

**June 5, 2017**

**TO:** DER and Advisory Committee  
**FROM:** CEE Project Team  
**RE:** **Plan for Primary Data Collection for DSM Potential Study**

---

This document was prepared to collect input from the MN Department of Commerce, Division of Energy Resources (DER) and members of the Advisory Committee for the MN Statewide Energy Efficiency and Carbon Saving Potential Study being conducted by a project team led by the Center for Energy and Environment (CEE). It outlines a plan for primary data collection for the study. This data would need to be collected between July and October 2017, in order to be used for the study. In developing this plan, our objectives were to:

- Collect useful information on existing measure saturation and other key data inputs for the potential study;
- Fill in the gaps from other, existing data sources collected by others, especially in likely market focus areas that will be of interest for the study, such as low income and small business; and
- Increase the reliability and credibility of the potential study results.

Below is a table summarizing our plan, with more details in the sections following.

<b>Sector/Segment</b>	<b>Methods</b>
Residential	Phone survey (n ≈ 1,500) and on-site collection (n ≈ 100) segmented between low-income and non-low-income, and metro and rural populations
Large Commercial	Phone survey (n ≈ 180) and on-site collection (n ≈ 30)
Trade allies	Phone survey (n ≈ 100) focused on 5 different contractor types
HVAC sales data	Collected from MN HVAC distributors

### **Residential survey and site visits**

While recent CARD projects have characterized multifamily and manufactured housing statewide, up-to-date information for a representative sample of site-built single-family and small multifamily homes is an identified data gap for the potential study. These segments are especially important for better characterizing energy efficiency opportunities among low-income households and customers of rural utilities.

This effort will use a combination of a telephone survey and site visits to characterize energy efficiency opportunities for these important residential segments and ensure that the potential study is empirically well-grounded in terms of overall residential energy consumption. The effort will deliberately oversample low-income and rural-utility<sup>1</sup> homes to ensure statistically useful samples for these sub-populations of interest, but will also collect data to allow for appropriate modeling statewide.

---

<sup>1</sup> A final definition of “rural utility” for the study is pending, but will likely include most (but not all) electric cooperatives and may include smaller municipal utilities.

The effort will begin with a short telephone survey aimed at collecting basic home and equipment characteristics (e.g. presence/type of cooling system). Target survey completion quotas<sup>2</sup> are:

	<b>Rural utility*</b> (20% of population)	<b>Non-rural utility</b> (80% of population)	<b>Total</b>
<b>Low-income</b> (20% of population)	200	100	300
<b>Non-low-income</b> (80% of population)	800	400	1,200
<b>Total</b>	1,000	500	1,500
*Rural-utility customers will be further sub stratified into four geographic regions: NE, SE, SW and NW.			

The scope and scale of the telephone survey will allow for analysis of regional variation in saturation of equipment such as heat pumps and air conditioning.

The telephone survey will also serve as a recruiting vehicle for site visits by experienced energy auditors to gather information that is not amenable to a telephone survey. These will include gathering information about air-leakage and insulation levels, equipment efficiency levels and lighting inventories. The site-visit protocol will be structured to directly assess each home in terms of a list of residential energy-efficiency measures identified for the potential study. Survey respondents who agree to a site visit will receive a \$100 gift-card incentive.

Target on-site completion quotas for the site visits are:

	<b>Rural utility</b> (20% of population)	<b>Non-rural utility</b> (80% of population)	<b>Total</b>
<b>Low-income</b> (20% of population)	40	20	60
<b>Non-low-income</b> (80% of population)	40	20	60
<b>Total</b>	80	40	120

The estimated statistical error margins (90% confidence level) for proportion-type items (e.g. % of households with electric water heaters) are as follows for various subgroups under both the telephone survey and site-visit sampling plans:

	Sampling margin of error <sup>a</sup>	
	Survey	Site visits
Overall (statewide)	±3	±12

<sup>2</sup> These completion quotas are driven by: (a) the target number of on-site target completions; (b) a typical on-site-willingness rate of about 20%; a population incidence of low-income households of about 20%. Note that the number of survey completes can be reduced if a sample-frame of pre-identified low-income households (e.g. Energy Assistance lists) can be obtained.

