

NON-ENERGY BENEFITS INCLUDING PRODUCTIVITY, LIABILITY, TENANT SATISFACTION, AND OTHERS – WHAT PARTICIPANT SURVEYS TELL US ABOUT DESIGNING AND MARKETING COMMERCIAL PROGRAMS

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ABSTRACT

Using detailed interviews and data on 130 commercial program participants we explored resource efficiency program benefits beyond bill or energy savings. As one component of the evaluation of a commercial audit program, we augmented the survey discussions of barriers, budgets, and program participation decisions. We also gathered detailed information on the array of benefits participants recognized from the program. Respondents were asked to rank these benefits, and provide associated dollar values to provide quantitative information on the “value” of the program’s non-bill benefits to the participant in the program. The presentation provides detailed information about:

- The frequency of mentioned of types of benefits by participants
- The types of benefits noted by business type and by end use or measure
- Dollar valuations of the “net” benefits accruing from the program
- Comparisons of the value of non-bill benefits with the estimated energy savings

The results showed that bill savings or energy benefits are important – but not necessarily the only important program benefit – to program participants. The research showed that a high percent valued benefits related to fewer tenant complaints and higher tenant satisfaction, safety issues, productivity increase, and other benefits considerably higher than the bill savings associated with the program. Most importantly, the project demonstrated that selling programs on “efficiency” or even just bill savings – even to the “bottom line-oriented” commercial sector – may not be the most effective approach because it ignores critical information on the benefits that participants value from these programs. We used this information to develop a variety of marketing and targeting recommendations for the program.

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INTRODUCTION AND PROGRAM DESCRIPTION

The authors conducted a process and impact evaluation of Seattle City Light’s (SCL) Operations Resource Assessment (ORA) program. This program, targeted at commercial and industrial business in SCL’s service territory, included an on-site audit that addressed electric and gas savings measures, as well as water conservation measures. Starting in December 1997, the ORA service has been available to City Light’s large commercial and industrial customers who have electricity consumption above 500,000 annual kilowatt-hours. The service is provided at no cost to eligible customers and is designed to help customers manage their operating costs by identifying specific action items that can reduce electrical, natural gas, and water usage. The program delivers the following services:

- A resource-use audit is conducted at each customer's facility, which identifies potential resource savings and associated cost reductions.
- An ORA report is then prepared for each customer that presents those actions that will reduce the customers' use of electricity, natural gas, and water. The report includes information on

expected costs and savings for the recommended operations and maintenance and capital-related measures.

- Seattle City Light staff meet with the business staff to discuss the report and develop an action plan for implementing the recommended actions in the report.
- Follow-up letter / action plan confirming expected actions resulting from the project and the meetings. City Light also follows-up periodically via phone.

During the two program analysis years (1998-99), the number of services completed for customers were: facility audit (129), ORA reports (110), and action plans (123). Skumatz Economic Research Associates, Inc. (SERA) conducted the process evaluation and the impact evaluation surveys; utility staff conducted the impact evaluation. As part of the project, SERA also conducted a non-energy benefits (NEB) analysis, identifying and valuing non-utility benefits (or non-bill-related benefits) that the participants attributed to the ORA program.

Interviews

For the evaluation and NEB work, SERA interviewed participating commercial and industrial building staff, as well as program staff and a sample of customers that had elected not to participate in the program. We gathered feedback on the program, and information about whether participants had implemented the ORA-recommended measures, to see how well the program was working and whether it had had a significant impact. We asked participants detailed questions about NEBs associated with each installed measure.

Participant interviews generally lasted about half an hour, and non-participant interviews were shorter. Participants were generally willing to share this amount of time because of the free services they had received under the program. We interviewed participants in a number of business types, including: groceries, hotel, medical, manufacturing, offices, restaurants, retail, shipping, warehouse, and others. We interviewed the primary person involved in the program – usually facility / plant / store manager, office manager, engineering supervisor, building manager, or similar titles.

ORA Program Impacts

The impact evaluation concentrated on assessing the program's savings in terms of dollars, kilowatt-hours, therms, gallons, and other measures. Considerable success was achieved by the ORA service in identifying potential electrical savings in customers' facilities and in spurring customers to take action to obtain the savings. The analysis covered the initial 96 projects served by the ORA service.

