

## **CoolNRG Evaluation, Measurement and Verification Plan**

September 22, 2008



ScottMadden, Inc. has been retained by CoolNRG USA, Inc. to perform an Evaluation, Measurement and Verification of their proposed program detailed in their document titled “A Big Switch for The Big Apple”. The documentation contained below is the independent ScottMadden Evaluation, Measurement and Verification plan to measure the program effectiveness and structure.

#### **A. Program Summary**

This Evaluation, Measurement and Verification (“EM&V”) Plan is submitted as part of the energy efficiency program proposal (“Proposal”) by CoolNRG USA, Inc. (“CoolNRG”) to the State of New York Public Service Commission (“Commission”) as an independent program administrator pursuant to the State of New York Public Service Commission Order Establishing Energy Efficiency Portfolio Standard and Approving Programs in Case 07-M-0548 (“Order”). The program described herein is referred to as the “Program”, “Project”, or “A Big Switch for The Big Apple”.

CoolNRG, in conjunction with Consolidated Edison Company of New York, Inc. (“Con Edison”), will deliver a high profile mass-market energy efficient light bulb campaign to New York City and Westchester County residents through the distribution of 2.7 million CFL bulbs in one week in March of 2009.

The Project will distribute a 2-pack of compact fluorescent lamps (“CFLs”) to approximately 1.35 million households, delivering a total of 2.7 million bulbs throughout New York City and Westchester County. The campaign will use a 13 watt, Energy Star rated, 10,000-hour, warm-white CFL light bulb.

The anticipated benefits of the Program are as follows:

- 860,890 MWh of energy savings over the life of the CFLs; equivalent to the yearly electricity usage of 80,000 American households
- 8,744 kW of demand reduction or 5,000 personal air conditioning units being turned off on a hot summer day
- 369,322 tons of CO<sub>2</sub> emissions reduced over the life of the CFLs; or the equivalent to taking 61,000 cars off the road for a year
- \$21 million saved on ratepayers’ electricity bills every year
- \$25 of value to each participating household in the first year
- \$117 of value to each participating household over the life of the CFLs
- Cost of less than 0.7c/kWh (after an installation rate of 80% and net-to-gross ratio of 80% have been applied)
- Benefit cost ratio over 9

## **B. Evaluation Goals and Priorities**

The goal of the EM&V plan is to apply established criteria from the NY PSC and established EM&V methodologies such as the 2007 Model Energy Efficiency Program Impact Evaluation guide and the International Performance and Measurement and Verification Protocol (IPMVP) to document the and measure the effects ~~To document and measure the effects~~ of the CoolNRG program and determine whether it met its goals with respect to the established standards.

Priorities of the EM&V plan are as follows:

- Independence from the CoolNRG program implementation
- Clear linkage to EM&V standards and guidelines
- EM&V plan transparency, with all assumptions clearly stated and incorporated,
- Clear quality controls applied throughout the EM&V plan implementation

ScottMadden has reviewed and validated the methodology proposed by CoolNRG in the Project Document and believes the structure and design of the plan will provide the energy efficiency savings indicated within the plan. The post implementation surveying described within this EM&V plan will provided the evidence at a 90/10 confidence/precision level that the CoolNRG plan objectives have been met.

## **C. Process Evaluation Methodology**

We have conducted a systematic assessment of the CoolNRG energy efficiency program for the purposes of documenting program operations at the time of the examination, and identifying and recommending improvements to increase the program's efficiency or effectiveness for acquiring energy resources while maintaining high levels of participant satisfaction.

Our evaluation consisted of discussions with CoolNRG, evaluation of previous campaigns in the U.K and in Australia, detailed discussions with third party survey organizations that are familiar with the type of surveying we have included in our methodology and through a detailed search and review of available guidelines and documentation that detail EM&V protocols and procedures.

Our process methodology review has indicated to ScottMadden that the processes and procedures included in the CoolNRG project plan are sufficient and will provide the energy efficiency savings indicated within the plan.

