Water-Saving Fixtures: A Residential and Multifamily Survey to Inform Program Year 2018 Impact Evaluation

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APEX ANALYTICS

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Contents

Executive Summary

In 2018, Marin Clean Energy (MCE), Pacific Gas & Electric Company (PG&E), Southern California Gas Company (SCG), and San Diego Gas & Electric Company (SDG&E), collectively referred to as Program Administrators or PAs, offered several residential and commercial energy efficiency programs that provided nearly 650,000 California households with equipment that saves energy on their hot water use. Most of these programs provided "water-saving fixtures," such as aerators for bathroom and kitchen faucets or showerheads. These fixtures were provided to households at no cost, either through direct installation or as part of energy saving kits. One program incentivized water-saving fixtures through point of sale rebates.

Water-saving fixtures save energy by using less water and therefore decreasing the amount of electric or gas energy required for water heating. Water-saving fixtures are relatively low cost and easy to install, and as a result, PAs offer them in multiple programs.

This report presents estimates of (i) water-saving fixtures PAs distributed that were installed in participants' homes and (ii) the extent to which the incentives offered influenced participants' decisions to obtain and install water-saving fixtures. The study used surveys of households that received water-saving fixtures and owners and managers of multifamily buildings in which water-saving fixtures were installed to develop these estimates. Table 1 summarizes the water fixtures PAs distributed in 2018.

Table 1: Water-saving Fixtures Distributed in Program Year 2018

Water-saving Fixture Type	Number of Participant Households	Units Distributed
Showerheads	645,493	1,008,440
Bathroom faucet aerators	638,235	1,280,435
Thermostatic shower valves (TSVs)[1]	2,607	4,238
Kitchen faucet aerators	635,062	641,011
Total	**647,990**	**2,435,269**

Evaluation surveys gathered three key types of data used to inform inputs in estimating energy savings:

[1] A TSV is a device that turns off the flow of water through a fixture when the water reaches a certain temperature. The user then pushes a button or pulls a chain on the device to restart the flow of water. TSVs save energy by reducing the hot water wasted when someone turns on a fixture and then leaves as they wait for the water to become hot.

- The number of water-saving fixtures installed (installation rates)
- Household or demographic factors that can impact hot water use (usage characteristics)
- The portion of fixture installations that were attributed to the incentive offered by the program (referred to as net-to-gross estimates)

The evaluation relied on two primary data collection activities: a web survey of 283 households that received water-saving fixtures and web and phone surveys of 23 multifamily property owners and managers whose properties received water-saving fixtures.

California PAs provided program participants with water-saving fixtures in a variety of ways. PAs provided fixtures to the largest number of participants (81% of the total) through programs that mailed participants kits containing water-saving fixtures to install themselves.[2] In other programs, a technician under contract to the PA or its implementation contractor visited the participants' homes and directly installed the fixtures (direct install), often in conjunction with other low-cost energy-saving devices. PAs also distributed kits containing water-saving fixtures at events and through programs that provided take-home kits to students participating in school-based programs, but household-level contact information was not available for the take-home kits provided to students or the kits distributed at events so these programs are not included in this analysis.

Table 2 shows the counts of household survey respondents by PA and the type of program providing the water fixtures they received. Overall, this sample is sufficient to provide greater than 90% confidence with 10% precision for direct mail and general direct install program totals, and for PG&E and SCG totals.

[2] PAs also distributed kits at events and through programs that distributed them to students participating in school-based programs, but household-level contact information was not available for these kit recipients.

Table 2: Household Survey Sample by PA and Delivery Approach

Program Delivery Approach		Population	Sample
Direct Mail	PG&E	Not Offered	
	SCG	500,848	69
	SDG&E	21,173	26
	Total	*522,021*	*95*
Multifamily Direct Install	PG&E	Not Offered	
	SCG	12,204	41
	SDG&E	3,005	No Household Contacts
	Total	*15,209*	*41*
Manufactured Home Direct Install	PG&E	3,012	14
	SCG	3,408	35
	SDG&E	572	1
	Total	*6,992*	*50*
General Direct Install**	PG&E	3,472	92
	SCG	Not Offered	
	SDG&E	158	5
	Total	*3,630*	*97*
Total***	PG&E	6,484	106
	SCG	516,460	145
	SDG&E	24,908	32
	Total	*547,852*	*283*

* Participant data for MCE were only available at the property manager level. MCE was not included in the household survey.