- **Electricity savings:** Potential electrical savings of almost 23,000,000 kilowatt-hours were identified in the audits. Of this potential, conservation measures and practices representing an estimated 9,000,000 kilowatt-hours savings were implemented in the facilities. Although most of the conservation actions were taken with partial financing from City Light's conservation programs, a sizable proportion of the savings (23%) were financed solely through customer funds.
- **Water savings:** The ORA service also achieved considerable success in identifying potential water savings in customers' facilities. For the initial ORA projects, the audits identified potential savings of more than 34,000,000 gallons, of which measures accounting for about 5,000,000 gallons of projected savings were implemented. This smaller implementation

percentage reflects the fact that there were few incentive funds available for these measures – only one of the eight water projects received financing through the Seattle Public Utilities conservation program. Almost all of the conservation actions taken by customers to obtain these savings were financed by the customers themselves.

- **Natural gas savings:** The ORA identified about 199,000 therms of natural gas savings; only three firms implemented measures, accounting for about 5,000 therms of estimated savings. All of the natural gas savings were financed solely by the customers.

However, there are other benefits that commercial and industrial customers realize from implement capital or operational changes in their place of business. Identifying and potentially estimating the perceived value from these non-energy (NEB) benefits¹ or non-bill benefits delivered, as a by-product of the ORA program was the purpose of the NEB study undertaken by SERA. The analysis also identified information useful to program design, marketing, and targeting that could potentially improve program participation and payback.

Estimating Participant Side Non-Energy Benefits (NEBs) from the ORA Program

Based on SERA’s previous work in NEBs (Skumatz and Dickerson 1995, 1997; Coates, Pearson, and Skumatz 2000; Skumatz, Dickerson, and Coates 2000; and others), we were confident that there were additional benefits accruing to the participants than just the energy or bill savings, and that we could derive estimates of the value of these benefits. Historically, however, this area has rarely been studied in a quantitative way, especially in the commercial sector. Although a number of researchers hypothesize the various types of benefits that might be experienced, the literature search turned up little quantitative work in this area.²

Specifically, for this program, we hoped to gather data that would allow us to:

- Identify NEB items that participants valued
- Determine some estimates of value associated with the NEBs from the measures, and
- Examine the impacts of the results on cost-effectiveness and their implications for marketing, targeting and other factors.

During the participant interviews, we asked a number of cost, impact, and decision-related questions associated directly with each individual recommended measure from the audit. To conduct the NEB analysis, we incorporated into the discussion of each individual implemented measure questions about any NEBs that accrued from the implementation of the measure. As a follow-on to that question, we asked about the relative value of the combination of net NEB benefits they received

¹ We will use the term NEBs in this article because that is the term established in the literature. However, in this context we are referring to benefits that are not related to the direct bill savings from the energy and water measures, so the “energy” term doesn’t quite apply. In the ORA report, we referred to the benefits as non-utility benefits (NUBs); however, we have adopted a more generic term, non-bill benefits (NBBs), for our other work in this area.

² Bensch (2002) notes several Energy Center of Wisconsin (ECW) studies that addressed some aspects of NEBs. In one study, they noted that participants in an ECW workshop on daylighting, participants designed measures into buildings that brought in light (but did not necessarily save energy). In another study of student dormitories, the administration found that students viewed the school more favorably (and may select it more readily) when renewables were (visibly) present – particularly wind towers, solar water heating, and photovoltaics. A third study indicates that owners receive an environmentally friendly impact from “green” buildings, and that this assists in leasing. Other studies are listed in the references including Feldman et.al. (1997), and Heschong *et.al.* (2000) and Okura *et.al.* (2000). The latter two studies examined aspects of daylighting in education and retail buildings.

(positive and negative). Participants were asked to enumerate the non-energy benefits they recognized from the measures they implemented³, then asked whether they valued that benefit *more than or less than* the bill savings benefit from the measure. Then, we asked respondents to tell us “*how much more [less] valuable*” they felt the benefit was to them than the bill savings they experienced (or expected) from the measure. These answers gave us approximate value multipliers to use in the non-utility benefits calculations. The survey gave us a chance to illustrate some of the benefits that non-residential customers recognized from these measures and from the ORA program, and to provide preliminary quantitative estimates of participant-side benefits to use in the benefit cost calculations.

We found that customers were quite willing to talk about these benefits and able to answer our questions about relative values. The survey required the participants to follow along on their printed audit recommendations, so that as they answered the relative value questions, they could see the expected bill and energy savings from each measure we discussed. This approach adds an extra level of credibility to the resultant data – beyond the residential work SERA had previously conducted using a parallel approach.⁴ By using the relative values in conjunction with the estimates of the average bill savings from each of the measures, we could attribute a dollar value to the NEBs.⁵

QUANTITATIVE RESULTS ON NEB ESTIMATES

We used a variety of quantitative and quasi-quantitative approaches to analyze the non-energy benefit occurring from the ORA program. We were interested in overall results as well as trying to uncover any patterns from analyzing the results by measure type and business type that might be useful in designing, targeting, or marketing programs. The results are presented in the following sections. We focus our analysis on both measure categories (HVAC, lighting, etc.) and business types. In the tables and analyses below, we address:

- Frequency of mentions of NEBs
- Relative and dollar values for NEBs, and
- Relationships between NEB values and measure savings and costs, and
- Implications for program design, targeting, and marketing.

