U.S. Department of Energy Smart Grid Investment Grant Technical Advisory Group Guidance Document #10

Topic: Consumer Behavior Study Data Collection Requirements

July 29, 2011

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OBJECTIVE

This guidance document describes the data that the Department of Energy (DOE) would like all Smart Grid Investment Grant (SGIG) recipients who have agreed to undertake a consumer behavior study (CBS) to collect as part of their study efforts. Most of the data that is collected will be reported to DOE; however, some of the collected data may not be required to be reported. The list of required data will be finalized in the coming months.

BACKGROUND

The Department of Energy (DOE) set the expectation early on in the SGIG Funding Opportunity Announcement (FOA) that recipients who undertake a rigorous consumer behavior study would be obliged to collect and report highly granular customer-level consumption and demographic data (hereafter referred to as "Project data"). DOE provided a more comprehensive (but still preliminary) data dictionary in Appendix D of the Metrics and Benefits Guidebook, which expanded the data reporting requirement to include the highly granular customer-level Project

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* The following individuals on the Lawrence Berkeley National Laboratory Technical Advisory Group (TAG) drafted and/or provided input and comments on one or more of the U.S. Department of Energy Smart Grid Investment Grant (SGIG) Technical Advisory Group Guidance Documents: Peter Cappers, Andrew Satchwell, Annika Todd and Charles Goldman (LBNL), Karen Herter (Herter Energy Research Solutions, Inc.), Roger Levy (Levy Associates), Theresa Flaim (Energy Resource Economics, LLC), Rich Scheer (Scheer Ventures, LLC), Lisa Schwartz (Regulatory Assistance Project), Richard Feinberg (Purdue University), Catherine Wolfram, Lucas Davis, Meredith Fowlie, and Severin Borenstein (University of California at Berkeley), Miriam Goldberg, Curt Puckett and Roger Wright (KEMA), Ahmad Faruqui, Sanem Sergici, and Ryan Hledik (Brattle Group), Michael Sullivan, Matt Mercurio, Michael Perry, Josh Bode, and Stephen George (Freeman, Sullivan & Company), Mary Sutter and Tami Buhr (Opinion Dynamics). In addition to the TAG members listed above, Bernie Neenan and Chris Holmes of the Electric Power Research Institute also provided comments.

data as well as more aggregate metrics produced by each recipient's own study evaluation effort. The data identified in the Metrics and Benefits Guidebook, however, was still incomplete relative to what a final data set would look like, as it did not include information about the study's recruitment, cell assignment, and attrition experience.

This guidance document provides a comprehensive listing of ***all the data that should be collected*** by SGIG recipients undertaking consumer behavior studies. It is understood, though, that several SGIG recipients may have already begun the data collection process without the benefit of this guidance document and as such may not have collected all of the information identified below. If such is the case, each recipient should work with their TAG to determine the "gap" in the data collection effort and then chart the most appropriate course in an attempt to collect as much of this data as possible within a reasonable level of effort and budget.

The data elements reported herein are all directly related to the current vision for the cross-project CBS evaluation effort LBNL and its subcontractors will be undertaking on behalf of DOE. However, it should be understood that it is not yet known with certainty what the final data set to be *reported* to DOE will comprise. Within the next several months, though, data reporting templates will be produced for uploading this collected data to the SmartGrid.gov Data Hub and explain the policies and procedures that will be implemented for protecting this data from Freedom of Information Act (FOIA) requests and granting access to internal DOE contractors (e.g., Lawrence Berkeley National Laboratory).

HISTORICAL DATA

Ideally, the timing of each recipient's study will allow for the collection of 12 months of historical billing and usage information for each participating treatment and control customer. In some cases, only a few months of hourly interval meter data may be available due to the commencement of the study relative to when the interval meters are installed and fully integrated into the meter data management system.

This historical usage data will be used to create a baseline level of electricity use for each customer. Electricity use during the study can then be compared against this baseline level as one way to determine if more or less electricity is being used when customers are exposed to treatment. Because different customers have varying patterns of electricity use over the day and week, it is important to collect electricity usage information on an hourly basis. As such, DOE would like each recipient to collect the following:

Broad Level Information.

- All applicable tariff sheets, including any changes to the tariffs, for 12 months prior to commencement of the study (include all tariff sheets for treatment customers, control

customers, and any customers who were invited to participate in the study but declined the offer).