#### **D. Impact Evaluation Methodology**

The proposed methodology is designed to be conservative and to offer transparency, predictability and simplicity, as it is:

- Transparent, with all assumptions clearly stated and incorporated,
- Robust, predictable and easily verifiable, due to the extensive reliance on stipulated values and the tool provided to calculate energy savings over time,
- Methodologically coherent, with a clear distinction made between factors that affect gross, site-level energy use and larger system factors that impact net program energy savings,
- Comprehensive in its consideration of factors that impact net program savings (not just leakage),
- Conservative due to the net-to-gross ratio assumptions and extensive safeguards including, technology quality, baseline penetration and program design.

This program has been designed around the Reward Card to minimize the impact of factors that would lower net savings and maximize those that would tend to raise net savings, including: (i) leakage, (ii) permanence, (iii) non participants (free riders, spillovers), and (iv) the rebound effect, which is defined as negative behavior change resulting in consumers increasing the usage of energy efficient products because people think it is acceptable to leave an energy efficient product on for a longer period than a product not labeled as energy efficient. Other elements not considered in the NTG ratio include: (i) positive spillover, such as the free-riders of increasing awareness of energy efficiency products and motivating consumers to purchase products they otherwise may not have considered and (ii) peak load reduction.

Scott-Madden will produce a detailed report showing who received bulbs, awareness of the Project and where the participating customers live in order to evaluate: (a) total energy savings in kWh, (b) demand reduction in kW, and (c) the overall program's value to the customers of New York City and Westchester County. The Project Evaluation Report will discuss: (i) the Project's total cost-effectiveness, (ii) the effectiveness of the distribution model used, (iii) how free-ridership was addressed and dealt with, (iv) the number of CFLs distributed, (v) the scope of the distribution to determine where the CFLs were distributed, and (vi) on-shelf sales pre and post campaign for energy efficient lighting category (vii) the Project's success in accessing hard-to-reach customers.

#### **E. Net to Gross Analysis**

The starting point for setting the NTG for residential CFL programs is the default value of 0.8 applied by the California Public Utility Commission as the regulator of demand-side management programs in that State (CPUC, 2003). We have adopted a similar value based on the potential leakage experienced with installation outside of New York utility service territories. It is also worth recognizing that this program has been designed to minimize the impact of factors that would lower net savings and maximize those that would tend to raise net savings (refer to “Summary Table of Factors that Influence Net Energy Savings of CFL Programs”), including:

- Leakage
- Non participants (free riders, spillovers)
- Rebound effect

Other elements not considered in the NTG ratio include:

- Positive spillover
- Peak load reduction

It is possible to include both these factors into the calculation if reliable data is available.

#### **Other Required Specifications**

- Incandescent lamps will be replaced with the lowest eligible CFL wattage as indicated in the Appendix, as the minimum CFL wattage delivers the equivalent or better lumen output than the baseline lamp.
- CFL technology under the project activity: screw-in uncovered compact fluorescent lamp with integrated electronic ballast; marked for the program; must meet international testing and quality standards (e.g., US EPA Energy Star products or Efficient Lighting Initiative (ELI, 2006) specification)
- Warranty: Failed lamps must be replaced free of charge within the first 12 months of use

Further discussion outlining the rationale behind each of the elements that make up the net to gross adjustment factor can be provided upon request.

**Summary Table of Factors that Influence Net Energy Savings of CFL Programs**

Parameter	Impact on net savings	Conservative assumptions	Relative order of magnitude	Adjustment factor
Grid efficiency improvement (load factor)	Increase (+)	Calculated energy savings do not include effect of improved load factor	Variable, depending on size of program	Not included
Spillover effects	Increase (+)	Calculated energy savings do not include spillover effects. Program experience shows increase in non program activity of 12%	Medium	1.10
Free riders	Decrease (-)	Program design will aim to restrict offer and limit number of lamps received per household. A correction factor will be applied to reflect current average market penetration of CFLs in baseline	Small	0.95
Leakage	Decrease (-)	Calculation recognizes that some bulbs will be installed outside of Utility Service Territory. Minimal use of incandescent transferred to previously unused fittings	Medium	0.8
Rebound	Decrease (-)	Calculated energy savings do not vary with hours of operation in the baseline	Uncertain (negligible)	0.98
Permanence	Decrease (-)	Only Energy Star technology will be implemented. Conservative assumptions of CFL lifetime (discount of minimum lifetime rates). 12 month warranty required	Negligible	0.98
<b>Aggregate NTG ratio</b>				<b>0.80</b>

## F. Benefit Cost Analysis

As a result of the PSC filing on August 22, it is clear that financial risks associated with project approval must be borne by Utilities as part of the proposed performance and incentive structure. This has created a situation where the proposed MWh savings must be delivered with a high level of confidence to avoid any negative financial penalty. CoolNRG believes that by adjusting the expected 'retention rates', a program can be proposed that delivers high confidence in the MWh savings whilst maintaining strong cost effectiveness still achieving a highly attractive TRC.