** Includes income qualified (middle income)

*** Household data were not available for programs providing point-of-sale rebates or school kit distribution.

The evaluation survey reached 23 managers and owners of properties that received water-saving fixtures through programs targeting manufactured homes and multifamily buildings in 2018 (Table 3). This sample size is sufficient for 85% confidence with 15% precision. Since each property manager is responsible for multiple dwelling units, collectively these 23 managers and owners were responsible for 1,518 units (approximately 8 percent of total participants).

Table 3: Property Manager and Owner Survey Sample

Delivery Approach	PA	Organizations		Units Managed	
		Pop.	Sample	Pop.	Sample
Multifamily Direct Install	MCE	5	0	316	0
	SCG	182	11	12,398	703
	SDG&E	11	2	2,839	798
	Total	*210*	*13*	*15,553*	*1,501*
Manufactured Home Direct Install	PG&E	56	0	1,340	0
	SCG	79	0	924	0
	SDG&E	119	10	339	17
	Total	*254*	*10*	*2,603*	*17*
Total		**464**	**23**	**18,156**	**1,518**

Findings

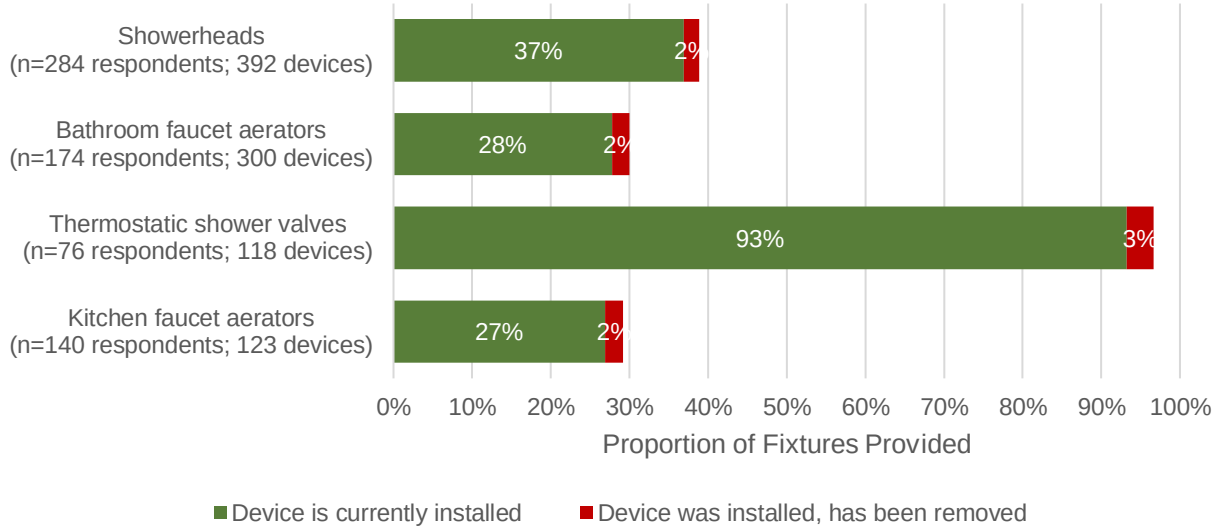
Installation

Apex assessed the extent to which the water-saving fixtures PAs provided, whether through direct install or kits, were installed in participants' homes.

For most fixture types, approximately one-third of the fixtures that programs provided were installed in participants' homes, primarily due to participants who received kits in the mail not installing the measures they received. Figure 1 shows the proportion of program-tracked water-savings fixtures that surveys verified were installed in participants' homes, and the proportion of fixtures that participants have since removed. Participants receiving fixtures through direct install more often reported that fixtures were installed than participants receiving fixtures in mailed kits. While PAs provided other fixture types through both mail and direct install programs, PAs provided thermostatic shower valves only through direct install programs. Reflecting this, respondents reported that a notably higher proportion of thermostatic shower valves were installed than other fixture types.[3]

[3] A relatively high proportion of respondents did not recall receiving some or all of the fixtures the PAs provided. The installation rate calculations in this evaluation assume any kit recipient not aware they received a fixture did not install it. A more detailed discussion of the approach to respondents who reported they did not receive a fixture or did not know is included in Section 3.3.

