FRAMEWORK FOR NON-ENERGY BENEFITS IN THE NEXT GENERATION OF EVALUATION AND PROGRAM DESIGN[a]

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Introduction

The literature on non-energy benefits (NEBs) associated with energy efficiency programs has seen dramatic growth over the past five years. These benefits are often "use benefits" such as increased comfort, improved indoor air quality, and even improved safety (*e.g.*, a repaired furnace) that are typically difficult to quantify. The wide-spread application of these analyses and the large estimates of benefits being attributed to NEBs (100% or more of the energy benefits of a program is not uncommon) makes this an important area of study. This paper builds on the existing literature and presents a new, and perhaps more credible framework for assessing non-energy impacts (NEIs) as well as lessons learned in developing this framework.[b] The goal is to place NEIs in a decision-making context that is able to withstand regulatory review and produce results with enough confidence to be used in program design and benefit-cost tests for program screening and evaluation. The paper discusses two methods being used as part of an ongoing effort to estimate certain NEIs, and points out issues that may cause some NEIs to be inappropriately estimated using current industry methods.

Background

All investments have direct and indirect impacts. Building a power plant provides electricity but it also has indirect impacts such as job creation, increased system reliability that can make a region more attractive to new businesses, and other economic impacts. In addition to these positive indirect effects, there are also negative indirect impacts, with environmental impacts being cited most often. As a result, supply-side investments designed to generate electricity have both energy and non-energy benefits and costs.

Similarly, demand-side investments in energy efficiency have both direct and indirect benefits and costs. These have been lumped together under the term "non-energy impacts." Indirect impacts are typically part of the analysis of traditional capital investments, and they should also be an integral component of assessing investments in energy efficiency and demand response programs.

The issue is not whether NEIs exist. Ample empirical evidence indicates the existence of NEIs.[c] The challenge is to determine the additional value they provide program participants that is not captured by

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[a] The views expressed in this paper are those of the authors and do not necessarily reflect the views of the New York State Energy Research and Development Authority.

[b] The term non-energy impacts (NEIs) is used in the remainder of this paper instead of non-energy benefits (NEBs). The term NEIs is meant to more clearly convey the fact that this analysis takes both positive (benefits) and negative impacts into consideration.

[c] The Heschong-Mahone Group has produced several often-cited studies highlighting NEIs, including Heschong Mahone Group. October, 2003. *Windows and Offices: A study of office worker performance and the indoor environment*. California Energy Commission; and Heschong Mahone Group. 2003. *Windows and Classrooms: A study of student performance and the indoor environment*. Public Interest Energy Research. Other select studies demonstrating evidence of NEIs include:

traditional impact analyses that focus on benefits in terms of energy savings. These values, if meaningful for a program, should be captured in that program's benefit-cost analysis. Given the large estimates for NEIs from recent studies and the increased attention they are receiving, assessing the context of these estimates has taken on greater importance.

Issues that need to be considered, especially if NEIs are to be incorporated in a benefit-cost assessment include:

Issue #1. NEI values should be "net" of what would have been obtained using the assumed baseline technology (*i.e.*, the assumed technology that would have been installed or have been in place if the program had not been offered). Most new technologies will have attributes different than the old technology that was replaced. For example, consider a "standard" new home versus an ENERGY STAR® new home – both homes are likely to have benefits compared to the old home. To use NEIs in benefit-cost analyses, it is important to assess the net impacts between the new technology that would have been installed and the energy-efficient technology that was installed through the program.

Issue #2. Implicit in a response to an NEI survey is the assumption that the program participant can provide a reasonably credible response to the questions being asked. This means that they have some knowledge about the level of the NEI and are not making a completely subjective judgment. For example, if they place a value on the equipment lasting longer, can respondents be expected to know the typical life of the equipment? In the case of ENERGY STAR clothes washers or refrigerators, NEI studies have shown that customers value the longer life of these appliances generally, without providing information on the actual expected lifetime. In crafting survey questions, evaluators need to critically consider whether the program participants can reasonably be expected to know how much longer an ENERGY STAR appliance lasts versus a standard efficiency appliance.