Because the sample is not exceptionally large, readers should be judicious in using these values or other values from this paper in absolute terms. However, we believed the relative information might provide some useful information about the major relationships between measures and benefits.

³ For this project, we asked the question open-ended or unprompted (with a few examples of the types of things we were talking about); for other projects we have asked unprompted first, and then incorporated any new answers into a fuller list and asked the longer list.

⁴ On the residential side, participants often have no idea of the bill savings they could expect, so their responses on relative values may be affected by this lack of knowledge. The commercial participants were aware of the estimated savings when we conducted the survey. Of course, the estimates provided in this study may still be affected by the fact that they represent the value of the individual interviewee.

⁵ Arguably, the most direct method of assessing the value of NEBs to customers is to ask them using a willingness-to-pay approach (WTP). There is a considerable and well-respected literature on the validity and constraints of this approach. However, in our previous experience, we find that this form of question (e.g., “what is the dollar value of the reduced maintenance in your building after new equipment was installed”) can be very difficult for program participants to answer for these types of programs – especially in the residential sector. Because we have found that customers have difficulty answering WTP surveys related to these benefits, we used the relative value approach, which customers were able to understand and answer fairly readily. See another paper by Skumatz, ACEEE 2002, for a detailed assessment of problems of using a WTP approach for NEB analysis – specifically very volatile estimates of NEBs and unrealistically high estimates for some NEBs.

Number and Type of Non-Energy Benefits Mentioned

Customers enumerated quite a wide array of NEBs associated with different major types of measure installed. These results, not ranked, are summarized in Table 1.

Table 1. Commercial / Industrial Participant-Side NEB Categories by Type of Measure

Lighting Measures	HVAC Measures	Water Measures	Refrigeration
<ul style="list-style-type: none"> • Better lighting • Safety/security • Lower maintenance • Improved work environment • Better aesthetics • Reduced glare, eyestrain • Improved productivity • Better control • Other 	<ul style="list-style-type: none"> • Lower maintenance • Longer eqpt. life • Greater comfort • Better air quality, airflow, quality • Better productivity • Higher tenant satisfaction • Better aesthetics • Better control • Environmental benefits 	<ul style="list-style-type: none"> • Reduced water losses and bills • Greater efficiency / control of water use • Reduced over watering of landscaping • Labor savings • Better aesthetics • Greater tenant/ guest satisfaction • Better water flow 	<ul style="list-style-type: none"> • Lower maintenance • Longer equipment lifetimes • Reduced noise • Greater control of equipment, temperatures, etc. • Greater product life, lower losses of product • Reduced water use • Better aesthetics

To provide more detail, we categorized the frequency of mentions of the key types of NEBs identified by the ORA participants in association with installed measures. Table 2 shows the number of mentions of different types of NEB benefits by broad measure types and business types. The table shows that some of the most frequency-mentioned NEBs are improved lighting, lower maintenance, comfort, aesthetics, productivity, efficiency, safety, equipment function, and fewer complaints.

There were patterns in the measures and business types that elicited these NEB mentions. Beyond the obvious (improved lighting in offices and from lighting measures; and less water with new water-related measures), we found other relationships.

- Lighting measures caused participants to recognize several key types of benefits, including better lighting, lower maintenance, safety, and aesthetic benefits. These benefits added to the value that customers received from lighting retrofits.
- HVAC measures delivered comfort, productivity, and satisfaction / complaint related benefits. Refrigerators added significant value in terms of lower maintenance.
- Comfort was associated with HVAC measures, and offices;
- Productivity was most often mentioned with HVAC measures and offices and transport / shipping businesses
- Process equipment changes resulted in productivity improvements
- Safety benefits were strongly associated with lighting measures
- Lower product losses were mentioned by groceries in association with new refrigeration equipment, and other patterns evident from Table 2.⁶

⁶ Some of these results are affected by the fact that more offices had implemented measures than some other business types, etc. The mentions per measure installed are presented in Table 6 later in the paper.

