PA Consulting Group

National Grid

Process and Impact Evaluation Plan for the New York Energy Efficiency Programs—Appliance Recycling Program

July 23, 2010

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Prepared For: National Grid

PA Consulting Group
6410 Enterprise Lane
Suite 300
Madison, WI 53719
Tel: +1 608 316 3700
Fax: +1 608 661 5181
www.paconsulting.com

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1. INTRODUCTION

This document presents the process and impact evaluation plan for the National Grid Appliance Recycling Program approved in 2010 in New York State. This process evaluation plan and individual program logic model will be finalized based on the individual study start-up meetings and program manager interviews, scheduled to begin in August 2010.

1.1 BACKGROUND

National Grid is an international electricity and gas company and one of the largest investor-owned energy companies in the world. National Grid plays a vital role in delivering gas and electricity to millions of people across Great Britain and the northeastern US. In the US, National Grid distributes electricity to nearly five million customers in Massachusetts, New Hampshire, New York, and Rhode Island. Owning 4,000 megawatts of electricity generation, it is the largest power producer in New York State—carrying power to over one million customers on Long Island and supplying around a quarter of New York City's electricity needs. National Grid is also the largest distributor of natural gas in the northeastern US, delivering gas to 3.4 million customers in New York, Massachusetts, New Hampshire, and Rhode Island.

National Grid is offering energy efficiency programs to its customers throughout its New York State service territories. These programs cover both electric and gas energy efficiency measures in upstate New York and are limited to natural gas energy efficiency measures in the New York City and Long Island portions of the Company's service territory. Ratepayer funds support these programs, which focus on reducing energy consumption.

To support the successful planning, implementation, and refinement of National Grid's New York Energy Efficiency programs, National Grid hired the PA team (PA Consulting Group and Innovologie, LLC) in September 2009 to conduct process evaluations of all of its New York energy efficiency programs. Since not all programs were approved at the same time, the process evaluations have been staggered.

The New York Public Service Commission (Commission) issued an Order establishing an electric and natural gas Energy Efficiency Portfolio Standard (EPS). The EPS established targets for energy efficiency, similar to the existing Renewable Portfolio Standard, and other programs, intended to reverse the pattern of increasing energy use in New York. The Order called for the creation of an Evaluation Advisory Group (EAG). The EAG advises the Commission and Department of Public Service (DPS) Staff in the development of statewide evaluation standards and protocols, program evaluation plans, and other critical evaluation and reporting issues. National Grid and the PA team (PA) will work closely with the EAG, Commission, and DPS throughout the process evaluations. To facilitate oversight of evaluation activities, DPS staff are invited to participate in the bi-weekly progress conference calls and review evaluation plans, survey instruments, and draft and final reports.

1.2 EVALUATION TEAM

Pam Rathbun is the project manager of the process evaluation of the New York energy efficiency programs and will serve as the main point of communication for National Grid. In addition to regular communication and reporting activities to National Grid, she will be

responsible for ensuring that all deliverables and activities stay on schedule. Stephanie Cox will support Pam Rathbun in project management activities.

PA has assigned technical leads to each program being evaluated under this contract. For the Appliance Recycling Program, Pam will lead the process evaluation activities and NMR Group, Inc. will lead the impact evaluation activities for the Appliance Recycling Program

1.3 EVALUATION PLAN ORGANIZATION

The next section in this plan details the key data collection activities and researchable issues, scope of work, schedule of deliverables, and evaluation budget for the residential Appliance Recycling Program.

2. APPLIANCE RECYCLING PROGRAM

This section presents the process and impact evaluation plan for the Upstate Appliance Recycling Program.

2.1 PROGRAM DESCRIPTION

The Appliance Recycling program is designed to encourage households to retire and recycle secondary, inefficient refrigerators and freezers. The program offers customers $30 plus free pickup of old working second refrigerators and freezers. National Grid and its vendor JACO Environmental (JACO), remove the appliances from participating customers' homes, and then safely dismantle and recycle the appliance in an environmentally responsible manner. In order to participate, customers need to schedule a free pick up and pick up a $30 incentive rebate form. The program goal is to remove approximately 14,000 appliances in 2010 from the residential market.