Issue #3. Related to Issue #2, if the respondent can not reasonably be expected to provide an estimate of the level of an NEI, then the responses represent the perception of the survey respondent, and not the actual field conditions. Perceptions of program participants can be important in program design and marketing. However, evaluators should consider whether these perceptions should be used in a benefit-cost analysis, or solely for program marketing purposes.

Issue #4. Given that respondents are reasonably well informed on some NEIs, what is the best way to elicit answers that accurately reflect these values?

With respect to Issue #1, it is clear that the goal of evaluations should be to estimate the "net" NEIs that result from program actions and would not have occurred if the program had not been offered. Issues #2 through #4 are among the researchable questions that are being addressed in this analysis effort.

Worrel, Earnst, Jon A. Laitner, Michael Ruth, Hodayah Finman. "Productivity Benefits of Industrial Energy Efficiency Measures." *Energy* 28 (2003): 1081-1098; Boyce, Peter R., Jennifer A. Veitch, Guy R. Newsham, Michael Myer, and Claudia Hunter. December, 2003. *Lighting Quality and Office Work: A Field Simulation Study*. Prepared by Lighting Research Center, Rensselaer Polytechnic Institute and National Research Council of Canada, Institute for Research in Construction, for U.S. Department of Energy; and Boentgen, Rudolf, and Steve Bonanno. (2004) Statewide Non-Electric Benefits Development in Massachusetts. *ACEEE Summer Study Conference Proceedings*.

Previous NEI Evaluation Methods and Results

The initial interest in estimating NEIs came from evaluation of low-income programs where it was reasonable and appropriate to assume that the actions taken as part of the energy efficiency program would not have been taken in the absence of the program. Low-income participants would normally place a low priority on investments in energy efficiency. In many instances, replacement of space heating and water heating equipment, installation of high efficiency windows and doors, and overall weatherization resulted not only in energy savings but also clear improvements in occupant comfort and safety. Based on this initial work on NEIs associated with low-income programs, researchers expanded the assessment of NEIs to virtually every type of energy efficiency program.

The research into the NEIs related to energy efficiency programs has seen quite a few papers published, but a somewhat thin level of research into alternative methods. Many studies have used a direct query method where the energy efficiency program participant is asked about the value of benefits that may be derived from the installation of equipment or practices through the energy efficiency program.[d] Generally, the approach queried participants, trade allies, and some non-participants about impacts from investments in energy efficiency programs that are not captured in the energy savings counted in program records. These tend to include factors such as comfort, ease of selling/leasing the building, environmental benefits, and other benefits for participants. To the extent these benefits (or costs) can be quantified and verified, they should be included in the benefit-cost analysis scenarios for energy efficiency programs.

Like many other program administrators, the New York State Energy Research and Development Authority (NYSERDA) has employed these standards to estimate NEIs in studies conducted over the past two years for the **New York Energy $mart^{SM}** Program. NYSERDA and other program administrators have obtained results showing very substantial values for NEIs.[e] Figure 1 summarizes the range of NEI values derived from NYSERDA's surveys of various market actors over the past two years. Expressed as a percentage of project energy savings, it was common to find NEI values equal to, or greater than, the value of the energy savings. In addition to the business/institutional and residential sector program results shown in Figure 1, one low-income program was also evaluated. In that case, NEIs were valued slightly higher than the energy savings at 108%.

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[d] Other studies have assessed NEIs using a review of records (*i.e.*, Heschong Mahone Group. October, 2003. *Windows and Offices: A study of office worker performance and the indoor environment*. California Energy Commission; and Heschong Mahone Group, as well as the Heschong-Mahone Group's studies on how daylighting influences student performance and retail sales), or directly testing the performance of treatment and control groups (*i.e.*, Boyce, Peter R., Jennifer A. Veitch, Guy R. Newsham, Michael Myer, and Claudia Hunter. December, 2003. *Lighting Quality and Office Work: A Field Simulation Study*. Prepared by Lighting Research Center, Rensselaer Polytechnic Institute and National Research Council of Canada, Institute for Research in Construction, for U.S. Department of Energy).

