

PV Adopter Survey Delivery

Summary

The PV Adopter survey was fielded to single-family homeowners who had installed PV on their current home or had signed a contract to do so, and provides a basis for understanding how and why people transition from not having to having PV, and the characteristics, viewpoints, and experiences of households who have chosen to buy or lease PV.

This document describes the survey process for the Adopter survey, covering instrument development, sampling, fielding, and the creation of a final data set for analysis. It also gives a brief summary of basic household and respondent characteristics of the Adopter survey sample, by state, as revealed in this data.

Project Overview

Three different household-level surveys were fielded for this project: one for households who had installed PV on their current home or had signed a contract to do so¹ (the Adopter survey), one for households that had seriously considered PV but had not installed it (the Considerer survey), and one for the general population who did not have PV on their current home (the General Population survey or GPS).

By collecting similar data from three fairly different “statuses” with respect to adoption, the surveys provide a basis for understanding how those who do not have rooftop PV differ from those who have, for how and why people do (or don’t) transition from not having to having rooftop PV on their home, and for understanding the characteristics and viewpoints of households who have scarcely, or not at all, entered the “PV consideration” track. All three surveys covered single-family owner-occupied households in each of the four target states used in the project -- Arizona, California, New Jersey, and New York – allowing a comparative approach to understanding how the factors that affect PV adoption vary by geography and policy conditions.

Instrument Development

Survey questions for the Adopter survey were designed to capture a broad range of information on what motivates and impedes households to install rooftop PV, as well as the details and timing of the decision and installation. Survey instrument development drew from existing PV adoption survey instruments, PV adoption literature, and research team experience, as well as from past work on household interest in energy efficiency, environmental attitudes, purchasing tendencies, and related knowledge. Early interviews and discussions with installers and others in the PV industry were also taken into consideration.

The three surveys together were developed to support major goals and requirements of the project, including:

¹ Less than 1% of surveyed adopters did not yet have panels that had started generating electricity.

- (a) Developing agent-based models of solar adoption with particular attention to social networks;
- (b) Strengthening general knowledge about: opinions on, and concerns and experience with, residential rooftop PV, along with socio-demographic, economic, and technical data, and related information on environmental and energy use attitudes, purchasing practices, social networks, and other psychological and social aspects with respect to adoption and consideration status. This approach thus supplies more information on how people figure into PV adoption, versus studies that focus primarily on technical and/or economic characteristics.
- (c) Characterizing population segments and mapping these segments to interest and non-interest in solar and to solar adoption and non-adoption, especially in a way that can be compared across states and to other SEEDS research on solar adoption;

Survey Content

In addition to basic tracking and administrative data, the following types of data were collected:

- Geographic location (zip code)
- What prompted the household to look into solar panels, and how long they had been thinking about solar?
- Motivation and criteria for adoption (e.g., “adding to your home’s market value”)
- Social networks: who else they knew who had solar panels and what influence they thought this had on their decision, who and how many they talked to about solar panels post-installation, referrals to other households, whether they had, or would consider, various social outreach on solar (e.g., writing a review or hosting a solar party)
- How many installation companies the household had talked to, how they connected with them, the name of the actual installer, and the degree to which they would recommend that installer
- How long the panels had been generating electricity
- Timing: approximate dates for signing a contract, actual installation, and first generation
- Difficulties faced (e.g. “finding a trustworthy and competent installer”)
- Concerns about installation (e.g., “taking on debt or signing a lease”)
- Experience with the actual installation and performance
- Technical and economic details of the installation, such as solar system size, cost before incentives, whether they took out a loan, and whether the panels were bought versus leased
- Details on how and why the household decided between purchasing versus leasing, and the degree to which households considered or faced both options
- For households that leased, details of the lease
- For households that purchased, details of the purchase price
- How the household assessed the economics of the decision (e.g. payback time, monthly bill savings)
- Electricity costs before and after installing solar
- Respondent “innovativeness”
- A “Value- Belief-Norm”-style battery of questions² (see Stern et al. 1999), covering attitudes and opinions about environment, energy use, and climate change, and general purchasing habits

² Summarized in Stern, P.C., Dietz, T., Abel, T.D., Guagnano, G.A. and Kalof, L., 1999. A value-belief-norm theory of support for social movements: The case of environmentalism. *Human ecology review*, 6(2), p.81-97.