To qualify, customers must be a National Grid electric customer in Upstate New York and own the units for pick-up. In addition, your refrigerator or freezer must be:

- Between 10 and 30 cubic feet using inside measurements.
- For refrigerators, must be the second refrigerator and not the primary refrigerator.
- Clean, empty and in working order at the time of pick-up.
- Accessible with a clear path for removal by contractor.

Each participating household is limited to pick-up and rebates for two units. The refrigerator or freezer must be picked up at a National Grid electric service address.

2.2 KEY DATA COLLECTION ACTIVITIES AND RESEARCHABLE ISSUES

The key objectives of the process and impact evaluation are to:

- Provide feedback on program effectiveness
- Provide feedback and corrective guidance on program design and implementation
- Measure and verify energy and demand savings for removed appliances

To accomplish these objectives, the PA team proposes three data collection activities: in-depth interviews with program and implementation staff, telephone surveys with a sample of program participants, and onsite monitoring at a sample of participant homes.

Table 2-1 provides an overview of our proposed data collection activities.

Table 2-1: Overview of Data Collection Activities

Evaluation Task	Key Objectives	Number of Interviews/ Visits
Interview program staff and implementation contractor	Gather insights on design, promotion, and operation of program as well as opportunities for improvement	4
Telephone surveys with program participants	Collect information regarding: program experience, satisfaction, demographics and estimate free ridership	400
Onsite monitoring	Monitor hours of use and demand of existing secondary refrigerators prior to removal through the program	50

Table 2-2 prioritizes preliminary key researchable evaluation issues for the process and impact evaluation. These researchable issues will be refined and revised as needed using information gathered during in-depth interviews with program managers and implementation staff. This matrix provides questions the Evaluation Team will address throughout the course of the evaluation, activities that support addressing the questions, and an initial prioritization of these questions.

Table 2-2. Researchable Issues and Prioritization

Researchable Question	Activity to Support the Question	Initial Priority
Customer Awareness and Marketing		
How is the program promotion working? What improvements can be made?	Program and implementation staff interviews Participant survey	High
How do participants most commonly hear about and become involved in the program?	Participant survey	Low
What additional marketing and outreach is needed?	Program and implementation staff interview	Med
Program Administration, Processes and Resources		
How effective is the collaboration between all National Grid and JACO?	Program and implementation staff interviews	Med
Is the support to JACO sufficient? If not, what additional training and education support can be provided?	Program and implementation staff interviews	Med
Are program goals clearly understood and communicated?	Program and implementation staff interviews	High
Do program manager and JACO feel they have sufficient staffing resources to efficiently deliver the program? What additional information or resources are needed?	Program and implementation staff interviews	Med

Researchable Question	Activity to Support the Question	Initial Priority
Trade Ally Participation		
Are there any internal or external barriers to JACO effectively delivering the program? Are program requirements clearly understood and correctly implemented?	Program and implementation staff interview	High
Use of other trade partners (e.g., new and used appliance retailers, Community Action Agencies) in providing program information and encouraging participation?	Program and implementation staff interview Participant survey	Low
Ease of Participation		
What are the characteristics of the participating customer population and how does that compare to the eligible population? Are there any groups not reached by the program that also have financial and efficiency needs?	Program and implementation staff interview Participant survey	High
What barriers exist for customers' participation in the program? What marketing and outreach efforts are most successful in generating customer leads?	Program staff interviews Participant survey	High
Program Satisfaction		
How is the program working? How could it be improved? What enhancements are needed in the design and delivery of the program?	Program and implementation staff interview Participant survey	High
Are customers satisfied with the program? What do they believe could be offered to improve program services?	Program and implementation staff interview Participant survey	High
Customer Characteristics and Decision Making Processes		
Did customers replace the secondary refrigerator?	Participant survey	High
Why did customers decide to recycle their secondary appliance?	Participant survey	High
How was the secondary appliance being used?	Participant survey	High
Does participation affect participants' perception of the utility and, if so, how?	Participant survey	Low
To what extent is the program reaching all segments of the population?	Participant survey	Med
Program Saturation		
Is the program delivering the intended benefits to participants and are they achieving planned energy impacts?	Program and implementation staff interview Participant survey	High
Is the appropriate information being collected to support future evaluation activities (i.e., impact evaluation)?	Program and implementation staff interview	High
Are program goals set appropriately?	Program staff interviews	Med
Will the program be on target to reach its savings and spending goals? Why or why not?	Program staff interviews	Med
Program Impacts		

