUC directed Public Service as follows: "In applying the TRC to low-income DSM programs, the benefits included in the calculation shall be increased by twenty percent, to reflect the higher level of non-energy benefits that are likely to accrue from DSM services to low-income customers." (Paragraph 139) In the Gas Rules, the Commission stated that the initial calculated Total Resource Cost Test ratio should be multiplied by 1.05 "to reflect the value of avoided emissions and other societal benefits. The result shall be the modified TRC. A utility may propose a different factor for avoided emissions and societal impacts, but must submit documentation substantiating the proposed value." 4753 (m) (I)

The clear value of research in the decision in the 2008 proceeding is illustrated in the order that describes the advocacy position taken by the Energy Efficiency Business Coalition. They cited NYSERDA research in identifying individual values for NEBs as a reliable source for quantifying non-energy benefits:

71. EEBC (*Energy Efficiency Business Coalition*) advocates that a broader range of non-energy benefits be included in the cost-effectiveness calculation. It specifically presented these additional benefits for consideration: comfort, health, safety, equipment durability/lower maintenance; reduced financial stress; psychological benefits; improved comfort/safety during power outages; improved resale value and ability to resell; higher worker productivity; secondary energy and demand savings due to more efficient appliances yielding less heat load and thus less air conditioning demand; reduced social service costs; reduced noise and water savings. EEBC also presented macroeconomic benefits such as increased employment, increased economic activity; and increased technology development. It cited NYSERDA as a source for quantifying such non-energy benefits and factoring into DSM cost-effectiveness analysis (Docket 07A-420E Decision No. C0-0560 pages 24-25).

Colorado revisited its cost-effectiveness screening in a later proceeding which resulted in an increase and expansion of the NEB adder to 25% for low-income programs for both gas and electric energy ratepayers. Again, research played a key role in the proceeding and its outcome. In its Order approving the company's Enhanced DSM Plan, the Colorado PUC directed Public Service to "update their quantification of low-income DSM non-energy benefits on a timetable that will inform the DSM filing in 2010." (p. 63, Decision No. C08-0560, Docket No. 07A-420E). A 2010 report (Skumatz, 2010a) provided the Commission with an analysis that fortified the importance of non-energy benefits within the low-income sector.[2]

In both of Colorado's proceedings (the 2008 and 2011 decisions) interveners played an important role. In particular, Energy Outreach, Sierra Club, and SWEEP testified, with the goal of incorporating NEBs to reduce bias in (and increase values for) benefit-cost tests and to increase energy efficiency programs in the state. As with the other three case studies in this paper, the story is not over. In 2013, these values are in the process of yet another reassessment, with interveners arguing that Colorado's adders are too low (based on growing research and treatment by other states), and that the cost-effectiveness tests need revision, amid discussions of program budget assumptions, avoided cost discussions, and other arguments.

[2] The study's results (drawing on approaches in California, from NYSERDA, and by other work) found that, including all NEBs from all perspectives, the total NEBs represented additional dollar value of benefits that were: 128-286% of the value of energy savings for the four gas programs studied; 147-213% of the savings for the electric programs; and 124-175% for the combined programs (Skumatz 2010a). The adopted 25% value was an increase over previous values, but considerably below the estimated values. In 2013 testimony, the utility argued that the study's values were "too liberal."

Lessons Learned

Three lessons arise from the Colorado cases. First, research is a valuable tool for quantifying NEBs, and it supports conceptual understanding of their contribution to energy efficiency programs. Second, committed interveners can provide necessary momentum for bringing about policy change in cost-effectiveness screening, especially if there is no significant opposition (as was the case with Colorado). Third, cost-effectiveness screening of energy efficiency programs is ongoing. Changes in existing research, adopting changes in screening by similar jurisdictions, and programmatic changes contribute to a dynamic environment in which cost-effectiveness screening and the incorporation of NEBs (and at what level) are under frequent review and revision.