- Technical details of the house, including year house was built, living area, efficiency improvements made, and presence of air conditioning, swimming pool, plug-in hybrid vehicle, or electric vehicle
- Political leanings and affiliation
- Respondent details (e.g., male versus female, age, education, whether they are retired) and household details (e.g., number of adults and number of children, income, financial situation)
- Open-ended comments, as volunteered by the respondent

Deployment

There were two basic methods for identifying PV adopters to complete the survey. First, we obtained sample lists by working with installers who agreed to share contact information for customers for whom the company had installed solar panels. Many contacts were obtained but response rates were low –about 9 percent, despite applying methods to increase response, including offering incentives. This method yielded many contacts for California, but much fewer for the other states. For Arizona, a commercial panel method was used to supplement installer-provided leads, again applying screening questions for homeownership and to establish status regarding whether they had installed rooftop PV for their current home. This brought the total number of Adopter survey responses to over 100 for each state. For California, well over 1000 responses were obtained. Surveys were fielded between December 2014 and April 2015. Table 1 summarizes the sampling and fielding statistics.

Table 1. Response summary for Adopter homeowner surveys.

Recruitment Source	When Fielded	Response Rate Estimate	Responses Passing Data Quality Checks				Total
			AZ	CA	NJ	NY	
Installers	Dec 2014 to April 2015	8.5%	34	1181	185	187	1587
Panelists	March/April 2015	Not applicable	75	0	0	0	75
		Grand Total	109	1181	185	187	1662

All surveys were distributed through an email invitation, with a trackable link to the survey web page. Only households where solar panels were generating, had ever generated, or were anticipated to generate electricity within two months, were included, and only respondents who reported being personally involved in deciding on solar panels for their current home were surveyed. The median complete time for the Adopter Survey was 30 minutes.

Data Cleaning and Recoding

The raw data set resulting from fielding the Adopter survey was cleaned and recoded. Of 2405 total survey responses, 708 responses were incomplete, 17 additional responses did not pass quality checks, and 20 additional responses were from outside of the 4 study states. Table 1 above excludes these surveys from the count, for a total of 1662 surveys passing quality checks.

Additional cleaning and recoding steps were applied to the data set, in particular:

- Converting open-end numerical responses into numerical values
- Creating derived variables based on response data, e.g. a Boolean variable for “have kids” based on response for the number of children, or combining parallel questions across branches.

Public Data File Preparation

A final step was completed to support the public release of the Adopter dataset while protecting respondent confidentiality. This step involved:

- Matching variable names and response codes in this survey to those in the other two surveys where possible to facilitate combined analysis across the three surveys
- Withholding open-ended text responses and several other variables
- Top coding, bottom coding, and general recoding of several variables to protect confidentiality
- Local suppression of individual question response values (recoding to NA/missing), affecting a total of 578 question-responses (and no more than 9% of responses to any one variable and less than 4% of responses for all but three variables), for the following variables:
 - INSTALL_YR_BINNED
 - INCOME_BINNED
 - EDUC_BINNED
 - SQFT_BINNED
 - AGE_BINNED
 - HAVE_KIDS
 - HAS_POOL
 - HAS_AC
 - BUY_LEASE
 - GENDER
 - SIZE_KW_COMBO_BINNED
 - PEOPLE_TOT_3PLUS
 - RETIRED_LAST5YRS
 - HOME_MOVED_SINCE2009
- Removing 11 “pre-installation” responses (<1%) from the Adopter dataset (respondents who had signed a contract to get solar panels but had not yet had them installed), and associated survey variable branches
- Removing 47 cases (3%) from the Adopter dataset with higher risk of re-identification.

Table 2 summarizes the sampling and fielding statistics of the responses remaining in the final public use data file. Basic quality checks were performed to ensure that overall sample statistics were not compromised by this processing.

Table 2. Adopter homeowner survey responses in the public data file.

Recruitment Source	Responses in public data file				Total
	AZ	CA	NJ	NY	
Installers	33	1176	144	176	1529
Panelists	75	0	0	0	75
Grand Total	108	1176	144	176	1604

Basic Comparison of Sample Characteristics

Table 3 summarizes central tendencies of some basic individual and household characteristics for the Adopter survey samples, by state. More than half of respondents in each state were 55 years old or older, frequently retired (about one out of three, and higher for Arizona), well-educated (usually with a 4-year degree), and fairly well off as viewed by annual income, except for Arizona (where the high level of retirement presumably relates to annual income).

Table 3. Central tendencies of basic household and respondent characteristics of Adopter survey sample, by state.

	Adopter Survey			
	AZ	CA	NJ	NY
Respondent: % female	45	36	25	35
Respondent: % 55 or older	77	61	64	55
Household: % reporting income of \$100,000/year or more	31	54	57	62
Respondent: % retired	51	37	35	34
Respondent: % holding 4-year degree or higher	64	57	59	56
Households: Summer electricity bill prior to PV				
% with bills \$100/month or more	94	88	86	88
% with bills \$150/month or more	84	75	69	68
Households: Winter electricity bill prior to PV				
% with bills \$100/month or more	63	81	71	90
% with bills \$150/month or more	36	60	51	69