[e] Lisa Skumatz, of Skumatz Economic Research Associates, Inc., has been involved with past NYSERDA NEI studies and has authored many articles on the topic, including: Skumatz, Lisa. (2002) Comparing Participant Valuation Results Using Three Advanced Survey Measurement Techniques: Non-Energy Benefits Computations of Participant Value. *ACEEE Summer Study Conference Proceedings*; and Fuchs, Leah, Lisa Skumatz, and Jennifer Ellefsen. (2004) Non-Energy Benefits from Energy Star: Comprehensive Analysis of Appliance, Outreach and Homes Programs. *ACEEE Summer Study Conference Proceedings*.

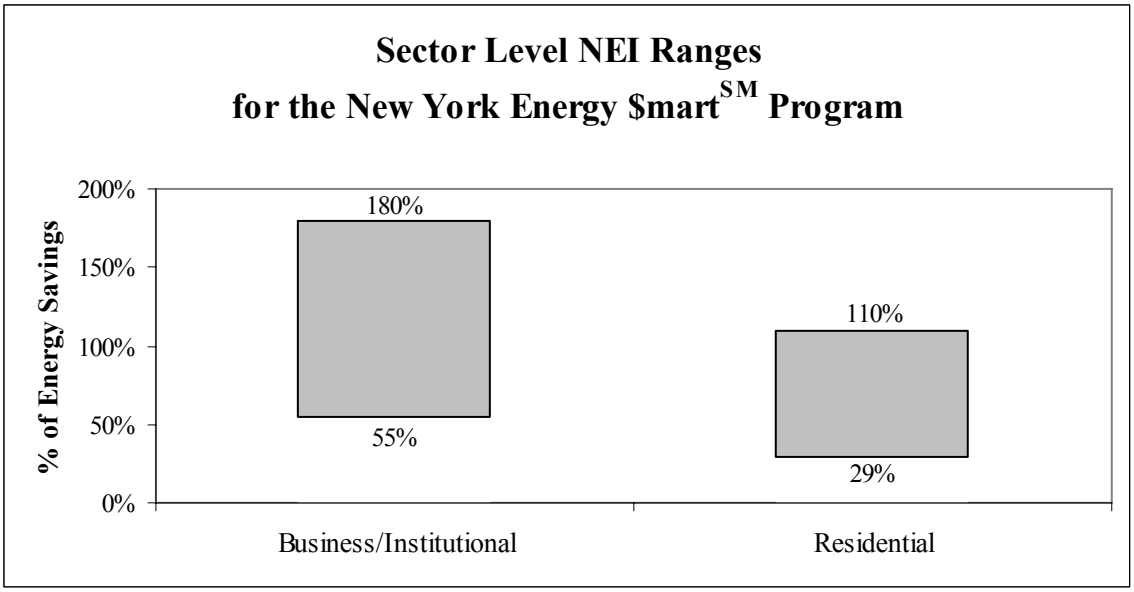

Figure 1

Current Approach to NEIs

As described earlier, in prior years' evaluations, NYSERDA's NEI research approach was based on a direct query method. NEIs were valued using a scale ranging from "much less valuable than the energy savings" to "much more valuable than energy savings."[f] The primary advantage of this approach is that the customer does not have to provide an answer directly in dollar terms, which can help respondents to feel more comfortable and result in a greater number of responses. A weakness of the approach, however, is that it requires the development of a transformation curve to translate responses to categorical questions into estimates expressed in dollar terms. Furthermore, the scaling approach may require some sensitivity analysis and cross checking. This illustrates the difficulty of assessing the value of non-market goods, and some of the trade-offs that need to be considered in developing the research approach. As a result, it is important to test alternative methods and to approach the research questions from different view points to verify the robustness of the results.

The goals of the current effort being undertaken by NYSERDA are to: 1) extend the approach taken in previous NYSERDA evaluations, and compare these results with those of a new approach that takes a different view of NEIs; and 2) see what can be learned from a review of environmental and economics literature related to contingent market valuation of non-market attributes.[g] In an effort to use the current research to build a platform for future research, the current NYSERDA studies are employing an extension of the direct query method used in prior years (Approach 1), as well as a conjoint method where respondents choose between different bundles of program-related attributes (Approach 2).

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[f] Lisa Skumatz, of Skumatz Economic Research Associates, Inc., devised the approach used in past NYSERDA NEI studies.