Data Elements. *The following data should be collected for each participating treatment and control customer as well as a representative sample of those who were invited to participate in the study but declined the offer*[1]:

- Unique study customer identification number;
- Date and hour of each day, with time zone;
- Hourly interval meter usage data for 0-12 months prior to commencement of the study (depending upon date of meter installation relative to start of study);
- Hourly weather data (i.e., wet bulb, dry bulb, and dew point[2]) from the nearest weather station for 12 months prior to commencement of the study;
- Tariff sheet reference (i.e., which tariff sheet(s) each customer was on and the date range that the customer was on that tariff sheet for the 12 months prior to the commencement of the study);
- Start date of billing cycle for 12 months prior to commencement of the study;
- Monthly electricity bill (i.e., $ amount) for 12 months prior to commencement of the study; and
- Electricity usage from monthly bill for 12 months prior to commencement of the study.

RECRUITMENT DATA

In order to better understand how customers accept AMI-enabled time-based rate programs and control/information technology, DOE would like each recipient to report information about their recruitment effort.

This data will be used to determine whether customers respond differentially to different types of marketing and recruitment efforts. It is possible that even subtle differences in wording can lead to different response rates. By having access to all recipients' marketing and recruitment materials, DOE can examine differences in tactics across recipients, which will hopefully provide insights on which types of approaches are most effective. Specifically, DOE would like each recipient to collect the following:

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[1] Each recipient should work with their TAG to determine the most appropriate size of the representative sample.

[2] Dry bulb is the air temperature, while wet bulb and dew point both provide an indication of the amount of moisture in the air. All are elements collected by weather stations in datasets published by NOAA's National Climate Data Center (NCDC). Dry bulb should always be reported. Both wet bulb and dew point should be reported if available; at least one of them should always be reported.

Broad Level Information

- Copies of all marketing collateral used, along with an indication of which treatment(s) it was used for (i.e., all phone scripts, email messages, billing inserts, incentives offered, advertisements, etc for each treatment); and
- Description of screening / qualification process, including eligibility criteria (e.g., no medical needs, presence of air conditioner, pays own bills, ability to install certain technology, verification of PCT installation, geographical qualification) and when in the recruitment process eligibility is determined (e.g., qualified on phone during sign up, qualified on phone call following web sign up, or qualified during site visit to install technology).

Data Elements. *The following data should be collected for each customer who was invited to participate in the study and for each wave of recruitment*.

- Unique study customer identification number;
- Date of each contact along with type of contact, reference to marketing collateral above, and outcome, if available (e.g., 1/1/2012 local paper, advertisement B; 1/23/2012 mail, bill insert A, no response from customer; 2/06/2012 phone call, script A, customer rejected; 4/01/2012 mail, offered incentive C, customer accepted incentive C);
- Eligibility status, type of criteria, and date of eligibility change (e.g., not disqualified, based response to medical needs question in web survey, 1/15/2012; disqualified, unable to install PCT, 5/01/2012); and
- An indication of which customers wanted to enroll in the study but were excluded due to technology constraints (e.g., communication problems) or installation issues.

EXPERIMENTAL ASSIGNMENT DATA

It is imperative that DOE understand the experimental cell that each participating customer was assigned to and what each experimental cell is comprised of. This data will be used to examine whether differences in rates, information, and technologies both between and across recipients lead to differences in energy use. For example, two different educational programs run by two different recipients may have very different informational content. By collecting as much detail as possible about the customer experience, DOE can try to determine which elements have the most impact on energy use. To that end, DOE would like each recipient to collect the following:

Broad Level Information

- All applicable tariff sheets, including all changes, used during the study (include all tariff sheets for treatment customers, control customers, and any customers who were invited to participate in the study but declined the offer)[3];
- Definition of each experimental cell (e.g., C1 received standard education, IHD, tariff sheet 3; T1 received enhanced education, IHD, tariff sheet 3; and T2 received enhanced education, IHD, tariff sheet 4);
- Detailed descriptions of all enabling technology, including screen shots or pictures of the informational content of the IHD display, screen shots of the educational or informational section of the website that is being used as treatment for the study group, and pictures of the PCT display; the content of the energy use information provided by the IHD, website, and/or PCT (e.g., the website shows energy use in kWh; cost in cents per hour; event notification; other billing information, etc); and the granularity and delay of the information provided by the IHD, website, and/or PCT (e.g., hourly & real-time, 15 minute and day-delayed);
- Detailed descriptions of all educational treatments, including screen shots and copies of all educational content, timing (e.g., website with tips updated weekly), and a description of the process / customer experience;
- Descriptions or examples of all monthly bill formats (i.e., the content of monthly bills and how the information is laid out);
- Detailed description of any other information being provided to customers;
- Whether or not each educational treatment and enabling technology included goal setting capabilities; and
- Detailed description of automation technology, including the type of device (e.g., PCT, IHD with automation included), targeted loads (e.g., air conditioner, water heater, whole house), and whether the utility or customer controlled the automation.