The Vermont Case Study

Three elements contributed to the incorporation of cost-effectiveness screening in Vermont: the quantity and nature of available research regarding NEBs, a growing number of other jurisdictions incorporating NEBs into their cost-effectiveness screening, and the collaboration of a broad group of stakeholders.

Vermont has been operating a single statewide efficiency program since 2000 through a third-party administrator. As early as 1990, the Vermont Public Service Board in Docket 5270 established cost-effectiveness guidance for utility efficiency investments made with ratepayer funds. In this docket, the Board adopted the Societal Cost-effectiveness Test as its primary method. The Board also set a 5% adder to account for the reduction of environmental externalities and a 10% adder to account for the reduced risks associated with obtaining electrical efficiency savings as an alternative to generation. (Hamilton 2009).

In 2009, the Vermont Public Service Board revisited these cost-effectiveness screening values with regard to thermal efficiency measures. There was apparent consensus among the proceeding's participants that NEBs added value beyond energy savings to efficiency. However, it became evident that more research was needed to determine how and at what level to incorporate NEBs into cost-effectiveness screening.

Three immediate developments came out of this proceeding. Riley Allen, a utilities analyst for the Board, recommended a 5% NEB adder be used as a stop-gap for screening efficiency measures associated with thermal and process fuels. He also recommended that stakeholders throughout Vermont create partnerships and seek out research to support a clearer value that should be associated with NEBs. This call to action laid the foundation for the three elements that contributed to the acceptance of a larger NEB adder for Vermont's cost-effectiveness screening.

In response to this recommendation, stakeholders reached out to other parties and thus expanded its scope. This expansion involved Weatherization agencies, affordable housing organizations, and the Vermont Department of Education. By December 2009, seven organizations representing utilities, energy efficiency providers, nonprofits, housing organizations, and economic opportunity organizations submitted joint comments to the Board, supporting an NEB adder in the State's heating-and-process fuel efficiency screening tool.

This expanded group of participants began researching NEB literature to determine the best methods for assessing and valuing NEBs. Energy efficiency researchers elsewhere also examined the same questions Vermont was asking about the valuation and incorporation of NEBs. Together, they contributed to the quantity of available research.

Of particular value to the low-income NEB adder was research on the Vermont Weatherization Assistance Program (Hall and Riggert, 2002), cited in participant comments in the proceeding. This research specifically measured the non-energy benefits of low-income programs. By quantifying reduced arrearages, fewer shut-offs, lower collection costs, lower emissions, economic impact through employment, water savings, increase in property value, fewer lost work or school days due to illness, and fewer fires, the researchers were able to quantify an NEB value per participant of $11,391 for a program that cost $2,259 per participant.

During the Vermont cost-effectiveness proceeding, the research was also changing. It was generally agreed that identifying and valuing NEBs were important components of energy efficiency programs; but research on the subject was also shifting to how best to incorporate NEBs into cost-effectiveness screening and recommending their incorporation as a best practice (Skumatz 2010, Woolf, et al. 2012, Daykin, Aiona, and Hedman 2010, National Action Plan 2006, NMR / TetraTech 2011, and the National Home Performance Council 2011, State & Local Energy Efficiency Action Network's Impact Evaluation Guide 2012). The information in these publications supported the Vermont partners' assertion that NEBs were real, often measurable, and an important facet of the value of energy efficiency. This research was of high value in Vermont's regulatory decision to include a NEB adder in cost-effectiveness screening.

The second element that led to the adoption of the NEB adder for efficiency screening in Vermont was the growth in the number of jurisdictions that were valuing NEBs in their own cost-effectiveness screening. Not surprisingly, this new practice in other jurisdictions was largely supported by the same research that supported Vermont's decision. Vermont looked to several other states for guidance in "counting" NEBs toward cost-effectiveness screening. The Colorado PUC's cost-effectiveness proceeding coincided with Vermont's proceeding. In 2008, the Colorado PUC adopted an NEB adder of 10% for electric programs, and a 20% adder for low-income electric programs.