Table 2. Number of NEB Mentions by Business Type⁷ and Measure Type

Type of NEB, # mentions	Measure Type	Business Type
Better Lighting (14)	Lighting (14)	Medical (2); Manuf (2); Offices (6); Residential (2); Restaurant (1); Shipping (1)
Lower Maintenance (11)	Refrig (2); HVAC (3); Audit (1); Air Compressor (1); Lights (4)	Grocery (3); Office (3); Shipping (2); Manuf. (1); Residential (1); Restaurant (1)
Comfort (9)	HVAC (6); Audit (1); Windows (1); Lighting (1)	Hotel (2); Manuf (1); Office (4); Residential (1); Shipping (1)
Aesthetics (8)	Lighting (3); HVAC (2); Shower (1); Windows (1) Refrig (1);	Manuf (2); Office (2); Hotel (2); Groc (1); Residential (1)
Productivity (6)	Lighting (1); HVAC (3); Air Compressor (1); Equipment (1)	Office (4); Shipping/Transport (2)
Efficiency (6)	Audit (1); Garbage (1); Water (1); Air Compressor (1); Lighting (1); Equipment (1)	Office (1); Restaurant (3); Shipping (2)
Equipment Works Better (6)	Process (2); HVAC (1); Refrig (1); Water (1); Equipment (1)	Manufacturing (1); Office (1); Restaurant (2); Shipping (1); Warehouse (1)
Fewer Complaints (6)	HVAC (2); Air Compressor (2); Garbage (1); Lighting (1)	Office (2); Shipping (3); Restaurant (1)
Safer (6)	Lighting (6)	Medical (2); Manufacturing (1); Office (1); Public (2)
Less water use (5)	Water (5)	Hotel (1); Office (1); Public (1); Shipping (1); Warehouse (1)
Guests Return, Happier Workers (5)	HVAC (1); Shower (1); Air compressor (1); Lighting (2)	Hotel (2); Shipping (3)
Increased Lifetime of Equipment (5)	HVAC (2); Lighting (2); Refrig (1)	Office (2); Restaurant (2); Shipping (1)
Better Control of Equipment (4)	Refrig (2); Audit (1); Lights (1)	Grocery (1); Offices (2); Warehouse (1)
More Air, Better Flow (3)	HVAC (3)	Office (3)
Environmental (3)	Refrig (1); HVAC (1); Lighting (1)	Grocery (1); Office (1); Public (1)
Lower Operating Cost (2)	Audit (1); Garbage (1)	Office (1); Restaurant (1)
Shelf Life, Lower Product Losses (2)	Refrig. (2)	Grocery (2)
Labor savings (2)	Water (2)	Hotel (2)

Computing Values Associated with NEBs

Number of mentions are useful information, but we were especially interested in uncovering which NEBs were most highly valued by participants. As described before, we asked participants whether the “net” value⁸ of the NEBs they recognized were more valuable, less valuable, or about equal to the value of energy savings associated with the measure. Table 3 provides the responses by type of NEB. Associated with these relative values, we computed the percent of mentions that received a value at least as high as the value of the energy savings.

⁷ Public space means museums and theaters; “residential” includes senior homes, etc; medical includes dentists and doctors offices; and shipping implies transportation / shipping companies.

⁸ We specifically asked them to provide the relative values net of any negatives associated with the measure (like contractor hassles, etc.).

Table 3. Non-Energy Benefits (NEBs) Mentions & Value as Percent of Energy Savings

Type of NEB	# Mentions	Reported NEB Value Relative to Energy Savings (and % at least equal to energy savings)	Wtd. Avg. NEB Value Multiplier as % of Energy Savings (simple) ⁹	Wtd. Avg. NEB Value as % of Energy Savings Adjusted for multiple NEB mentions ¹⁰
Better lighting	14	More (4); Same (5); Less Valuable (5) (M/S/L); 64% same or more value	96%	53%
Lower maintenance	11	More valuable (1); Same (8); Less (2) (M/S/L) 82%	95%	44%
Comfort	9	M/S/L (6)/ (3)/ (0); 100%	133%	33%
Aesthetics	8	M/S/L (2)/ (4) (2); 75%	100%	44%
Productivity	6	M/S/L (4)/ (1)/ (1); 83%	125%	33%
Efficiency	6	M/S/L (1)/ (2) (3); 50%	83%	27%
Equipment works better	6	M/S/L (2)/ (2)/ (2); 67%	100%	62%
Fewer complaints	6	M/S/L (3)/ (1)/ (2); 67%	108%	28%
Safer	6	M/S/L (2)/ (1)/ (3); 50%	92%	51%
Less water use	5	M/S/L (2)/ (1)/ (2); 60%	100%	65%
Guests return, happier workers	5	M/S/L (1)/ (3)/ (1); 80%	100%	42%
Increased eqpt life	5	M/S/L (2)/ (3)/ (0); 100%	120%	47%
Better eqpt control	4	M/S/L (1)/ (2)/ (1); 75%	100%	33%
More/better airflow	3	M/S/L (1)/ (0)/ (2); 33%	83%	50%
Environmental	3	M/S/L (1)/ (1)/ (1); 67%	100%	42%
Lower operating cost	2	M/S/L (0)/ (2)/ (0); 100%	100%	N/A
Shelf life, lower product losses	2	M/S/L (1)/ (1)/ (0); 100%	125%	54%
Labor savings	2	M/S/L (1)/ (1)/ (0); 100%	125%	N/A