Figure 1: Installation Status of Water-saving Fixtures Received, as of December 2019



Proportions are weighted to reflect volume of water-saving fixtures distributed by program type

Program Influence

This evaluation examined how successful the PA programs were in influencing program participants to install water-saving fixtures they would not have installed if the programs had not existed. Participants who would have installed fixtures providing the same water and energy savings are considered free riders. The total savings from all the fixtures a program provides or incentivizes, including from fixtures installed by free riders, is called "gross savings." The savings generated without free riders is called "net savings."

The ratio between the net and gross savings is called the net-to-gross ratio. A ratio equal to 100% or 1.0 means the program influenced the installation of all the water-saving fixtures it provided or incentivized. A ratio less than one represents the netting out of free ridership; for example, 25% free ridership would yield a NTGR of 0.75 – so the closer the NTGR is to 1, the lower the free ridership. [4]

Most participants would not have installed water-saving fixtures had they not received them from a program. Table 4 lists the proportion of program-supported fixtures installed as a result of program efforts by (i) water-saving fixture and (ii) program delivery approach. The number of survey responses on which these estimates are based is listed in Section 3.1. Free ridership values were generally higher for direct mail programs than they were for direct installation programs,

[4] Section 5.1 provides a more detailed description of this evaluation's free ridership scoring approach.

although multifamily property managers and building owners also reported relatively high free ridership values.

Table 4: Net-to-Gross Ratio by Delivery Approach

Water-saving Fixture	Net-to-Gross Ratio				
	Manufactured Home Direct Install[1]	Multifamily Direct Install[2]	General Direct Install[1]	Direct Mail[1]	Total[3]
Shower heads	94%	76%	93%	83%	83%
Bathroom faucet aerators	96%	81%	98%	79%	79%
Thermostatic shower valves	N/A	N/A	96%	N/A	96%
Kitchen faucet aerators	95%	62%	100%	75%	75%

[1] Based on household survey responses
[2] Based on property manager and owner survey responses
[3] Weighted to reflect volume of devices distributed through each program type

PA programs increase the number of fixtures single-family household participants install and accelerate their installation of those fixtures; multifamily building owners and managers have different installation considerations. Most household survey respondents (ranging from 66% for showerheads to 84% for thermostatic shower valves) reported they were unlikely to purchase water fixtures outside of a program, or, if they were to purchase fixtures independently, that they would have purchased those fixtures more than two years later (ranging from 59% for kitchen faucet aerators to 83% for thermostatic shower valves). While most participants reported they would be unlikely to purchase water fixtures outside a program, those that indicated they were likely to do so typically reported they would purchase devices with a similarly low flow rate (and thus similar energy savings) to the ones they received.

Multifamily building owners and managers reported different considerations in their decision to install water fixtures. Noting that they were motivated by water usage restrictions, municipal benchmarking policies, and routine maintenance, multifamily building owners and managers were more likely to report they would have installed multiple fixtures at the same time (ranging from 45% for showerheads to 60% for kitchen faucet aerators) but may have chosen a less efficient option.

Usage Characteristics

Overall, program participants were similar to California's population in key aspects that impact water usage. A variety of factors can influence the amount of water a household uses and thus the energy savings potential of water-saving fixtures. This evaluation gathered data on a range of demographic variables, household characteristics, and water usage behaviors that could impact the savings from water-saving fixtures. Overall, the distribution of households receiving water-saving fixtures in 2018 was similar to that of California's population in terms of number of residents, home ownership, dwelling type, and fuel used for water heating.

Conclusions and Recommendations

Apex Analytics draws the following conclusions based on the results of this research.