[g] Contingent valuation is an economic technique for assigning value to non-market attributes, or resources that are not bought and sold. Contingent valuation uses surveys to gather data on the utility people derive from non-market resources. The technique is often used to value environmental resources such as clean air and water. Contingent valuation studies that have used conjoint analysis include: Turner, Robert, Alia Giuda, and Laura Noddin. (2005) Estimating nonuse values using conjoint analysis. Economics Bulletin, Vol. 17, No. 7 pp. 1-15; and McCollum, Daniel, and Michelle Haefele. February 1999. A Survey of 1997 Colorado Anglers and Their Willingness to Pay Increased License Fees. USDA Forest Service and Department of Agriculture and Resource Economics, College of Natural Resources, Colorado State University; and Stevens, Thomas H., C. Barrett, and C. Willis. "Conjoint Analysis of Groundwater Protection Programs." Agricultural and Resource Economics Review 27(2), 1997, pp 229-236.

The conjoint method was chosen as a test approach for the 2005-2006 evaluation effort. This method allows respondents to choose between bundles of attributes (both positive and negative) that they can, theoretically, relate to as real-world consumer product options. In each bundle of attributes, or choice options, one attribute is expressed in dollar terms allowing for estimates of the dollar value of the non-market attributes included in the bundles. The conjoint approach used in this application is discussed in greater detail later in this paper.

Approach 1 – Extension of the Direct Query Method to Assess NEIs

This approach will use a set of questions that is similar to those used in NYSERDA's past NEI studies. The differences will include:

1. Use of fewer NEI attributes to avoid overlapping values at the outset. Prior years' studies were reviewed to correlate the results across attributes and develop a reduced set of attributes for use in the 2005-2006 questionnaires.

2. Rather than asking the respondent if the attribute is much less valuable, somewhat less valuable, the same value, somewhat more valuable, or much more valuable than the energy savings, and then having to translate these rankings into a numeric scale, the 2005-2006 study will directly ask the respondent to assign a value to each NEI expressed in terms of a percentage of the project's estimated energy savings. This approach allows respondents to rank attributes appropriately using any percentage of the value of the energy savings that they deem appropriate. The literature on scaling shows that, even when using percents directly, an anchor is needed if individuals are to rank judgmental attributes on the same scale (*e.g.*, comfort). The use of energy savings as the reference point accomplishes this across the individuals.[h]

   For each attribute included in the survey (*e.g.*, lighting quality, occupant comfort, operation and maintenance costs, etc.) respondents will be asked the following question (this example is taken from surveys developed for NYSERDA's Commercial/Industrial Performance Program):

Energy Equipment Operation and Maintenance Costs *(not including fuel costs)* – Your experience with this non-energy impact has been (*please check one*):	
Positive	And when compared to the value of energy savings from your company's participation in NYSERDA's Commercial/Industrial Performance Program, this impact is _____% as valuable (insert best estimate).
Zero	
Negative	And when compared to the value of energy savings from your company's participation in NYSERDA's Commercial/Industrial Performance Program, this impact detracts _____% (insert best estimate).
Don't know	

[h] This approach is labeled magnitude scaling with a modulus. See Kahneman, D. et al. "Shared Outrage and Erratic Awards: The Psychology of Punitive Damages" Journal of Risk and Uncertainty, 16:49 (1998).

3. Similar to the previous years' approach, a consistency check will be applied that asks the respondent to rank all the NEI factors overall as a percent of the energy savings attained. The question is as follows:

Now please consider the ***overall*** value of all the non-energy impacts mentioned above, compared to conditions in the building prior to the program. Your overall experience with all the non-energy impact has been (*please check one*):	
Positive	And when compared to the value of energy savings from your company's participation in NYSERDA's Commercial/Industrial Performance Program, the overall value of all the non-energy impacts is _____% as valuable (insert best estimate).
Zero	
Negative	And when compared to the value of energy savings from your company's participation in NYSERDA's Commercial/Industrial Performance Program, the overall value of all the non-energy impacts detracts _____% (insert best estimate).
Don't know	

4. As an additional consistency check, a contingent valuation based willingness-to-pay question will be asked similar to the approach used in previous NYSERDA studies. The question reads as follows:

If the overall value of the non-energy impacts is positive, and these positive impacts disappeared, approximately how much would you be willing to invest to gain back these benefits, in terms of an annual dollar amount?