In the last two columns of Table 3 we computed a weighted average of the value of the NEBs relative to the energy bill savings. The “simple” weighted average uses the reported NEB values for the measures that mentioned that NEB. The last column takes account of the fact that many measures had more than one associated NEB. In this case, the full multiplier was divided by the number of NEBs mentioned, and we recomputed the weighted average NEB value. The percentages in the last two columns are both presented in terms of the NEB’s value in terms of the percent of energy savings associated with the measure. The unadjusted figures range from 133% of the value of the energy savings for comfort benefits to a low of 83% from better airflow. The adjusted figures are lower, and account for the fact that some NEB mentions come in “groups”. We find here that lower water use and better functioning equipment have the highest values (over 60% of energy savings), and comfort, and other benefits are relatively less valuable to participants. The rankings of these relative NEB values (both adjusted and unadjusted) are presented in Table 4. Preliminary work was also conducted to estimate the relative dollar values associated with the NEB categories. We do not present these values here, but summarize the relative rankings in the bottom section of Table 4. The results indicate highest

⁹For purposes of this paper, we used simplified values for the weighted average multiples. We assigned 1.5 times (150%) the energy value for those with “more” value, and 0.5 (50%) for those reporting that the NEBs were “less” valuable than the energy savings.

¹⁰The second number in this column corrects for the fact that in many cases, multiple NEBs were mentioned at one time. We “shared out” the total multiplier among all the NEBs mentioned, and the second figure is the multiplier taking this into account.

dollar values were associated with lower water use, lower maintenance, comfort, aesthetics, safety, productivity, and better lighting.

Table 4. Ranked NEB Values – Dollar Value and Percent of Energy Savings

	High -- Unadjusted (More valuable than Savings)	Medium (Approximately same value as Energy Savings)	Lower (Less valuable than Energy Savings)
Unadjusted Multipliers	Comfort Productivity Shelf life / lower product loss Labor savings Increased eqpt lifetime Fewer complaints	Aesthetics Lower water use Better control of equipment Equipment works better Guests return; happier workers Environmental benefits	Lighting Lower eqpt maintenance Safer work environment Improved efficiency More air, better flow
	High -- Adjusted Values 50% and higher share of savings	Medium -- Adjusted Values 40%-49% of energy savings	Lower -- Adjusted Values Less than 40%
Adjusted Multipliers (Adjusted for multiple mentions)	Less water use Equipment works better Lower product loss / shelf life Better lighting Safer More air, better flow	Increased equipment lifetime Lower maintenance Aesthetics Environmental benefits Guests return, workers happier	Comfort Productivity Better eqpt control Fewer complaints Efficiency Lower operating cost, Labor savings (n/a)
	High dollar values	Medium dollar values	Lower dollar values
Higher / Lower Dollar Values	Less water use Lower maintenance Comfort Aesthetics Safety Productivity Better Lighting	Efficiency Equipment works better Increased equipment lifetime Better equipment control More air, better flow	Guests return, workers happier Fewer complaints Environmental (Lower operating cost, labor savings, lower product life (n.a.))

As mentioned before, we found that lighting measures received the most absolute NEB mentions, but that is related to the fact that lighting was the most commonly recommended measure. We also received more NEB mentions from offices. Table 5 controls for these frequency issues by presenting the number of mentions per measure installed. The table shows that, for example, each lighting measure installed generates an average of 0.89 mentions of associated NEBs, and offices mentioned 1.16 NEBs per measure installed. The highest number of NEB mentions per installed measure (PIM) occur in:

- Buildings installing refrigerators, controls, O&M measures, or conducting process audits;
- Transport / shipping, medical, hotel, and warehouse businesses.