- **Conclusion 1: Mailing kits is a riskier, though lower cost, approach to distributing water-saving fixtures than direct installation.** Direct mail programs had both a lower installation rate than direct installation programs and higher free ridership. Some households receiving kits in the mail reported they did not have sinks or showers on which to install all of the fixtures included in the kits. Participants also may not recognize some fixture types. Households may be more likely to request kits when the need to replace a water fixture arises, increasing their likelihood of being free riders.
  - **Recommendation 1:** PAs sending water fixtures in mailed kits should consider opportunities for participants to customize the kits they receive and investigate whether opportunities exist for the accompanying materials to more clearly explain how to use each of the fixtures included.
- **Conclusion 2: Multifamily building owners and managers differ from participants making decisions for an individual household in their approach to replacing water fixtures.** While household survey respondents indicated that programs motivated them to install more water-saving fixtures and do so sooner than they otherwise would, building owners and managers indicated that the programs had a greater influence on the efficiency of the fixtures they installed than the timing. Property owners and managers cited considerations like ongoing maintenance, water restrictions, and benchmarking ordinances in their installation decisions.
  - **Recommendation 2:** PAs should monitor local policies influencing multifamily buildings. PAs should work to leverage those policies to encourage building owners and managers to install more efficient water fixtures where appropriate and consider the effects those polices might have on program net-to-gross values.

1. Introduction

The California Program Administrators (PAs) offer several residential and multifamily programs that incentivized or provided hot water saving fixtures in program year (PY) 2018. The programs use ratepayer funds to provide customers with incentives to purchase and/or install these water fixtures.

This report presents estimates of the proportion of water saving fixtures PAs distributed that were installed in participants homes and the extent to which the programs influenced participants' decisions to obtain and install water saving fixtures. These estimates will inform energy savings estimates for these fixture types. The study used surveys of households that received water saving fixtures and owners and managers of multifamily buildings where water saving fixtures were installed to develop these estimates. Apex Analytics performed this work for the California Public Utilities Commission under the Group A contract.

1.1 Background

Water saving fixtures, such as aerators for bathroom and kitchen faucets, save energy by using less water and therefore decreasing the amount of electric or gas energy required for water heating. Water saving fixtures are relatively low cost and easy to install and PAs often include them in programs in which a technician under contract to the PA or its implementation contractor visits the participants' homes and installs energy efficiency measures (direct install), as giveaways, or part of kits distributed by mail.

In PY 2018, MCE, PG&E, SCG, and SDG&E program tracking data, which includes all measures installed by customers through the program, lists 36 unique water saving fixtures. Apex Analytics classified these fixtures into four categories listed in Table 5. The individual fixtures within each category primarily varied in the flow rate of water passing through the fixture and the fuel used for water heating.

Table 5: 2018 Water Saving Fixture Categories

Fixture Category	Count of Fixture Codes	Flow Rate Range (Gallons per Minute)	Other Distinctions Between Fixture Categories
Bathroom Faucet Aerators	14	0.35 – 1.2	Water heater fuel (electric vs. gas), building type (single family vs. multifamily)
Kitchen Faucet Aerators	8	1 – 1.5	Building type
Showerheads	9	1.5 – 1.6	Water heater fuel, building type
TSVs	5	N/A	Water heater fuel, whether provided with another fixture (e.g., showerhead)

The four PAs distributed these fixtures through 14 programs, each of which used either different distribution approaches or targeted different segments of residential

customers. Table 6 lists the programs, their target population, and delivery approach that provided water saving fixtures in PY 2018 by PA.

Table 6: 2018 Programs Providing Water Saving Fixtures

PA	Program Name	Target Population	Delivery Approach
MCE	Multifamily Comprehensive	Multifamily	Direct Install
PG&E	Residential Energy Fitness Program	General	Direct Install
	Direct Install for Manufactured and Mobile Homes	Manufactured Homes	Direct Install
	Redwood Coast	General	Direct Install
SCG	Plug Load and Appliances	General	Kits: Direct Mail
	Plug Load and Appliances - POS	General	Point of Sale Rebates
	Community Language Energy Outreach (CLEO)	Non-English Speaking	Event Give-Away
	Multifamily Direct Therm Savings	Multifamily	Direct Install
	LivingWise	General	Kits: School Distribution
	Manufactured & Mobile Homes	Manufactured Homes	Direct Install
SDG&E	Home Energy Efficiency Rebates (HEER)	General	Kits: Direct Mail
	Multifamily Energy Efficiency Rebates (MFEER)	Multifamily	Direct Install
	Middle Income Direct Install (MIDI)	Income Qualified	Direct Install
	Comprehensive Manufactured-Mobile Homes	Manufactured Homes	Direct Install