The introduction of an NEB adder in Colorado (see Colorado case study) and the research that supported it (see New York case study) were beneficial to Vermont's case. But perhaps even more compelling was Colorado's review of its NEB adder in 2011, the resulting proceeding, and finally, that state's decision to increase its NEB adder from 20% to 25% for low-income electric efficiency programs in the screening of both low-income gas and electric programs. The final element that spurred Vermont's incorporation of an NEB adder was the collaboration of several Vermont entities: the Public Service Department (the State's ratepayer advocate), Weatherization agencies, affordable housing agencies, efficiency administrators, and Community Action Councils. They all collaborated to support cost-effectiveness screening measures, including the 15% NEB adder for thermal and electric efficiency screening and another 15% adder for screening for low-income energy efficiency.

The Board ordered a 15% NEB adder as a conservative rebuttal presumption that could be amended in later proceedings, as information became available to more accurately assess the exact value of NEBs in energy efficiency in Vermont.

> While there is a high degree of uncertainty surrounding the magnitude of non-energy benefits, it is clear that the current value of zero is incorrect, and that 15 percent is on the lower end of the range of estimates. It is appropriate to start with a conservative estimate, and to revisit the estimate in the biennial EEU avoided-cost proceedings, with 15 percent serving as a rebuttable presumption (Vermont Public Service Board Order dated 2/7/2012 at 27[3])

Lessons Learned

It all comes back to research. The three elements that contributed to Vermont's adoption of an NEB adder were (1) availability of research supporting the value of NEBs and how to incorporate NEBs into cost-effectiveness screening to obtain a more accurate measurement of the value of efficiency programs and measures (see measurement summaries in Skumatz 2002, 2009), (2) the increased number of jurisdictions that incorporated NEBs into their screening, and (3) the support of participants committed to the accurate counting of the benefits of energy efficiency. Consequently, it is likely that future changes to Vermont's NEB adder will be informed by research in years to come.

The District of Columbia Case Study

Although the population of the District of Columbia is roughly the size of the population of Vermont, there are many differences between the energy efficiency utility operated in Vermont and the DC Sustainable Energy Utility (DCSEU). Vermont has a long history of mature and evolving energy efficiency programming overseen by Vermont's Public Service Board. However, the DCSEU has been operating only since 2011, and incorporates ambitious social equity goals into the fabric of its programs.

The Council of the District of Columbia developed enabling legislation for the formation of an energy efficiency utility in its Clean and Affordable Energy Act of 2008. The act established a Sustainable Energy Trust Fund to be funded by a system benefits charge on gas and electric services, as well as from proceeds from the sale of credits from the Regional Greenhouse Gas Initiative. This legislation required that the primary cost-effectiveness test would be the Societal Benefit Test. The program is run by a third-party administrator, the Vermont Energy Investment Corporation. The contract is overseen by the District Department of Environment under the Office of the Mayor.

The cost-effectiveness screening involves NEBs "…including comfort, noise reduction, aesthetics, health and safety, ease of selling / leasing home or building, improved occupant productivity, reduced work absences due to reduced illnesses, ability to stay in home / avoided moves, and macroeconomic benefits," (DDOE-VEIC Contract, 2010). These benefits are included as a 10% NEB adder in the event that calculating NEBs requires significant original research. In addition to NEBs, the DCSEU's cost-effectiveness screening also involves a 10% risk adder, and a 10% adder for the reduction of environmental externalities.

[3] http://psb.vermont.gov/sites/psb-/files/orders/2012/2012-4/OrderReCostEffectivenessScreeningofHeating.pdf/.