Estimated Values Associated with NEBs for the ORA Program

We used the survey responses to compute approximate dollar values from the major NEB categories. The dollar value rankings would be expected to differ from the relative rankings in the previous table because they take into account the differences in the expected savings values associated with each measure. That is, some of the benefits with highest multiples relative to energy savings may have relatively low absolute dollar values if the energy savings associated with the measures generating those NEBs tend to be low.

Table 5 indicates that better lighting, lower maintenance, and aesthetics were some of the highest value benefits received. In addition, equipment control, safety, comfort, and productivity were

valued by participants. Of course, the numbers should be used with some caution, but relative scores provide potentially useful information for program design..

Table 5. NEB Results by NEB Category & Business Type Per Installed Measure (PIM)

Measure or Business ¹¹ Category	# of NEB Mentions	# NEBs Mentioned (PIM)	Computed NEB Value (PIM)	Average Cost (PIM)	Average Savings (PIM)	Payback (w/o & w/NEBs) ¹²	NEB as % of Savings (Rounded)
Lighting	37	0.89	\$2,400	\$15,000	\$5,200	2.9 / 2.0	45%
HVAC	24	0.95	\$1,500	\$33,400	\$3,600	9.3 / 6.5	40%
Refrigerators	9	2.0	\$7,800	\$73,500	\$16,300	4.5 / 3.0	50%
Water	9	0.86	\$2,000	\$4,400	\$5,300	0.8 / 0.6	40%
Air Compress.*	6	0.5	\$200	\$900	\$8,200	0.1 / 0.1	0%
Audits*	5	3.0	Large	\$94,000	\$30,000	3.1 / 3.1	Large
Motors*	4	0.25	\$500	\$22,400	\$5,000	4.5 / 4.1	10%
Controls	7	1.29	\$9,500	\$63,500	\$18,300	3.5 / 2.3	50%
Capital Measures	19	0.92	\$1,600	\$20,300	\$4,600	4.4 / 3.3	35%
O&M Measures	66	1.29	\$500	\$4,800	\$1,700	2.8 / 2.2	30%
Grocery	8	1.00	-	\$38,900	\$1,100	35.4 / 35	-
Hotel	9	1.29	\$2,700	\$12,700	\$7,700	1.6 / 1.2	35%
Manufacturing	9	1.0	\$1,100	\$14,000	\$1,800	7.8 / 4.8	60%
Medical*	4	1.33	\$2,800	\$10,600	\$2,000	5.3 / 2.2	140%
Office	34	1.16	\$3,600	\$40,400	\$7,500	5.4 / 3.6	50%
Public Spaces*	4	0.33	\$100	\$700	\$1,000	0.7 / 0.6	10%
Residential*	5	1.0	\$900	\$11,500	\$1,600	7.2 / 4.6	55%
Restaurant	11	1.2	\$100	\$50	\$650	0.1 / 0.1	15%
Transport/Ship	17	1.7	\$800	\$10,700	\$5,600	1.9 / 1.7	15%
Warehouse*	3	1.5	Large	\$70,500	\$30,000	2.4 / 2.4	Large
Wholesale/Retail*	2	0.5	Large	\$130,000	\$35,000	3.7 / 3.7	Large
Total		1.03	\$2,100	\$22,000	\$5,350	4.1 / 3.0	40%

Note: * indicates especially small sample sizes; PIM stands for “per installed measure”

Table 5 also presents important information on the computed dollar value of NEBs. The table shows the computed dollar value of NEBs, the average cost and savings for the average installed measure, and simple payback information (in years, the first figure omitting NEBs and the second figure including NEBs in the computation of payback). The last column presents the NEB multiplier – the value of the NEB expressed as a percentage of energy savings from the measure. These NEB multipliers are mostly clustered around 30%-45% of the value of energy savings, with some outliers.

In earlier work, we used estimates of the multiplier effects from ORA participants to develop estimates of the participant NEB valuation for the ORA measures and program. These were presented in Coates, Pearson, and Skumatz (2000) and Skumatz, Dickerson, and Coates (2000) and elsewhere. This information is presented in Table 6. Table 6 also shows the updated values based on our more detailed computations in the last column. The enhanced computations presented in this paper¹³ demonstrate some shifts in NEB multipliers; however, except for HVAC, the results are not dramatically different than reported earlier.

¹¹ Omits the businesses with no NEB mentions, including education, laundry, newspapers, and recreation.

¹² The figure before the slash is the simple payback not including NEBs (cost / savings). The number after the slash is the payback including the value of the NEBs computed as (cost / (NEB+savings)).

¹³ Taking greater account of shared NEBs, and eliminating some outlier data.