Rural utilities, statewide	±3	±11
Rural utilities, by region	±6	±21
Non-rural utilities (statewide)	±4	±15
Low-income (statewide)	±7	±15
<sup>a</sup> Percentage point uncertainty at a 90% confidence level for p=0.5 proportion. Calculated margin of error includes effects of stratification and weighting.		

The effort will result in datasets that will be used to refine inputs to the potential-study models. A description of the approach and high-level results from the effort will also be summarized in a separate technical report that will be included as an appendix to the overall potential-study report. In addition, the survey and site-visit data collected under the effort will be anonymized and made available to the Department, utilities, and the general public.

### Timeline

Task	Timeframe
Survey sample and instrument development	July
Survey implementation	July – September*
Site visit protocol and instrument development	July
Site visit implementation	August-October*
Site visit incentives	n/a
Data compilation and reporting	November-December
<b>Total</b>	
*For logistical efficiency and to maximize site-visit recruitment, the survey and site visits will proceed in parallel by region, with site visits scheduled for 1-3 weeks following survey response.	

### **Large commercial building survey and site visits**

While recent CARD projects have characterized small commercial buildings, defined as buildings with less than 100 occupants, large commercial buildings are a data gap for the potential study. Using the CBECS definition of building with areas over 50,000 square feet, this segment uses about half of the energy in all commercial buildings, thus has potential for individual projects with large savings.

This effort will use a combination of a telephone survey and site visits to characterize energy efficiency opportunities for large commercial buildings that were excluded from the CARD small commercial building and RTU characterization studies.<sup>3</sup> The effort will exclude those building types that include

---

<sup>3</sup> The two CARD projects are, respectively, “Commercial Roof-top Units in Minnesota: Characteristics and Energy Performance” (final report available at: <https://www.cards.commerce.state.mn.us/CARDS/security/search.do?method=showPoup&documentId={AC3FB94A-9598-4A9C-BF02-967BFAC28FF3}&documentTitle=386204&documentType=6> ) and “Characterizing Opportunities for Small Commercial Energy Programs” (final report not yet available, but data from this study will be available in time to use for the potential study).

both small and large buildings if the likely measures and penetrations are already available from that work. Overall, the combination of phone surveys and on-site visits will be used to ensure adequate samples for the building types of interest to allow for appropriate modeling statewide.

The effort will begin with a short telephone survey aimed at collecting basic building and equipment characteristics (e.g. construction materials, number of stories, type of heating, cooling and lighting systems). Target survey completion quotas are:

	<b>Estimated Number of Large Buildings</b>	<b>% of Sector Area in Large Buildings (approximate)</b>	<b>% of Large Building Energy Used by Sector</b>	<b>Number of Phone Surveys (Goal)</b>
<b>Healthcare</b>	600	80%	25%	40
<b>Education (all)</b>	1,000	40%	24%	50
<b>Office</b>	800	80%	15%	50
<b>Public Assembly</b>	100	20%	11%	15
<b>Warehouse</b>	300	50%	7%	25
<b>Total</b>	2,800			180
Lodging, retail and service buildings are excluded since they are similar to the small commercial sample and/or were included in the RTU study. Public order and enclosed malls are excluded because of small numbers.				

Our goal of 180 completed surveys is ambitious based on the number of buildings. We will use our contacts with property management firms, architecture and engineering firms, professional associations such as BOMA, IFMA and MASMS, and utility program representatives who work with these sectors as needed to ensure a broad statewide sample.