- ❑ $_____/yr
- ❑ Don't know/refused

OR

If the overall value of the non-energy impacts is negative, what would you be willing to invest to eliminate these negative impacts from your new building, as an annual dollar amount.

- ❑ $_____/yr
- ❑ Don't know/refused

To ensure that respondents are gauging their answers based on realistic estimates of energy savings resulting from program participation, an estimate of energy savings for each individual participant is taken from the program records and provided as a reminder at the outset of the survey.

Approach 2 – Conjoint Analysis to Assess NEIs

This approach was viewed as the most appropriate method based on a literature review and discussions with outside researchers on contingent market methods.[i] In addition, the literature review showed that a conjoint approach was the most frequently recommended across different types of non-market attribute valuation applications.[j] While conjoint analysis is widely used for valuing non-price factors in other contexts,[k] it has not been applied to the types of energy efficiency programs that comprise the **New York Energy $mart^{SM}** portfolio. As a result, this is a new approach for addressing NEIs in this context.

The conjoint method is becoming more commonly used in other fields, in part, because many individuals have difficulty determining the relative importance (or value) they place on a specific attribute (*e.g.*, an NEI) when asked directly. When asked which attributes are important, individuals often rank them all as important. Instead, a conjoint analysis groups attributes into product offerings, then the individual is asked to choose between different groupings of attributes. Ideally, six to eight of these preference questions would be asked. Since one of the attributes is expressed in dollar terms and varies across the attribute groups, a statistical model can be used to develop values for those attributes that are not directly measured in dollars.

In this application, one challenge was to come up with reasonable groups of attributes for the NYSERDA programs selected for this analysis. While it is recommended that conjoint analyses focus on only a limited number of attributes (ideally, six or fewer), previous year's NEI studies had included as many as fifteen attributes. In addition to honing the list of attributes, it was also important to describe the attributes in language that would make sense to respondents, while being careful not to lead the respondent in any way.

As an example, the attributes used to assess the NEIs associated with NYSERDA's New Construction Program are shown in Table 1. These attributes are then used to develop conjoint questions for the New Construction Program, such as the one shown in Table 2. Again, the New Construction Program example has one attribute that is expressed in dollars which varies across groups of attributes that the respondent is asked to choose between. Pair-wise choices are generally used in this type of analysis, *i.e.*, the respondent has to pick a favored "group" of attributes from the two choices posed in the question.

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[i] Don Waldman, professor of economics at the University of Colorado at Boulder, has been instrumental in guiding the conjoint analysis component of this research. Lynn Hoefgen of Nexus Market Research has also been helpful in developing this research approach.

[j] The use of a conjoint analysis was determined to be the next step in research on non-energy impacts by an August, 2005 Report on "Value of Quality, Comfort, and Energy Efficiency in New Homes," by California Energy Commission, Public Interest Research Program (PIER) Publication Number: CEC-500-2005-118. This document states that, "although consumer value of home energy efficiency, comfort and quality cannot be determined from existing data sources, this remains a viable area for future research. A conjoint analysis using a web-based consumer audience has been proposed by the NAHBRC to assign value to the attributes of quality, comfort, and energy efficiency. The consumer survey that generates the Visions 2000 database is also available for enhancements to capture this information." This research has not yet been funded by the CEC based on phone communications.

[k] Conjoint analysis is often used for the purposes of market research and product development. Such studies tend to be privately-funded and unpublished. Sample conjoint survey tools used by an internet provider and a university (to assess library service preferences) were reviewed as part of this study.

