

# Central Hudson Gas & Electric Corp Appliance Recycling: Impact Evaluation Summary

*Evaluation Conducted by:* Applied Energy Group (AEG), DATE: April 2014

## **PROGRAM SUMMARY**

The Central Hudson Residential Appliance Recycling Program has the objective to provide a collection and recycling service to Central Hudson customers in order to capture significant energy savings and environmental benefits by recycling old refrigerators, freezers, and window & through-wall air conditioner (AC) units. Refrigerators and freezers are removed from the customer's premises by the Appliance Recycling Centers of America ("ARCA"), the third-party program implementation contractor, and ARCA's subcontractor, Sears Logistics.

## **EVALUATION OBJECTIVE AND HIGH LEVEL FINDINGS**

An independent evaluation contractor Applied Energy Group (AEG) designed the 2010-2011 impact evaluation to estimate energy and demand savings impacts of the program. The evaluation utilizes various methods to calculate savings, including engineering and billing analyses of program impacts. AEG performed the following tasks to determine the impacts of the program:

- Reviewed program tracking database to verify savings and develop participant samples for the billing analysis.
- Conducted a participant survey to verify program participation and determine the influences of free ridership and spillover.
- Conducted a statistical billing analysis to identify changes in billed energy usage as a result of program participation.
- Performed a cost-effectiveness analysis of the program.

Between May 2010 and December 2011, participants recycled 8,550 appliances through the program. The majority of appliances (60%) were refrigerators, followed by room air conditioners (23%) and freezers (17%).

The overall net energy and demand savings determined by the engineering analysis was 9,140,472 kWh and 851 kW, respectively. By contrast, the billing analysis yielded a net energy savings of 3,870,425 kWh and demand savings of 424 kW. AEG estimated a net-to-gross factor of approximately 87 percent using the results of a telephone survey program participants designed to assess the effects of free ridership and spillover.

## **DETAILED IMPACT EVALUATION FINDINGS**

AEG performed two separate analyses of program impacts that yielded different results. In particular the engineering impacts were greater than the billing impacts. The overall realization rate was 42 percent. The variance is primarily due to the engineering analysis was expected savings based on assumptions, while the billing analysis directly examined changes in participants' billed energy usage.

Refrigerators accounted for the majority of energy savings in both the engineering and billing analyses, followed by freezers and room air conditioners. However, room air conditioners accounted for the majority of demand savings since these appliances are used primarily during peak hours.

The net-to-gross factor includes estimates of free ridership and spillover. Using the results of a participant telephone survey, AEG estimated that 47 percent of savings would have been achieved due to natural causes without the influence of the program. However, the program motivated participants to engage in spillover energy saving actions that amounted to 35 percent of additional savings. Participants engage in a variety of spillover actions such as installing energy efficient lighting and appliances.

## **EVALUATION METHODS AND SAMPLING**

The impact evaluation includes four major components: an engineering analysis to determine the amount of expected savings, a billing analysis to determine observed changes in energy usage before and after the program, a participant survey to assess free ridership and spillover, and a cost-effectiveness analysis to evaluate program benefits and costs.

AEG performed the engineering analysis consistent with the *2010 New York Standard Approach Manual for Estimating Energy Savings from Energy Efficiency Programs* ("Tech Manual").<sup>1</sup> AEG utilized the program tracking data with savings algorithms provide by the Tech Manual for each type of appliance recycled through the program. The savings algorithms yielded savings per measure for each type of appliance, which were multiplied by the number of participants to determine total gross savings.

The statistical billing analysis used linear regression of year-over-year differencing method to reflect changes in average daily energy usage over the same billing period before and after participating in the program. Program tracking data was cross-referenced to Central Hudson customer billing data to develop experimental and control group samples. Various sampling techniques were applied to ensure that results had a confidence interval of 90 percent and  $\pm 10$  percent statistical precision.

In October 2012, AEG conducted a telephone survey of 80 randomly selected program participants to evaluate the impacts of free ridership and spillover. Free ridership was determined through a series of questions designed to predict whether the participant would have recycled the appliance without receiving an incentive through the program. Responses to the free ridership questions were weighted based on the probability that the participant was a free rider and to account for potential bias. Similarly, participants were asked if the program motivated them to engage in spillover energy savings actions beyond the program, such as energy efficient lighting or appliances. The spillover factor was calculated based on the ratio of spillover savings to total gross savings for each participant.

---

<sup>1</sup> *New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs*, Prepared for New York Department of Public Service by TecMarket Works, October 15, 2010.