Researchable Question	Activity to Support the Question	Initial Priority
What are the bill impacts and savings of program participation	Onsite metering Participant survey	High
Explore free-ridership and spillover issues for the purpose of informing program design	Participant survey	High

2.3 EVALUATION WORK PLAN

This section outlines the proposed process and impact evaluation plan. These tasks will be refined and revised, as needed, based on our interviews with program staff and our analysis of the program database.

2.3.1 Task 1: Start-Up Meeting and Program Documentation Review

The PA team will hold a teleconference in August 2010 with program managers and National Grid evaluation staff. Prior to this meeting, PA will review available program-related materials and documentation. PA will continue to review available documentation, including program materials and marketing collateral, as documents are identified and become available. At this meeting, we will refine the proposed scope of work, review the program design and implementation, review information contained in the data tracking system, and establish communication protocols.

2.3.2 Task 2: Finalize logic model and evaluation plan for each program

a. Logic Model Development

As part of Task 3, we will be conducting in-depth interviews with National Grid program staff and implementation staff from JACO. The information collected from these interviews, the start-up meeting, and program documentation will be used to develop the logic model. A program logic model is a visual representation of the program's theory[1] that illustrates a set of interrelated program activities that combine to produce a variety of outputs that lead to key short-, mid- and long-term outcomes. A program logic model can lead to a cost-effective determination of program effectiveness.

Logic models can be linked to performance indicators in order to provide on-going feedback to program managers. The models flow top to bottom and are typically organized according to five basic categories:

- **Program resources:** Financial, staffing, and infrastructure resources that support the activity
- **Program activities:** Overarching activities that describe what the program is doing. Examples include marketing, rebate processing, etc.
- **Outputs:** Metrics resulting from the activities. These tend to be measurable "bean counting" results (e.g., provide outreach events at 5 community fairs)

[1] A program's theory articulates what the program is designed to accomplish and through what means.

- **Short- to medium-term outcomes:** Expected outcomes resulting from program activities, with goals attached to those outcomes when possible. Examples include: target energy savings, recruitment into the program, etc.
- **Long-term outcomes:** Ideal, sustainable outcomes resulting from program activities, such as "all eligible customers participate in program" and "increase customer awareness of program offerings."

Short-, medium-, and long-term outcomes tend to detail program outcomes at a high level and capture market effects. National Grid requested that the outcomes detailed within the logic model be more concrete. Therefore, the logic model includes two outcome categories: short-term outcomes and program cycle outcomes. The short-term outcomes are the stepping-stone(s) to the program cycle outcomes, which are tied to program cycle goals (e.g., energy savings, cost per MWh, etc.).

Stepping across the activities enumerated in the logic model indicates an approximate 'flow' in the sequence of activities. For example, the logic model begins with the program infrastructure and ends with the activity that results in direct energy savings. In each column, the resources needed are specified above each activity. Then, the direct outputs of the activity are enumerated. The outcomes are causally linked to the various outputs in each column of the logic model. In other words, it is expected that the specified output (e.g., installed measures) will result in the specified outcome (e.g., energy savings).

The program logic model will be updated based on evaluation findings and submitted with the program's final report. In addition to an updated logic model, the final report will contain a work flow chart that visually depicts program processes.

b. Assessment of data tracking mechanisms and data collection procedures

A key function of the tracking system is to capture information mandated by the Commission as necessary for program implementation and evaluation. The PA team will review the requirements that National Grid is directed to meet as well as their ability to adhere to those requirements. We will document barriers to adhering to requirements where they are not met. The PA team will conduct an analysis of the tracking database to identify whether the information required for the process and impact evaluation is being collected and tracked. The review will also be used to inform the customer sample design.

2.3.3 Task 3: Sampling methodology

Participant Survey. As part of the data tracking system review and discussions with program staff, PA will confirm the size of the program population being examined, including implementation staff and participating end-use customers. This data will be used to develop the proposed sampling plan. A sampling plan memorandum for each data collection effort will be distributed to National Grid for review and approval. This memorandum will detail the sampling and stratification approach (e.g., by region, by appliance), as well as population size, selected sample size, expected number of completes, and projected level of precision.