Table 1. Attributes and Levels for NYSERDA's New Construction Program

Project Attributes	Levels
Construction cost ($/ft^2)	• $140/ft^2 • $144/ft^2 • $148/ft^2
Energy equipment operation & maintenance (O&M) costs	• Annual planned and unplanned energy equipment O&M expenditures equal 5% of annual operating expenses. • Annual planned and unplanned energy equipment O&M expenditures equal 3% of annual operating expenses.
Lighting quality	• > 30% of building occupants express dissatisfaction with lighting quality (*i.e.* complain of dark spots, flickering, noise, etc.) • < 10% of building occupants express dissatisfaction with lighting quality (*i.e.* complain of dark spots, flickering, noise, etc.)
Thermal comfort and HVAC effectiveness	• Building occupants express dissatisfaction with conditioned space (*i.e.* temperature settings, ventilation, etc.) > 25 days per year • Building occupants express dissatisfaction with conditioned space (*i.e.* temperature settings, ventilation, etc.) < 5 days per year
Occupant productivity	• Occupant productivity increases by 2% relative to previous work environment • Occupant productivity increases by 10% relative to previous work environment
Ease of selling/leasing the building	• Average time on the market for vacant space is 60 days • Average time on the market for vacant space is 30 days

Table 2. Example Conjoint Question for NYSERDA's New Construction Program

Please consider the two building options that are presented, labeled A and B, and select the option that you prefer. For each comparison, please select the option you prefer even if you do not consider either option to be ideal.	**Building A** ☐	**Building B** ☐	**Difference**
Construction Cost	$140/ft^2	$148/ft^2	B has a 6% higher construction cost
Equipment Operation & Maintenance Costs: Annual energy equipment O&M costs as percent annual operating expenses	5%	3%	A has higher annual equipment O&M costs
Lighting Quality: Percent of building occupants expressing dissatisfaction with lighting quality (*i.e.* complain of headaches, dark spots, noise, insufficient light levels etc.)	< 5%	< 5%	No difference
Thermal Comfort and HVAC Effectiveness: Number of days per year building occupants express dissatisfaction with conditioned space (*i.e.* temperature, air quality, ventilation)	> 25 days	< 5 days	B occupants are more comfortable
Worker Productivity: Productivity in relation to previous work environment.	Increases by 2%	Increases by 10%	B workers are more productive
Ease of Selling / Leasing: Average days on market for vacant space	60 days	60 days	No difference

While a great strength of the conjoint framework is its ability to present respondents with realistic "product" choices so that they can make decisions in a context that is familiar to them as consumers, researchers must recognize that the product options (or bundles of attributes) for which respondents express their preferences are hypothetical; they may or may not mirror the respondent's actual experience. In the case of NEIs, this is a departure from earlier approaches to measuring attribute values, in which respondents have characterized their own experience with NEIs. This is one reason that an extension of the previous approach was also maintained in this year's study in addition to the conjoint analysis.

Since a primary purpose of NEI studies is to measure dollar values of the actual NEIs experienced by program participants so that the values can be incorporated into benefit-cost analyses, it is important to explore strategies for using the conjoint framework to provide information regarding actual consumer experiences with NEIs. The results of this year's conjoint approach will increase evaluator understanding of consumer preferences for various NEI attributes and will have great value for product marketing and program outreach purposes. Future plans include possibly exploring alternatives for applying the conjoint method to gauge respondents' actual experience with NEIs so that the results will be more directly applicable to program benefit-cost analyses.

Programs Selected for Evaluation

Several large scale **New York Energy $mart^{SM}** programs that encompass a number of energy efficiency measures across different end-uses (multi-attribute programs) were selected. The multi-attribute programs selected were the Commercial/Industrial Performance Program, the New Construction Program, and ENERGY STAR Homes. In addition, two ENERGY STAR products --- clothes washers and compact fluorescent light bulbs (CFLs) -- were selected to perhaps more easily demonstrate the methods and techniques. Finally, the Small Commercial Lighting Program (SCLP) was selected due to the companion research that has been conducted on the impact of lighting quality on productivity as a NEI, and due to the program's focus on NEIs and quality lighting design. This mix of programs should provide a good baseline against which prior NEI estimates can be compared, as well as establish a platform for future research. Programs not addressed this year may be addressed in future years. The target audiences and sample sizes for primary research are shown in Table 3.