All of the programs listed in Table 6 provided showerheads to participants and all, with the exception of SCG's Point of Sale (POS) rebates, provided bathroom faucet aerators. In total, these programs provided more than 1.2 million bathroom-faucet aerators and 750,000 showerheads (Table 7). PG&E did not distribute kitchen faucet aerators through any of its program offerings, nor did SCG's POS program. The remaining programs distributed more than 600,000 kitchen faucet aerators. Five programs offered and distributed approximately 3,000 thermostatic shower

valves (TSV).[5]. In total, approximately 650,000 households received water saving fixtures in PY 2018.

Table 7: Water Fixture Fixtures Distributed in PY 2018

Fixture Category	Households Receiving	Units Distributed
Showerheads	645,493	754,462
Bathroom Faucet Aerators	638,235	1,268,319
Kitchen Faucet Aerators	635,062	635,295
TSVs	2,607	2,932
Total	**647,990[a]**	**2,661,007**

[a] Fixture category-level household counts do not sum to total as individual households received multiple fixtures.

1.2 Research Objectives

This research addressed three key research objectives:

- Determine installation rates of water fixture categories (an installation rate is the proportion of water-saving fixtures programs provided that are installed in participants' homes);
- Assess program attribution for water fixture installations (free ridership);
- Examine household or demographic factors that may impact hot water usage.

These objectives serve as inputs to the assessment of the energy savings impacts associated with the water fixtures PAs distributed in 2018.

1.3 Program Types Covered

For the purpose of this evaluation, Apex Analytics grouped the programs listed in Table 8 into four program delivery approaches. Table 8 lists the programs included in each grouping and shows the data sources drawn on for each. This report draws on findings from a program participant survey (households that received water fixtures from California PAs in PY 2018) and owners and managers of multifamily buildings that received fixtures.

[5] PG&E's Residential Energy Fitness and Redwood Coast programs, and SCG's POS rebates, CLEO, and Manufactured and Mobile Homes programs.

Table 8: 2018 Programs Included in Survey Outreach

Program Delivery Type	Programs Included		Data Sources	
			Household Survey	Property Manager/ Owner Survey
Direct Mail	SCE	Plug Load and Appliances	✓	
	SDG&E	HEER	✓	
Multifamily Direct Install	MCE	Multifamily Comprehensive		✓*
	SCG	Multifamily Direct Therm Savings	✓	✓
	SDG&E	MFEER		✓
Manufactured Home Direct Install	PG&E	Direct Install for Manufactured and Mobile Homes	✓	✓
	SCG	Manufactured and Mobile Homes	✓	✓
	SDG&E	Comprehensive Manufactured-Mobile Homes	✓	✓
General Direct Install	PG&E	Residential Energy Fitness Program	✓	
		Redwood Coast	✓*	
	SDG&E	MIDI	✓	
Other	SCG	Community Language Energy Outreach	✓*	
		Plug Load and Appliances - POS		
		LivingWise		

* Participant populations were small, and no participants ultimately responded to the survey invitation.

Apex Analytics could not include two programs in the survey due to the lack of end-user and/or property manager contact information collection for those programs. These included the point-of-sale rebate program and LivingWise, which distributed kits to students participating in school-based energy education programs.

1.4 Report Organization

The remainder of this report begins with a summary of the methodology used to gather data for this research, followed by presentation of findings related to each research objective. The report closes with conclusions and recommendations.

2. Methodology

This research draws on two primary data collection activities: surveys of households as well as multifamily property owners and managers who received water fixtures. This section describes the approach used to gather data for each effort.

2.1 Household Survey

The household survey captured the perspective of end-users that received water fixtures. For most program types, these end-user households were the primary decision-makers regarding fixture installation. Apex Analytics administered the household survey as an online survey with email invitations. Online surveys allow researchers to reach a large number of respondents relatively quickly and at relatively low cost. These benefits were important for this study, which sought broad representation of households that received water-saving fixtures.