Table 6. Estimated Value of Non-Utility Benefits to ORA Participants

End use	Participant Valuation (initial estimates) ¹⁴	Participant Valuation (updated)
All End Uses	50% of the value of energy savings	40% of the value of energy savings
Lighting	40%	45%
HVAC	100%	40%
Water	60%	40%
Refrigeration	25%	50%
Other measures	Small	Varies (see Table 6)

Tables 7 and 8 summarize and rank key information from Table 5 and other computations by measure type and business type. The tables show the ranked results for: 1) NEB value (in dollars) per installed measure; ratio of NEB value as a percent of measure savings; and 3) ratio of NEB value as a percent of measure costs. Note that asterisks indicate particularly small sample sizes, and all results should be used with care.

Table 7. Ranked Average NEB Value Per Measure by Measure Type (across all measure types for businesses that installed measures; * indicates small sample size; rounded values)

NEB Value Per Measure Installed	Ratio of NEB Value to Expected Measure Savings	Ratio of NEB Value to Expected Measure Costs
Controls	50%*	Water 45%
Refrigerators	50%*	Air compressor 20%*
Lighting \$2,400	45%	Lighting 15%
Water \$2,000	40%	Controls 15%
Capital measures \$1,600	40%	Refrigerators 10%
HVAC \$1,500	35%	O&M measures 10%
Audits Large*	30%	Capital measures 10%
Motors/drives \$500	10%*	HVAC 5%
O&M measures \$500	Large*	Motors / drives 2%
Air compressors \$200*	*	Audits *

Table 8. Ranked Average NEB Value Per Measure by Business Type (across all measure types for businesses that installed measures; * indicates small sample size; rounded values)

NEB Value Per Measure Installed	Ratio of NEB Value to Expected Measure Savings	Ratio of NEB Value to Expected Measure Costs
Office \$3,000+	100%*	Restaurant 100%*
Medical \$2,800*	60%	Medical 25%*
Hotel \$2,700	55%	Hotel 20%
Manufacturing \$1,100	50%	Public spaces 15%
Wholesale / retail \$900+*	Large*	Office 10%
Warehouse \$900+*	Large*	Manufacturing 10%
Residential \$900*	35%	Transport / shipping 10%
Transport / shipping \$800	15%	Residential 10%
Public space \$100	15%	Warehouse *
Restaurant \$100	10%	Wholesale / retail *
Grocery *	*	Grocery *

¹⁴ The original computations indicated a potential extra value for the ORA participants of \$170,000 per year or \$2.7 million over the measure lifetimes using computed impact evaluation figures. Revised figures would be somewhat lower based on these updated NEB computations.

Table 7 indicates that refrigerators, controls, lighting, water and HVAC measures tend to have some of the highest associated NEB values. In addition, these measures are those that tend to have the highest rankings in terms of percent of energy savings. Looking at the NEB values relative to the cost of implementing the associated measures shows particularly large NEB returns from installing water, air compressor, lighting, and controls measures.

Table 8 indicates that offices, warehouses, hotel, manufacturing, and medical businesses seemed to realize the highest values and benefits above and beyond the energy savings provided by the measures installed. The highest returns from dollar invested in the measure are in restaurants, medical, hotel, and public spaces.

SUMMARY AND CONCLUSIONS

This analysis provided some of the first quantitative information on the value of non-energy, non-utility value for a variety of key types of measures implemented in the commercial / industrial sector. Specifically associated with the ORA program, we find that the values that participants gain from the measures installed is significantly higher than that traditionally counted by the utility in its benefit cost analysis. The results here indicate that the paybacks would be improved (overall), and the mills per kilowatt-hour cost figures including NEBs would also be reduced, significantly increasing the program's performance statistics. However, potentially more important is the information that these customer-related results provide for designing, targeting, and marketing the program. The value of the NEBs added significantly to the benefits side of the cost-benefits analysis for the program.¹⁵

What participants value: Based on the information from Tables 2 and 4, a number of NEBs provide especially strong benefits in relation to the energy savings or dollar value benefits that they provide. These are listed in Table 9.