Table 3. New York Energy $mart^{SM} Programs/Areas Undergoing NEI Study in 2005-2006

Program/Area of Focus	Survey Audience and Goal for Completes
Commercial/Industrial Performance Program	80 program participants (end-use customers)
New Construction Program	80 program participants (end-use customers)
Small Commercial Lighting Program	50 program participants (end-use customers)
ENERGY STAR Homes Program	50 program participants (end-use customers) 30 non-participants (end-use customers who purchased a new non-ENERGY STAR home)
ENERGY STAR Clothes Washers	50 recent purchasers
ENERGY STAR Compact Fluorescent Light Bulbs	50 recent purchasers

Lessons Learned to Date

Much has been learned during the course of the current analysis and the methodological development process. Key insights into NEI levels and values are highlighted below.

Background Research is Key to Developing Focused, Reasonable, and Realistic Attributes and Levels for Conjoint Analyses

In developing a conjoint analysis, one must take considerable care in creating a limited and focused list of attributes that address reasonable categories of NEIs, and that are specified at levels likely to be experienced by program participants. This requires a great deal of background research and critical thinking but results in a better understanding by the research team of the NEIs they are attempting to estimate.

As discussed earlier, conjoint analyses are based upon pair-wise comparisons of different attribute groupings that are presented as separate product offers. The groupings are based upon a selection of attributes that are defined in terms of various levels (*i.e.*, a high-price level, a mid-price level, and a low-price level or a 10% increase in occupant productivity, a 5% increase in occupant productivity, and no increase in occupant productivity). The levels associated with each attribute must be realistic and reasonable given available knowledge of the attributes. If this is not the case, the robustness of the conjoint analysis is reduced. For example, if the levels associated with a specific attribute are unrealistic and/or unreasonable for a given region or market actor group, respondents will rightfully be disinclined to value that attribute in a given pair-wise comparison. This will skew the results of the evaluation.

Conjoint analysis also requires that the researcher use a limited number of attributes since a long list of attributes is not practical in a choice experiment. In prior research efforts, which have used long lists of NEIs, when the values associated with the individual NEIs are summed, the result is often greater (sometimes by a factor of five) than the overall value respondents assign to all NEIs considered in aggregate. A review of attributes used in prior studies shows that there are a number of closely related attributes. For example, an attribute defined as tenant satisfaction in a commercial building that is rented will also be related to attributes such as comfort, reduced noise, and better lighting. Including all of these attributes in the analysis is bound to lead to estimates of NEI values that are difficult to interpret. In contrast, an NEI conjoint analysis which focuses on just a key set of attributes will highlight those attributes that are the greatest drivers of value for participants. While some NEI factors may be left out, the list that is included should capture the vast majority of NEIs and, depending on the outcome of the research, may result in values that are viewed as having greater credibility. This reality argues for a carefully considered evaluation design and background research.

Evaluation Design Must Consider the Difficulty Respondents Have in Conceiving of Net NEIs

As discussed previously in this paper, the goal of NEI evaluations should be to estimate the net NEIs that result from program actions that would not have occurred if the program had not been offered. In order to do so, NEI evaluations must be designed to elicit information regarding these net impacts. Results from previous NEI (and other) evaluations imply that it is likely that some respondents may have difficulty conceiving of net NEIs. As an example, consider residential purchasers of new homes. In most instances, the new homes people purchase, whether ENERGY STAR labeled or not, will have more efficient equipment and systems than the existing homes they are replacing (assuming the existing homes are more than several years old and have not undergone major renovation activity). Is it reasonable to expect that purchasers of new ENERGY STAR certified homes will be able to determine

the net NEIs associated with their homes as compared to other new homes that are not ENERGY STAR? This is a difficult question regardless of the program type considered (*i.e.*, commercial new construction programs, equipment replacement programs, etc.), and one that argues for a carefully considered evaluation design that acknowledges and explicitly addresses the difficulty of the questions respondents are being asked to answer. The conjoint approach addresses this issue by specifying an appropriate range of values that capture the net differences between high efficiency and standard efficiency technologies, buildings, and practices.

NEI Valuation Results

Both the extended direct query (*i.e.*, Approach 1) and conjoint methods (*i.e.*, Approach 2) are currently being fielded in the form of Internet-based surveys and mail surveys. The initial results from both approaches, as well as a comparison to prior years' estimates of NEI values, will be presented at the February 2006 AESP conference.

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