Since we are attempting to contact participants within two weeks of their participation in the program, we have assumed that National Grid will provide us with one clean Excel file that contains all contact and participation information for new participants on a weekly basis.

We understand that data security is of utmost importance when receiving utility customer data, particularly when receiving full customer data. We have worked with National Grid to ensure complete confidence that customer data is secured. As standard practice, PA has operating policies that protect client data through the transfer and storing process.

National Grid will provide a list of participating customers to the evaluation team from which PA will select the sample. PA will submit a request with the specification of the data to pull. We will sample participants to achieve 400 completed surveys.

Onsite Monitoring. In addition to a Process Evaluation of the ENERGY STAR® Refrigerator Recycling Program, the Company proposes to meter a small sample of these secondary refrigerators. The objective of this study is to determine actual usage over a minimum two-week period, monitoring kWh consumption and possibly demand prior to removal. This data will be compared with DOE data for these refrigerators to determine accuracy. Consequently, metering eligibility will be limited to units that have nameplate information.

NMR will conduct the onsite monitoring. They will install meters for a minimum of two weeks with an objective of optimizing the amount of time available in the project schedule while not delaying removal long enough to inconvenience the participant. This monitoring will be performed via an electric plug meter that is installed directly between the unit and the wall plug. These meters will measure the interval kWh of the units for the period in which it is installed.

All metering equipment will be removed following two weeks (at minimum) of monitoring, and each customer will receive a $50 incentive for participating. The on-site information and analysis will be used to refine assumptions.

While onsite, NMR will ask participants a series of questions mirroring the process evaluation telephone survey, including, impact related questions and demographic information.

The objectives of the impact study include estimates that are best performed onsite, including quantification of energy savings and hours of use for refrigerators. In order to perform due diligence on the impact evaluation objectives, we feel it is prudent to gather primary data in New York to add support to the tracking level of savings.

In order to determine the precision for a given sample size, we use the formula below:

$$E = \left(\frac{z \times CV}{\sqrt{n}}\right)$$

Where,

- n = the required sample size before adjusting for the size of the population,
- z = a constant based on the desired level of confidence—e.g., 1.645 for the 90% level of confidence,
- E = error margin,
- CV = coefficient of variation (error ratio).

Based on a conservative assumption that the error ratio (also known as the coefficient of variation) for mean savings is 0.4, we will need a sample size of approximately 40 respondents to yield estimates that are accurate to within ±10% at the 90% confidence level. In order to keep the costs of onsite monitoring to a minimum, we propose completing a total of 50 onsite visits in a limited geographic area—25 in the Syracuse area and 25 in the Albany area.

2.3.4 Task 4: Data collection

a. National Grid program and evaluation managers and JACO staff interviews

Program and implementation staff are a major component of the evaluation effort. We are proposing to interview the National Grid program manager and three staff from JACO, including the main contact, the primary person responsible for data tracking, and the lead field worker.

These interviews will be used to understand the program theory and logic, explore the researchable issues identified above, and inform the customer survey design. The interviews will identify stated program goals and objectives, assess the effectiveness of the programs' operations relative to the defined program goals and objectives, capture program processes and flows, and explore ways to implement the programs more cost-effectively. The interview results will also be compared to program documentation to identify any areas where operations or priorities are not fully consistent with the program goals or where operational inefficiencies exist. This will form the basis to explore further in the evaluation any warranted recommendations on how the program management, organizational structure, operations, budget, or other practices should be modified or clarified. A logic model will be developed based on the interviews with the program manager and implementation staff.

b. Participating customer surveys

This evaluation will include 400 quantitative surveys with participating customers. Assuming a sufficient population size, we will conduct the surveys over an 8 week period and target customers within two weeks of program participation to minimize recall issues. Note that the telephone survey will not be used to identify customers who are willing to participate in the field inspections, because the telephone survey will target customers who have already had their refrigerator removed. As such, our team will rely on the implementation contractor to provide a list of customers willing to participate in the field inspections (discussed below).