Data Elements. *The following data should be collected for each treatment and control customer as well as a representative sample of those who were invited to participate in the study but declined the offer*[4]:

- Unique study customer identification number;
- Experimental cell identifier (e.g., C1, T1, C2, T2, not in study);

[3] Note that the tariff sheets asked for here are those that apply from the beginning of the study forward whereas the tariff sheets asked for in "Historical Data" are those from the 12 months prior to the beginning of the study.

[4] Each recipient should work with their TAG to determine the most appropriate size of the representative sample.

- Tariff sheet reference (i.e., which tariff sheet(s) each customer was on and the date range that the customer was on that tariff sheet);
- Date range bill protection or bill guarantee was in effect, if applicable;
- Date participating customer began receiving educational treatment and date customer stopped receiving educational treatment;
- Date energy usage information technology device was installed and date it was uninstalled, if applicable;
- Date energy usage information technology device was activated and date it was deactivated, if applicable;
- Date participating customer began receiving energy usage information treatment and date customer stopped receiving energy usage information treatment;
- Date automation/control technology was installed and date it was uninstalled, if applicable;
- Date automation/control technology was activated and date it was deactivated, if applicable; and
- Date participating customer began receiving automation/control treatment and date customer stopped receiving automation/control treatment, if applicable.

EXPERIMENTAL ATTRITION DATA

Some customers who chose to participate in these consumer behavior studies will be unable to complete the study due to a variety of reasons. This data will be used to gain a better understanding into what causes or helps explain attrition so that future time-based rate programs can better retain customers. To accomplish this goal, DOE would like each recipient to collect the following:

Data Elements. *The following data should be collected for each participating treatment and control customer*:

- Unique study customer identification number;
- Date customer exited the study; and
- Reason customer exited the study (e.g., account reclassification, customer unhappy, technology installation issues, technology communication problems, account shut-off, or end of study).

EXPERIMENTAL USAGE DATA

During the consumer behavior study, data will be collected from each participating treatment and control customer in order to better understand how being exposed to treatment affected

electricity consumption behavior. In order to fully capture the treatment effect, DOE would like each recipient to collect the following:

Broad Level Information

- For CPP, PTR, and VPP, a schedule of all "events" when the price changed throughout the duration of the study. This should include a timestamp indicating the beginning and the end of each critical or peak event for CPP and PTR, and a timestamp indicating the beginning and end of each pricing level along with a code corresponding to the price level in effect during that time for VPP (e.g., if there are 6 different peak period prices under VPP, then indicate a 6 for the maximum price, 5 for the next highest, etc.).

Data Elements. *The following data should be collected for each treatment and control customer* ***throughout the study duration*** *as well as a representative sample of those who were invited to participate in the study but declined the offer*[5]:

- Unique study customer identification number;
- Date and hour of each day, with time zone;
- Hourly interval usage meter data;
- Hourly weather data (i.e., wet bulb, dry bulb, and dew point) from the nearest weather station;
- For any demand metered customers, report the demand component that is used for billing purposes along with the date and time (e.g., the date, time and level of 15-minute maximum demand data);
- Daily count of page views and click-through data for websites;
- For each event, the type of notification, number of notification channels, number of hours in advance, and success or failure (e.g., for customer #492, for the critical event on 5/03/2012, notified via email – email bounced, notified via phone – no answer);
- Date and time customer over-rode customer or utility programmed automation, if applicable;
- Any other customer engagement statistics that are already being tracked (e.g., some recipients may be collecting information on when customers set their PCTs, if they turn the IHD backlight on, if a customer calls the help center);
- Monthly actual electricity bill ($ amount);
- Start date of billing cycle; and
- Monthly "shadow" electricity bill for each rate treatment in study, if available.

[5] Each recipient should work with their TAG to determine the most appropriate size of the representative sample.

CUSTOMER DATA

DOE believes that one of the major contributions of these studies is to provide a richer understanding of the segmentation of customer acceptance and response to AMI-enabled time-based rate programs and control/information technology. This segmentation is only possible, however, if demographic and other information is collected by recipients that more fully describes a customer's situation and surroundings.