Con Edison calculated the cost effectiveness of the program using the 'total resource cost test'. The TRC of the program, as designed, is 12.91.

The ~~main factor affecting the~~ cost effectiveness of this proposal relates to the level of installation and retention that are proposed, compared to those that are achieved. Post-program research from CoolNRG's programs delivered around the world has shown an installation rate of more than 80 percent achieved.

CoolNRG has undertaken a modeling activity to determine the cost effectiveness of the program-benefit-cost ratio using the 'participant test- under different scenarios. Although this analysis is different from the TRC calculation, it is likely that the trends will be the same. does not include all the elements associated with the total resource cost test, it is apparent that these factors (such as avoided infrastructure expenditure, societal value, carbon value etc) will in most cases only improve the TRC ratio.

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The following table shows the benefit cost outcomes of various installation rates and can be considered a valuable tool for determining the most appropriate retention rate at which to propose the program. It must be noted, that even at an installation rate of 20%, the benefit cost outcomes still come in above 7:1.

Retention rate	80	70	60	50	40	20
c/kWh	0.64	0.74	0.86	1.03	1.29	2.58
Benefit cost to participants	22	19.5	17.1	14.6	12.2	7.3

This information allows the model to be revised will allow us to determine how best to propose a model as necessary to deliver the desired cost effectiveness that delivers an attractive TRC whilst managing the downside risks for the State of New York whilst establishing an acceptable risk/reward situation for all parties.

## G. Sampling strategies and sample design.

Major guidelines for energy efficiency EM&V (evaluation, measurement and verification) all outline four phases of verification that range from utilization of engineering calculations

without post implementation metering requirements to very complex measurement and modeling. These internationally recognized standards are as follows:

- a. 2007 Model Energy Efficiency Program Impact Evaluation guide
- b. EM&V Guidelines: Measurement and Verification for Federal Energy Projects, United States Department of Energy – Energy Efficiency and Renewable Energy (FEMP)
- c. International Performance and Measurement and Verification Protocol (IPMVP)

The range of verification options are displayed below:

M&V Option	How Savings are Calculated
<b>Option A:</b> Based on <i>measured</i> equipment performance, measured or <i>stipulated</i> operational factors, and annual verification of “ <i>potential to perform</i> ”	Engineering calculations
<b>Option B:</b> Based on periodic or continuous measurements taken throughout the term of the contract at the device or system level	Engineering calculations using measured data
<b>Option C:</b> Based on whole-building or facility level utility meter or sub-metered data adjusted for weather and/or other factors	Analysis of utility meter data
<b>Option D:</b> Based on computer simulation of building or process; simulation is calibrated with measured data	Comparing different models

Option A, which is designed for energy efficiency equipment or device retrofits, estimates savings that are determined by means of engineering calculations of baseline and post-installation energy use based on measured or estimated values. Option A is an appropriate ~~an~~ EM&V approach for this project because the project is simple, with limited independent variables, the risk of not achieving the savings is low, and the interactive effects are stipulated through our estimating model.

#### **H. Data reliability standards (e.g., precision and confidence level for customer surveys, measurement and verification).**

The goal for estimating gross energy savings at the program level will be at a 90/10 confidence/precision level. At this level one can be 90 percent confident that the measured value (for example the energy reduction resulting from a program) is within +/- 10 percent of the reported value based on sampling techniques. This measurement target has been recommended in the EAG DPS EEPs Evaluation Guidance document (9/10/2008), and is consistent with the guidelines provided in the 1978 Public Utilities Regulatory Policies Act (PURPA) for confidence/precision levels to be used when estimating demand.