To support the process evaluation, the survey will capture how they became aware of the program, reasons for participation, barriers prior to participation, customer experiences with the program, satisfaction with key aspects of the program, and customer demographics. The survey will also ask a number of questions to support the impact evaluation. We will confirm that the appliance was removed by the program, and ask other questions about the old unit, including its age, whether it was a primary or secondary unit, operating full-time or part-time, where it was installed, whether it was installed in a conditioned space, and what respondents would have done with the unit in the absence of the program. For this study NMR proposes to define free ridership as the retirement of units that would neither yield energy savings nor

divert units from the secondary market. To determine free ridership through the telephone survey NMR will include questions to assess the following:

- Units that were not in working order
- Units that would have been stored unused
- Units that would have been recycled anyway
- Units that had not been used in the year prior/were unlikely to be used, but whose owners later indicated the units would have continued to be used if the program had not been available

We anticipate that this survey will be no longer than 15-20 minutes in length. We will provide a draft survey for approval by National Grid.

The participant telephone surveys will be implemented through PA's in-house survey lab. PA has experienced survey center managers that have been working with a core group of staff trained in conducting residential and small commercial surveys. The focus of the survey center managers, and subsequently interviewers, is quality. Prior to conducting interviews on a specific evaluation project, all interviewers are required to attend a training session to ensure quality and consistency in the data collection. This training covers the survey objectives and procedures and walks interviewers through the survey instrument question by question. In addition to this initial training, we schedule regular debriefings with interviewers to discuss issues that have arisen and approaches they can take to increase cooperation. At least 10 percent of all telephone surveys are monitored, and the evaluation team receives reports each evening on the progress of all interviewers. Prior to fielding the survey, we will pretest the instrument by telephone with 5-7 participants. The objective of the interview will be to confirm the interview length, and determine whether respondents are able to understand and answer the questions.

Knowing the importance of achieving a high response rate for evaluation studies, the PA team aggressively monitors the samples and employs numerous efforts to maximize response rates and minimize potential non-response bias. Before any telephone contact, the PA team will send sampled participating customers a letter on National Grid letterhead that explains the purpose of the upcoming call and asks for their cooperation. This letter will also contain a toll-free telephone number that customers can use to contact the PA team and a toll-free telephone number to contact the Company with questions about the study. During data collection, we will provide a weekly response rate report to National Grid that summarizes the interviewing progress and any issues encountered.

c. Onsite Monitoring

NMR will conduct the onsite monitoring. They will install monitors for a minimum of two weeks with an objective of optimizing the amount of time available in the project schedule. This monitoring will be performed via an electric plug meter that is installed directly between the unit and the wall plug. These meters will measure the interval demand (kW) of the units for the period in which it is installed.

All metering equipment will be removed following two weeks (at minimum) of monitoring, and each customer will receive a $50 incentive for participating. The on-site information and

analysis will be used to either provide specific support to the current savings assumptions being used, or provide a basis for refinement of the assumptions.

While onsite, NMR will ask participants a series of questions mirroring the telephone survey, including, impact related questions and demographic information.

2.3.5 Task 5: Analysis

We will conduct data analysis throughout the study as different data collection activities are completed. Results from the analysis will inform findings and recommendations at the program, sector (residential, commercial), and portfolio levels that will be communicated to National Grid at regular intervals.

We will analyze qualitative data from in-depth interviews with program managers and implementation staff by thoroughly reviewing interview transcripts and notes for consistent themes and significant, but perhaps less frequently stated, views. Our analysis of the qualitative interview data will help us assess the effectiveness of the programs' operations relative to the defined program goals and objectives, capture program processes and flows, and suggest ways to implement the programs more cost-effectively.

We will use methods appropriate for the analysis of quantitative data with customers to examine survey responses. We will conduct descriptive analysis (e.g., frequency distributions, measures of central tendency and variation, and cross-tabulations) to examine differences in program awareness, factors affecting participation, and experiences with the program. Our analysis will be guided by the researchable issues identified.