DOE would like to obtain some summary information on the survey efforts undertaken by each recipient to collect this data. Specifically, DOE would like each recipient to collect the following:

Broad Level Information. *The following data should be collected for each survey associated with the consumer behavior study that is administered*[6]*:*

- Dates for survey administration;
- Survey modality (e.g., mail, phone call);
- Type of survey (i.e., enrollment, pre-treatment, event, post-treatment);
- Number of surveys fully completed;
- Number of surveys partially completed;
- Number of surveys returned unopened (mail) or refused (phone);
- Number of surveys not returned (mail) or unable to be contacted (phone);
- Number of surveys returned incomplete (mail) or unable to be interviewed (phone);
- Response Rate 3 (RR3, described in Appendix F on p.25 of Guidance Document #9); and
- Response Rate 4 (RR4, described in Appendix F on p.25 of Guidance Document #9).

Data Elements. *The following demographic and household characteristics data should be collected for each participating treatment and control customer as well as a representative sample of those who were invited to participate in the study but declined the offer*[7,8]:

- Unique study customer identification number

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[6] More detail is provided about the survey response characteristics information in Appendix E of *Guidance Document #9: Preferences for DOE Required Data Collection via Survey Instruments*. Please refer to this guidance document when determining how to calculate Response Rate 3 and Response Rate 4.

[7] The following demographic and other customer data that is to be collected via survey instruments is more explicitly discussed in *Guidance Document #9: Preferences for DOE Required Data Collection via Survey Instruments*. Ideally, all recipients will utilize the survey questions and answers as identified in that Guidance Document so that there is as much uniformity in the data collection effort as possible across the different consumer behavior studies.

[8] Each recipient should work with their TAG to determine the most appropriate size of the representative sample.

- Residential Customers, Pre-Treatment:
    - Own/rent of home;
    - Type of dwelling;
    - Presence of a central air conditioner;
    - Presence and number of room air conditioners;
    - Presence and programming of a programmable thermostat;
    - Presence of an electric clothes dryer in the home;
    - Number of people living in the home (broken down by age);
    - Presence of person with chronic illness or medical disability in the home;
    - Presence of person in the home on Monday to Friday between 1 PM and 5 PM;
    - Presence of person working full time and if work out of the home;
    - Remembrance of reception of pilot solicitation;
    - Usefulness of solicitation information;
    - Primary language spoken in home;
    - Income range;
    - Level of education;
    - Assessed home value;[9]
    - 9 digit zip; and
    - Census block group number.
- Commercial Customers, Pre-Treatment:
    - Business classification
    - Number of square feet
    - Number of full time employees
    - Business income
    - Electricity's share of operating costs
- Post Treatment:
    - Remembrance of information from electric utility to educate person around behaviors to reduce impact of rates;
    - Usefulness of the educational information; and
    - Whether the customer followed/utilized any of the educational information.

[9] DOE understands that if a recipient reports a customer's assessed home value even with some degree of rounding or masking, then such would allow DOE and its contractors to derive personally identifiable information (PII) from the complete data record, even if no PII were explicitly provided by the recipient. A guidance document is being developed to explain the legal framework for how both NREL, the entity responsible for managing the Data Hub, and LBNL, the entity that will take possession of this data to perform analysis on the SGIG-funded consumer behavior studies, will seek to protect all CBS reported data from Freedom of Information Act requests. Given the sensitive nature of this data element coupled with the implications it may have for customer privacy, recipients should work with their TAGs to determine whether or not this metric will be reported.

EXPERIMENTAL EVALUATION DATA

Each recipient is responsible for evaluating their SGIG consumer behavior study. The results of those evaluations are of keen interest to DOE as this information will be used, in part, to summarize experiences, results and lessons learned across the different studies. DOE would like each recipient to produce the following *metrics where appropriate and at the appropriate level of detail (e.g., individual customer, treatment group(s), and study) given the type of evaluation method that will be employed*[10]:

- Elasticity of Substitution;
- Own-Price Elasticity of Demand;
- Cross-Price Elasticity of Demand;
- Daily Demand Elasticity;
- Impact on system coincident peak demand (% and MW) ;
- Average hourly impact on consumption for each event(% and MWh/Hour);
- Standard error of hourly impact on consumption for each event(% and MWh/Hour);
- Average annual impact on energy (% and MWh); and
- Standard error of annual impact on energy (% and MWh/Hour).

[10] Each recipient should work with their TAG to determine the appropriate metric(s) and at what level of detail such metrics should be reported based on the recipient's evaluation plan. It is not expected that each recipient will report all appropriate metrics at all indicated levels of detail (e.g., individual customer, treatment group(s), and study), but rather at the singular level of detail deemed most appropriate based on the evaluation methods employed.