A key disadvantage of online surveys is the potential that they will fail to capture households or individuals without easy access to the internet and thus may provide a biased sample. Apex Analytics took a variety of steps to increase the representativeness of the household survey sample. Apex randomly selected households within each program delivery approach and PA strata to receive survey invitations. Apex contacted each selected household multiple times to invite them to take the survey. Apex ultimately sent multiple invitations to a total of 12,896 households. As discussed in Section 5, our overall household survey sample closely parallels California's population in key household and demographic factors, including tenure (own/rent), distribution of dwelling types (single family/multifamily, etc.), household size, and water heater fuel. Analysis of respondent demographics did not indicate a systematic bias in survey response.

Anticipating that the decision to install water fixtures would be different between participants receiving those fixtures in direct install programs and those receiving them in mailed kits, Apex Analytics sought to ensure that survey findings would represent all program delivery approaches. Apex developed sampling targets to ensure survey respondents would adequately represent the range of PAs and program types that distributed water-saving fixtures in 2018. Apex ultimately surveyed 283 households that had received water fixtures in PY 2018. Table 9 shows the population of households receiving fixtures, Apex's sampling targets, and the ultimate sample achieved for each PA and delivery approach.

Table 9: Household Survey Sample by PA and Delivery Approach

Delivery Approach	PG&E			SCG			SDG&E			Total*		
	Pop.	Target	Sample	Pop.	Target	Sample	Pop.	Target	Sample	Pop.	Target	Sample
Direct Mail	0	0	0	500,848	50	69	21,173	20	26	522,021	70	95
Multifamily Direct Install	0	0	0	12,204	70	41	3,005	Contact data not available		15,209	70	41
Manufactured Home Direct Install	3,012	30	14	3,408	35	35	572	5	1	6,992	70	50
General Direct Install**	3,472	70	92	0	0	0	158	10	5	3,630	80	97
Total* **	**6,484**	**100**	**106**	**516,460**	**155**	**145**	**24,908**	**35**	**32**	**547,852**	**290**	**283**

* Participant data for MCE were only available at the property manager level. MCE was not included in the household survey.

** Includes income qualified (middle income)

*** Household data were not available for programs providing point-of-sale rebates or school kit distribution.

Overall, this sample is sufficient to provide greater than 90% confidence with 10% precision for direct mail and general direct install program totals, and for PG&E and SCG totals. The sample provides greater than 90% confidence with 15% precision for all PA and delivery approach totals. Precision is lower when examining specific delivery approaches for specific PAs; as a result, this evaluation reports aggregate findings by delivery approach and PA.

This respondent distribution underrepresents program participants receiving fixtures through direct mail programs (Table 10). Direct mail programs represent such a dominant share of the water fixtures distributed that a proportionate sample would not have allowed for meaningful representation of other program delivery approaches without significantly increasing sample sizes. Section 2.3 discusses Apex's approach to weighting findings across program delivery approaches.

Table 10: Distribution of Fixtures Provided by Delivery Approach and IOU in Program Data and Household Survey Sample

Delivery Approach	PG&E		SCG		SDG&E		Total*	
	Pop.	Sample	Pop.	Sample	Pop.	Sample	Pop.	Sample
Direct Mail	0%	0%	97%	48%	85%	81%	95%	34%
Multifamily Direct Install	0%	0%	2%	28%	12%		3%	14%
Manufactured Home Direct Install	46%	13%	1%	24%	2%	3%	1%	18%
General Direct Install**	54%	87%	0%	0%	1%	16%	1%	34%
Total* **	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

While Apex Analytics did not explicitly stratify the sample by fixtures received, Apex monitored data collection to ensure the sample sufficiently represented each fixture category. Table 11 summarizes the distribution of household survey respondents by the types of water fixtures they received.

Table 11: Household Survey Sample by Fixtures Received

Fixture Category	PG&E		SCG		SDG&E		Total*	
	Pop.	Sample	Pop.**	Sample	Pop.	Sample	Pop.	Sample
Showerheads	5,896	99	521,575	87	24,207	21	551,678	207
Bathroom Faucet Aerators	2,231	17	1,020,009	63	22,782	15	1,045,022	95
Kitchen Faucet Aerators	0	0	511,265	51	23,858	18	535,123	69
TSVs	2,573	63	34	0	0	0	2,607	63

* Participant data for MCE were only available at the property manager level. MCE was not included in the household survey.