We will combine the onsite data with free ridership data collected through the telephone survey, along with program information on the number of refrigerators recycled to estimate program savings based on the following formulas:

> Gross Energy Savings per Unit = Metered Energy Usage (kWh) / Hours of Monitoring * 8,760
>
> Gross Peak Demand Savings per Unit = Metered Demand during Peak Period[2]
>
> *Net Program Savings = Gross Savings per Unit x Total Units Recycled x (1-Free ridership)*
>
> Where,
>
> - Gross savings per unit is determined by the onsite monitoring
> - Total units recycled are provided from the program tracking records
> - Free ridership is determined by the telephone survey

All survey data will be cleaned to ensure all responses receive valid numeric codes and verify that missing values represent logically skipped (not applicable) survey questions. We

[2] As defined by National Grid

will provide National Grid with cleaned data files in the Company's preferred file format, along with codebooks and user guides which clearly describe the file format and data collection procedures.

2.3.6 Task 6: Communication and reporting

PA will provide reports and presentations throughout the evaluation period. Our reporting will consist of several types:

- Status reports to support bi-weekly conference calls
- Interim result discussions
- Weekly response rate reports during data collection
- Preliminary results presentation
- Draft report and final report.

PA will participate in the bi-weekly project update teleconferences for the programs with National Grid and DPS staff. Prior to each teleconference, PA will provide a brief status report to guide the discussion. This status report will summarize progress to-date, tasks for the next reporting period, outstanding data needs or questions to be resolved, major decisions regarding evaluation activities, and any other items for review. As the evaluation matures, the frequency of these meetings may decrease.

We recognize it is critical to communicate feedback immediately to key stakeholders including program planning and delivery staff, and implementation contractors. Our approach is to provide and discuss interim results on a continual basis and schedule periodic results meetings, in person or via teleconference/web, as soon as data are summarized and preliminary findings are available. This allows key stakeholders the opportunity to discuss problem areas and possible solutions, and it allows program staff to make implementation adjustments in a timely manner.

For the final report, the PA team will discuss the complete set of high-level results before we complete the draft report for the program. These discussions are particularly valuable in developing final recommendations for program changes that consider factors such as resource requirements to make those changes. At the same time, these open discussions are conducted in the context of not compromising the objectiveness of the evaluation. In some cases, the discussion may dictate the need for some additional analysis to support findings. The draft report will present a complete summary of program results.

Along with the final report, we will develop an Executive Summary appropriate for submittal to regulators. In addition to review by Company evaluation manager and other staff, we understand that the draft report, the draft final report, and the final report may be reviewed by the DPS and/or outside consultants before finalizing.

2.4 TIMELINE

Table 2-3 lists the timeline for the process and impact evaluation, assuming we have approval to proceed by mid August.

Table 2-3: Schedule

Task/Deliverable	Date
Kickoff Meeting	
Project Kickoff Meeting	August 23, 2010
Final Work Plan Provided	August 30, 2010
Process Evaluation	
In-depth interviews with program and implementation staff	Week of August 23, 2010
Draft Participant Survey Provided	September 10, 2010
Final Participant Survey Provided	September 17, 2010
Participant Survey Begin	September 20, 2010
Participant Survey End	November 12, 2010
Response Rate Reports	Weekly during data collection
Field Inspections	
Draft Protocol Provided	October 4, 2010
Final Protocol Provided	October 11, 2010
Onsite Visits Begin	October 18, 2010
Onsite Visits Completed	December 20, 2010
Reporting	
Interim reporting on process and impact data collection activities	As data collection activities end
Draft Onsite Report Provided as Part of Overall Report	January 21, 2011
Comments on Draft Overall Report	February 4, 2011
Final Overall Report Provided	February 18, 2011

2.5 BUDGET

The budget for the Upstate Appliance Recycling program is $107,990.50. This budget includes evaluation activities that will occur in 2010 and early 2011. The budget, per task, is seen in Table 2-4 below.

Table 2-4. Budget by Task

Task	Process Budget	Impact Budget	Total Budget
Conduct staff interviews, develop logic model and finalize evaluation plan	$6,780.80	$3,724.00	$10,504.80
Sample methodology	$3,494.40	$1,410.00	$4,094.40
Data collection	$32,843.20	$36,417.00	$69,260.20
Analysis	$6,988.80	$2,820.00	$9,808.80
Reporting	$8,065.20	$4,973.00	$13,038.20
Administrative Fee		$2,481.30	$2,481.30
Total	$58,172.40	$51,825.30	$109,997.70