Although the inclusion of these adjustments for cost-effectiveness screening are important, the DCSEU stands out because of its incorporation of what has traditionally been seen as an NEB into a performance benchmark. The Clean and Affordable Energy Act specifically outlined six performance benchmarks to be achieved by the Sustainable Energy Utility:

1. Reduce per-capita energy consumption in the District of Columbia
2. Increase renewable energy generating capacity in the District of Columbia
3. Reduce the growth of peak electricity demand in the District of Columbia
4. Improve the energy efficiency of low-income housing in the District of Columbia
5. Reduce the growth of the energy demand of the District of Columbia's largest energy users
6. Increase the number of green collar jobs in the District of Columbia

Performance Benchmark 6 as a key DCSEU goal is unique. It specifically classifies what is often assessed as an NEB as a key goal of an energy sustainability and efficiency program. Job creation is typically considered an element of economic development that falls under the category of "societal" non-energy benefits in the current literature. Economic development and its associated job creation have long been considered a societal or public NEB of energy efficiency programs. In 2008, Oppenheim and MacGregor studied the economics of public utility system benefit funds. Their analysis found that:

> …across the Entergy jurisdictions of Arkansas, Louisiana, New Orleans, Mississippi, and the Beaumont-Port Arthur area of Texas, investments in low-income efficiency yield more than 23 times the investment as well as 216 jobs for every million dollars of investment (Oppenheim and MacGregor).

In a recent ACEEE policy paper, Eric Mackres quotes a Brookings Institution report:

> An energy efficiency investment creates more jobs than an equivalent investment in either the economy on average or in the utility sector and fossil-fuels. As an example, a $1 million investment in a building efficiency improvement will initially support approximately 20 jobs throughout the economy. By comparison, the same $1 million investment in the economy as a whole supports 17 jobs. As of 2010, at least 830,000 jobs related to energy and resource efficiency already existed around the U.S. and their numbers were increasing at an annual rate of 3% (Muro et al. 2011).

Although evidence of the job creation value of investments in efficiency is strong, DC's elevation of green collar job creation to the level of one of its six performance benchmarks is noteworthy. Additionally, within the DCSEU contract, performance-dependent "at-risk" compensation is determined by the degree to which the benchmarks are achieved. It is notable that the top three benchmarks account for 75% of the "at-risk" funds:

Benchmark	Share of at-risk compensation
Reduce per capita energy consumption	30%

Increase number of green collar jobs	25%
Improve energy efficiency of low-income housing	20%

The six DCSEU benchmarks indicate very specific performance criteria with regard to social equity. Implementing a program that prioritizes multiple benchmarks is challenging, because they introduce competing priorities. For example, the most cost-effective way to achieve electric efficiency savings might not be the most effective way to create local jobs. However, this laudable enterprise of social equity and sustainable energy goals is still young. The Council of the District of Columbia had the foresight in the Act to include targets that could be revisited and realigned to balance the goals surrounding sustainable energy and job creation.

As far as cost-effectiveness screening is concerned, DC incorporates a 10% NEB adder, but takes NEBs to the next level by incorporating job creation at the forefront of its goals and as one if the efficiency program's primary measures of success.

Lessons Learned

Combining social equity goals with energy efficiency goals introduces competing priorities that might require revision throughout the course of program operations. Therefore, when such goals are combined, it is important to plan for future program review and flexibility, so that adjustments can made to rebalance and re-prioritize the efficiency and social justice objectives.

Lessons and Conclusions

Twenty years on, it appears to be time to reconsider benefit-cost tests that better represent actual benefits and costs, and support more optimal program investment. It is clear that there has been incremental progress in addressing the bias inherent in tests that exclude NEBs. In fact, we see a domino effect: as one state makes progress, another directly incorporates that progress into its deliberations. These case studies illustrate how New York's research informed Colorado's decision, which in turn influenced Vermont's decision.

Billions of dollars are invested nationwide each year in energy efficiency programs. To accurately account for both the costs and the benefits of these programs, NEBs must be counted in cost-effectiveness tests. Society, ratepayers, and utilities will benefit by including NEBs in program evaluations, thus reducing bias in determining program cost-effectiveness. Inclusion of some NEBs is better than exclusion of NEBs, but long-term progress in addressing the bias in tests should not be delayed. Value-based decision-making can address the short-term measurement questions. We look forward to the next twenty years!

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