Table 9. NEBs Highly Valued by Participants

High Value of NEB relative to Energy Savings (%) or Dollar Terms (\$)	Associated with Measures	Associated with Building Types
Reduced water use (% and \$)	Water measures	Various
Better lighting (% and \$)	Lighting	Offices and others
Improved eqpt operation / longer lifetime / efficiency / better airflow, lower maintenance (% and \$)	Lighting, HVAC, Process equipment	Grocery, office, transport / shipping
Lower product loss (%)	Refrigeration	Grocery
Fewer complaints (%)	HVAC, Air compressor	Office, Transport / ship
Safety (% and \$)	Lighting	Public space, Medical
Productivity improvements (% and \$)	HVAC, other	Offices, transport / ship
Comfort (\$)	HVAC	Offices, hotels
Aesthetics (\$)	Grocery, hotel	Office, manuf, hotel

Measure-Based Implications: The highest value benefits associated with each measure type were examined, and the results were presented in Table 5 and ranked in Table 7. We found that lighting measures caused participants to recognize several valuable NEBs, including better lighting, lower maintenance, safety, and aesthetic benefits. HVAC measures delivered comfort, productivity, and satisfaction / compliant related benefits. Refrigerators added significant value in terms of lower

¹⁵ And when the NEB values from the utility and societal perspective are added, the benefits improve even more, but the focus of this paper is the value and use of what participants value from the program. See the original report for additional information.

maintenance. Combining all the NEBs from the measures, we found that the highest NEBs in dollar values were associated with *lighting, water measures, HVAC, and potentially controls, audits, and refrigeration measures*.¹⁶ We found that the highest return for dollar invested in measures were in *water, air compressor, lighting, and controls*.

Business-Based Implications: Those businesses with the highest NEB value from program participation were examined in Tables 5 and 8. These included *office, hotel, manufacturing, warehouse, and potentially medical businesses*. The preliminary values we were able to associate by business type seemed to indicate that these business types realize the highest NEB values in addition to the energy savings provided by the installed measures. The highest NEB value returned per dollar invested in the measures occurred in *restaurants, medical, hotels, and public space buildings*.

Implications for Program Design, Recruiting, and Marketing

The results provide some guidance to program planners hoping to maximize the non-energy benefits (NEBs) from the program, and thus, partly, the program's appeal to potential participants. Program staff should consider making sure that the program design includes installation of lighting, HVAC, water and refrigeration measures. In both relative and absolute dollar terms, these measures provide some of the most valuable benefits to participants separate from the energy savings. In addition, high NEB values are recognized by the office, hotel, manufacturing, and medical sectors.¹⁷

Although the specific results are necessarily dependent on the program, measures, and geographic region, we believe the relative figures provide guidance for other programs and regions. Combining the results of the analysis, we derived priority program design and targeting/ marketing recommendations, which are summarized in Table 10. The table addresses the highest priority measures to include in the program (those with strong NEBs and energy savings), businesses to recruit (strong NEBs), and also highlights the NEB issues to emphasize in program marketing.¹⁸ These NEB issues are the benefits that speak to participants in terms they reportedly valued most highly. On average, these benefits represent an additional 40-50% in value beyond the energy savings on average, and some individual benefits were reported to be more valuable to individual respondents than the energy savings delivered by the program measures.

¹⁶ The term potentially is used to note that the associated sample sizes were especially low for these entries.

¹⁷ Certainly, some of these results occur because the program measures implemented were heavily weighted toward certain measures and businesses – particularly offices and lighting.

¹⁸ The next tier of recommended measures and businesses might include controls, audits, air compressors, and O&M measures. These also have relatively high NEBs and have high energy savings. Businesses in the next group include residential hotels, warehouses, and wholesale/retail. Marketing messages can also be derived from the results.

Table 10. NEB-Related Implications for Program Design & Targeting/Marketing

Measures to include	Estimated Average NEB Value per measure	Energy savings / measure	Businesses to Target	Items to Emphasize in Marketing
Refrigeration	Value of 50% of energy savings; \$5,000+* per installed measures	\$16,300	Grocery	Reduced product losses, lower maintenance, better eqpt control
Water (shower-heads / aerators)	40% of savings; \$2,000 per measure	\$5,300	Hotel, office, public space, various	Reduced water use & water/ sewer bills; reduced labor
Lighting	45% of savings; \$2,400 per measure	\$5,200	Office, manuf, public space, medical	Better quality lighting, safety, productivity
HVAC	40% value; \$1,500 per measure	\$3,600	Office, hotel	Comfort, productivity, fewer complaints, better air flow

We hope this kind of analysis will empower an important change in emphasis from designing and marketing programs on the basis of “efficiency” or ”energy savings” to (or in conjunction with) a different approach –incorporating information on a host of other benefits that the participants particularly value. The analysis provides quantitative estimates that support anecdotal evidence that NEBs are important to participants; for example, they value better lighting, improved safety, reduced water use, lower maintenance and better equipment reliability / lifetime / performance, and other benefits participants report gaining from measures installed by the program. It may be time to start listening to what customers are telling us they care about and using that in 1) designing, 2) targeting, and 3) marketing programs. This approach has the potential to maximize everyone’s benefits.

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