

## SGIG Consumer Behavior Study Cleveland Electric Illuminating Company *Smart Grid Modernization Initiative*

### Overview

The Cleveland Electric Illuminating Company (CEI), a FirstEnergy (FE) company, is a summer peaking investor-owned utility with ~750,000 customers in its ~1,680 square miles service territory that covers the northwest corner of Ohio (i.e., Cleveland and its environs). CEI’s SGIG project (Smart Grid Modernization Initiative) includes a consumer behavior study that evaluates customer acceptance of and response to different levels of enabling technologies combined with various time-based rate programs. The utility is targeting AMI-enabled residential customers in the suburbs east of Cleveland for the study.

### Consumer Behavior Study Features

**Goals and Objectives**—This study focuses on evaluating the timing and magnitude of changes in customers’ peak demand and energy usage patterns due to exposure to several different designs of a CPR and use of various enabling control technologies. CEI is also interested in learning about customer acceptance of the technologies.

**Treatments of Interest**—Rate treatments include the implementation of a CPR that provides a payment to customers for reducing electric load during declared critical peak events, while the price charged by CEI for electricity consumed stays at the customers’ existing flat rate (Flat w/CPR). CEI’s original plans included testing two levels of rebate (40 ¢/kWh and 80 ¢/kWh) and two critical peak periods (four hours and six hours) within the hours of 1 and 7 p.m. during weekday non-holidays in the summer season (June to August). Customers receive day-ahead notification of critical peak events and can receive such notification up to 15 times per year.

Control/information technology treatments include the deployment of IHDs; direct load control devices for air conditioners, water heaters and pool pumps; and a PCT. The thermostat has two treatment methods: (1) PCTs under customer control and; (2) utility-controlled PCTs. These devices, in conjunction with customer web portal access, facilitate information exchange and enable customers to better manage their electricity bills through improved understanding of electricity consumption patterns of appliances and equipment. All participating customers receive web portal access, customer support and a variety of education materials.

All of the experimental cells were not filled and consequently CEI chose to drop 12 of the 16 rate and technology treatments in order to provide the best opportunity for sufficiently precise impact estimates. CEI restricted the scope of the study to a Flat w/CPR with a \$0.40/kWh rebate with either: a four hour event duration that could be paired with an IHD or customer-controlled PCT; or a four- or six-hour event duration that could be paired with a utility-controlled PCT.

**CEI rate levels (¢/kWh)**

Period	Flat w/CPR (1)	Flat w/CPR (2)
Base	n/a*	n/a*
Critical Event	40.0	80.0

\* Retail competition exists in CEI’s service territory so Base energy charges depend upon the entity supplying electricity to the participating customer.

**Cleveland Electric Illuminating Company** *(continued)*

**Experimental Design**—The design for the pilot involves a randomized encouragement design, where customers are randomly assigned to either be offered a treatment or not offered a treatment. Data from customers who are offered a specific treatment but eschew the offer are nonetheless included in the study’s evaluation effort, as well as data from the customers who were randomly assigned not to be offered a treatment.<sup>i</sup>

All residential customers in several adjacent suburbs in the service territory who respond to a survey are pre-qualified to potentially receive an offer of treatment.

Those who self-identify as having central air conditioning are randomly assigned either to a control group or to receive an offer to opt in to a study where they receive a PCT and take service under a Flat w/CPR rate design. Those who opt in are then given the choice to receive either the utility-controlled or customer-controlled PCT but are randomly assigned to one of the available Flat w/CPR rate treatments.

Those who self-identify as not having central air conditioning are randomly assigned either to a control group or to receive an offer to opt in to a study where they take service under a Flat w/CPR rate design. Those who opt in are then randomly assigned to one of the available Flat w/CPR rate treatments.

**Enrollment Incentives and Retention Activities**—None

**Sample Size Requirements**—Sample size requirements are shown in the table below.

**CEI Sample Size Requirements**

Experimental Cell		Power Switch	Customer Controlled PCT	Utility Controlled PCT	IHD
CPR 40¢/kWh	4-hour event	260	173	173	260
	6-hour event	260	173	173	260
CPCPR 80¢/kWh	4-hour event	260	173	173	260
	6-hour event	260	173	173	260
Control		280	280		280

**Key Milestones**

Key Milestones	Target Dates
Study begins	June 2012
Interim evaluation report submitted	September 2012
Study ends	August 2013
Final evaluation report submitted	September 2014

**Cleveland Electric Illuminating Company** *(continued)***Contact Information**

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In a randomized encouragement design, customers are “encouraged” to take up the treatment but some may not do so. The evaluation of the treatment effect in such a design necessitates including both the customers who actually took up the treatment and those who did not. In aggregate, this “treatment” group can be compared against a randomly drawn control group from the general population, which would likewise be comprised of those who, if given the offer of treatment, would accept it as well as those who would reject the offer. This randomly drawn control group from the customer population is therefore, in expectation, an unbiased counterfactual to the behavior of the aggregate “treatment” group.