ScottMadden has significant experience in survey design, administration and analysis, and provides many types of surveys for clients:

- d. Internal customer satisfaction



- e. Employee satisfaction
- f. External customer satisfaction
- g. Program/initiative assessment
- h. Measurement of perception gaps between management and employees
- i. Measurement of perception gaps between employees and customers

Additionally, ScottMadden manages all aspects of the survey process:

- a. Survey design
- b. Communications
- c. Deployment and administration
- d. Collection of data
- e. Analysis of results
- f. Development of recommendations

Post distribution surveying will be accomplished through a combination of phone surveying and email surveying. The EM&V methodology will not employ 3<sup>rd</sup> party door to door visits.

**I. Steps to identify and mitigate threats to data reliability (e.g., systematic error, random error) and uncertainty (e.g., assumptions, adjustments to data).**

The evaluation, measurement and verification reporting lies at the core of this Program. Therefore, in order to ensure that conservative, robust and transparent EM&V reporting is achieved, Scott-Madden will work directly with the Duane Reade Reward Card team to deliver EM&V that can withstand the highest level of scrutiny.

EM&V will be facilitated using the Reward Card customer data. Duane Reade will create reports on who is receiving the CFLs during the Project by tracking the customer information from the Reward Card data. This data will provide the basis for tracking the CFLs given away during the Project. Duane Reade will be able to process the consumer data provided by the Reward Card, to provide ScottMadden with detailed reports on the consumers receiving the free bulbs. The reports will be generated daily. These reports will show the zip code of the customers receiving the bulbs, which will provide great accuracy and great certainty where the bulbs are being installed.

**J. Data collection and management process (e.g., what data will be collected and in what format?)**

Post Implementation sampling data will be collected via phone and email surveying. Survey questions will consist of yes/no questions rather than open ended responses that require interpretation by the survey personnel.

Requests for email surveying will be structured in such a fashion that emails will not be captured in the user spam folders. We will craft the email subject header in a fashion that avoids being classified as spam. Sources for both phone and email will be obtained from Duane Reade. All survey data will be captured in a database which will be sortable by demographic data and participants. Care will be taken to ensure that survey results from the phone and email surveys are not redundant. The number of samples needed to ensure the verification is conducted to the specified 90/10 confidence/precision level will be clearly displayed in the final report prepared at the end of the EM&V effort. The database and data will be available to both ConEd and the NY PSC if requested.

The details of our surveying approach are provided below.

#### **PROPOSED METHODOLOGY**

We recommend a mixed approach to surveying to efficiently and effectively collect feedback from program participants.

Using the email addresses and customer information captured by Duane Reade, we will use a web-based survey administered via email to target identified program participants

- The web-based survey provides a quick means of collecting feedback and typically yields response rates around 30%
- An online survey allows customers to respond to the survey at a time that is convenient to them rather than being called on the phone
- We will be able to monitor the response rate to determine what additional surveying is needed to achieve a representative sample
- The email communication to participants and the survey itself provide opportunities to reinforce the campaign branding for recognition

Since the customer information captured by Duane Reade may not be representative of all program participants, we will analyze zip codes to determine areas where additional surveying is needed. A phone survey will be used to target these areas since we will not have participant contact information.

- The phone surveys will require the purchase of phone number lists by targeted zip codes
- For each completed phone survey that is desired, approximately 15-20 phone numbers will be needed to account for non-participants and those who cannot be reached
- Phone surveys where the client is identified versus blind typically yield response rates between 20-40%

The combined approach to surveying using phone and internet will help to address coverage issues that may occur if only one approach is used.

Our experience would indicate that electronic surveying is more effective in accurately capturing information and in managing the number of actual ~~of~~ survey sampling points. Duane Reade has indicated that it can provide approximately 130,000 email addresses of people who have been provided reward cards, which will be supplemented by Duane Reade consumer reports which will show the zip code of the customers receiving the bulbs, which will provide great accuracy and great certainty where the bulbs are being installed.

ScottMadden survey experience with phone surveys indicates that 10 – 15 times the desired sample count of actual samples is needed to fulfill the required confidence/precision level requirements of the sample. Our experience also indicates that with email surveys it is ~~Necessary~~ y to query approximately 10 times the desired sample count needed to fulfill the required confidence/precision level requirements of the sample.

The EM&V plan anticipates the utilization of both email and phone surveying to ensure that we have validated the installation of a sufficient number of CFLs to fulfill the net energy savings indicated in the project overview section of this plan.