The telephone survey will also serve as a recruiting vehicle for site visits by experienced energy auditors to gather information that is not amenable to a telephone survey. These will include gathering more detailed information about equipment age, state of repair, energy efficiency, building envelope and building staff knowledge and interest regarding energy management. The site-visit protocol will be structured to both assess each building in terms of a list of energy-efficiency measures identified for the potential study and to ensure compatibility with the existing data sets. Survey respondents in non-government buildings who agree to a site visit will be offered a \$100 gift-card incentive. Target on-site completion quotas for the site visits are:

	<b>Number of Large Buildings</b>
<b>Healthcare</b>	10
<b>Education (all)</b>	10
<b>Office</b>	10
<b>Total</b>	30

The estimated statistical error margins (90% confidence level) for proportion-type items (e.g. % of households with electric water heaters) are as follows for various subgroups under both the telephone survey and site-visit sampling plans:

	Sampling margin of error <sup>a</sup>	
	Survey	Site visits
<b>Overall (statewide)</b>	±7	±16
<b>Healthcare</b>	±12	±25
<b>Education (all)</b>	±12	±25
<b>Office</b>	±12	±25
<b>Public Assembly</b>	±16	NA
<b>Warehouse</b>	±16	NA
<sup>a</sup> Percentage point uncertainty at a 90% confidence level for p=0.5 proportion. Calculated margin of error includes effects of stratification and weighting.		

The effort will result in datasets that will be used to refine inputs to the potential-study models. A description of the approach and high-level results from the effort will also be summarized in a separate technical report that will be included as an appendix to the overall potential-study report. In addition, the survey and site-visit data collected under the effort will be anonymized and made available to the Department, utilities, and the general public.

#### **Timeline and costs**

<b>Task</b>	<b>Timeframe</b>
Survey sample and instrument development	July
Survey implementation	July – September*
Site visit protocol and instrument development	July
Site visit implementation	August-October*
Data compilation and reporting	November-December
*For logistical efficiency and to maximize site-visit recruitment, the survey and site visits will proceed in parallel by region, with site visits scheduled for 1-3 weeks following survey response.	

#### **Trade ally interviews**

We plan to conduct guided interviews with a diverse set of trade allies to understand current program landscape for residential, commercial, and industrial buildings from the perspective of Minnesota trade allies. This research will help inform estimates of current market share for efficient technologies, uncover motivations behind participation in energy efficiency programs, and identify challenges and opportunities associated with energy efficiency program designs. The results of this research will be used in both estimation of statewide energy efficiency potential and to guide policy and programmatic recommendations.

We will target five trade ally types, and will target a relatively even split between residential and commercial/industrial trade allies. We will complete 20 interviews for each trade ally type (100 interviews in total):

- HVAC&R contractors

- Plumbers
- Electricians
- New construction design professionals
- Insulation contractors

The interviews will focus on, but will not be limited to:

- Trade ally knowledge of utility programs
- Ease of participation utility programs
- Trade ally perception of customer knowledge of utility programs
- Current and projected market share for efficient technologies in replacement and new-construction markets
- Trade ally perspectives on changing customer needs

Interviews will last between 15 to 30 minutes. To encourage participation, we will provide an incentive of \$50 per complete.

The sampling frame for the effort will be based on a combination of trade-ally lists maintained by utilities, trade association lists and business information data purchased for other CARD-funded projects. The sample will be balanced between trade allies who operate in the Twin Cities area and those who do business in other parts of the state.

Results of the effort will be used to calibrate model inputs for estimating achievable energy-efficiency potential, and to guide the development of policy and program recommendations. The methods, results and insights from the effort will also be documented in a technical report that will be included as an appendix to the overall potential-study report.

**Timeline**

<b>Task</b>	<b>Timeframe</b>
Sample frame development	July-August
Interview guide development	July-August
Interview implementation and data compilation	September - October

**Existing baseline HVAC sales data**

Actual sales data of efficient versus non-efficient equipment is ideal for helping to baseline existing efforts. Project partner D+R International has been collecting transactional data from 62 HARDI distributors around the country, representing over 4,100 individual branches. D+R has been collecting this data since 2013. D+R estimates that it has market coverage for a representative sample of distributors that includes 13.2% of the sales in the Minnesota HVAC market, including all residential HVAC. For this study, D+R would report product sales by Investor-owned utility, municipal, and cooperative territory. D+R is further able to break-down the IOU sales by all three of the major electric IOUs in Minnesota (Xcel, Otter Tail Power, and Minnesota Power).