A database will be developed to record all survey answers and ensure that there are no double counts between email and phone surveying. We will also validate that survey answers for a consumer that participates in both a phone and an email survey.

The post-implementation verification will be performed only one time after distribution of the CFL devices, followed by a detailed post-Implementation report.

#### K. Timeline for major evaluation milestones.

EM&V	Tasks	Next Steps	Estimated Completion Date
<b>Con Edison</b>	Customer geographic segmentation Customer survey information	1. Map customer service territory against DR store locations and club card holder zip codes	1. Completed
		2. Work with CoolNRG to determine expected leakage variable	2. Prior to Week 1
		3. Compile EM&V report for submission to Public Service Commission	3. Following Project Completion
<b>Duane Reade</b>	Data collection	1. Provide Con Edison with store locations by zip code	1. Completed
		2. Collect point of sale transaction data	2. Week 16
		3. Provide project partners with daily sales and club card reports	3. Week 16
		4. Provide stock reconciliation report post program – stock received vs. stock distributed	4. One month following Project completion

		5. Compile post program reports showing on-shelf sales pre and post program by club card holders	5. Monthly; for six months following Project completion
<b>NY Post</b>	2 <sup>nd</sup> chance promotions	1. Collect customer information for 2 <sup>nd</sup> chance draw for Con Edison marketing	
<b>Scott-Madden</b>	Market research	1. Validate proposed EM&V methodology 2. Develop EM&V plan for submission to PSC 3. Identify outbound phone market research 4. Develop market research questions 5. Conduct market research 6. Market research reports	1. 2 <sup>nd</sup> Week of September 2008 2. 2 <sup>nd</sup> Week of September 2008 3. Week 2 to 6 4. Week 6 to 8 5. Week 8 to 16 September 6. Quarterly for 12 months following Project Completion
<b>CoolNRG</b>	Manage the partners	1. Ensure that Scott-Madden has the information it needs to carry out the EM&V	Prior to Week 1; Weeks 1 to 17; for twelve months following Project Completion

**L. Evaluation report format.**

CoolNRG will utilize EM&V data from ScottMadden to produce a detailed report showing who received bulbs, awareness of the Project and where the participating customers live in order to evaluate: (a) total energy savings in kWh, (b) demand reduction in kW, and (c) the overall program's value to the customers of New York City and Westchester County. The Project Evaluation Report will discuss: (i) the Project's total cost-effectiveness, (ii) the effectiveness of the distribution model used, (iii) how free-ridership was addressed and dealt with, (iv) the number of CFLs distributed, (v) the scope of the distribution to determine where the CFLs were distributed, and (vi) on-shelf sales pre and post campaign for energy efficient lighting category (vii) the Project's success in accessing hard-to-reach customers.

**M. Evaluation budget.**

The proposed program evaluation budget has been divided into phases based on the expected program milestones

**Estimate by Project Phase:**

EM&V Validation Fees	\$ 15,000 - \$ 15,000
Data base development	\$ 10,000 - \$ 15,000
Survey Management Fees	\$ 40,000 - \$ 45,000
Conduct of Survey	\$ 25,000 - \$ 30,000
Post-Implementation Report	\$ 15,000 - \$ 15,000
Total Professional Fees	\$ 95,000 - \$ 105,000
Out-of-pocket Expenses (entire project)	\$ 3,000 - \$ 5,000
Total	<b>\$ 108,000 – \$125,000</b>

**N. Roles and Responsibilities**

Roles and responsibilities for the CoolNRG project are indicated in section k above as well as in the main proposal from CoolNRG.

**O. Format and timing of periodic program progress**

Data collection during the project will provide for daily reports to describe the progress towards achieving project approval.

- P.** Post program surveying will be undertaken within 3 months of project completion. A report describing project outcomes will be provided in accordance to the schedule provided in the in the main proposal from CoolNRG.

**Q. Policy describing how the program administration function will be organizationally separated from the evaluation function.**

As detailed above, ScottMadden is organizationally and functionally independent from CoolNRG which meets the requirement for organizational separation between the independent program administrator (CoolNRG) and the EM&V contractor (ScottMadden). Additionally, there will be specific attention to transparency in the methodology, as well as the reporting.