** Household data were not available for programs providing point-of-sale rebates or school kit distribution.

The household survey sample better reflected the distribution of fixtures provided by PA and fixture type than the distribution by PA and delivery approach (Table 12).

Table 12: Distribution of Fixtures Provided by Type and PA in Program Data and Household Survey Sample

Fixture Category	PG&E		SCG		SDG&E		Total*	
	Pop.	Sample	Pop.**	Sample	Pop.	Sample	Pop.	Sample
Showerheads	55%	55%	25%	43%	34%	39%	26%	48%
Bathroom faucet aerators	21%	9%	50%	31%	32%	28%	49%	22%
Kitchen faucet aerators	0%	0%	25%	25%	34%	33%	25%	16%
TSVs	24%	35%	0%	0%	0%	0%	0%	15%

Apex gathered survey data between December 5, 2019 and January 15, 2020. As Table 13 indicates, response rates varied by fixture delivery approach, ranging from 7% for manufactured home direct install to 1% for multifamily direct install.[6] Overall, the household survey achieved a response rate of 3%. While the timing of survey fielding (over the December holidays) may have depressed the survey response, these response rates are in line with Apex staff members' experience with general population web surveys and web surveys focused on relatively low-engagement measures.

[6] In many cases, property managers and owners, rather than households, were the primary installation decision-makers in multifamily direct install programs.

Table 13: Household Survey Response Rates

Program Delivery Approach	PG&E	SCG	SD&GE	Total
Direct Mail	NA	2%	5%	2%
Multifamily Direct Install	NA	1%	NA	1%
Manufactured Home Direct Install	5%	8%	4%	7%
General Direct Install	6%	NA	4%	6%
Total	**6%**	**2%**	**5%**	**3%**

2.2 Property Manager and Owner Survey

Property owners and managers may be involved in water fixture installation decisions, particularly in programs targeting manufactured homes and multifamily buildings. In some cases, the property manager is the primary decision-maker on fixture installation, while in others the property manager's role is limited to providing access to the property where individual households ultimately decide on installation.

Apex Analytics conducted a web and phone survey of property managers and owners. This approach leveraged the expediency of online surveys for respondents able and willing to take the survey online. However, given the smaller target population and the challenges prior evaluation efforts have encountered in reaching property owners and managers, Apex supplemented the email survey invitations with phone outreach, inviting respondents to complete the survey by phone.

Apex Analytics sent survey invitations to all 464 property owners and managers for whom email addresses were available.[7] These contacts received multiple emails encouraging them to take the survey. Apex offered property owners and managers a $20 electronic gift card as an incentive for completing the survey. Following the email outreach, Apex Analytics called 58 property owners and managers who did not respond to the email survey invitation, or for whom an email address was not available, seeking to complete the survey over the phone.[8] Ultimately, 20 property managers completed the survey online, while 3 completed it by phone. Table 14 summarizes the distribution of property managers and owners by delivery approach and PA.

[7] Apex identified a total of 663 property owner and manager organizations in PA tracking data. Email addresses were available for 464 (70%) of these organizations.

[8] Apex prioritized property managers and owners participating in multifamily direct installation programs in this follow-up as preliminary survey findings suggested they played a more extensive role in water fixture installation decisions than property managers and owners participating in manufactured home direct installation programs. Property manager phone numbers were not available for PG&E Manufactured Home Direct Install participants, and they were not included in phone follow-up.

Table 14: Property Manager and Owner Survey Sample

Delivery Approach	PA	Organizations		Units Managed	
		Pop.	Sample	Pop.	Sample
Multifamily Direct Install	MCE	5	0	316	0
	SCG	182	11	12,398	703
	SDG&E	11	2	2,839	798
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	SDG&E	119	10	339	17
	Total	*254*	*10*	*2,603*	*17*
Total		**464**	**23**	**18,156**	**1,518**

The sample of 23 property owners and managers is sufficient for 85% confidence with 15% precision. However, as each property manager is responsible for multiple dwelling units, this sample represents a larger number of participating households. In total, the 23 surveyed property managers and owners were responsible for 1,518 units. Taken as a sample of housing units, rather than individual respondents, this sample exceeds 90% confidence with 10% precision. Table 15 summarizes the response rate for the property owner and manager survey.

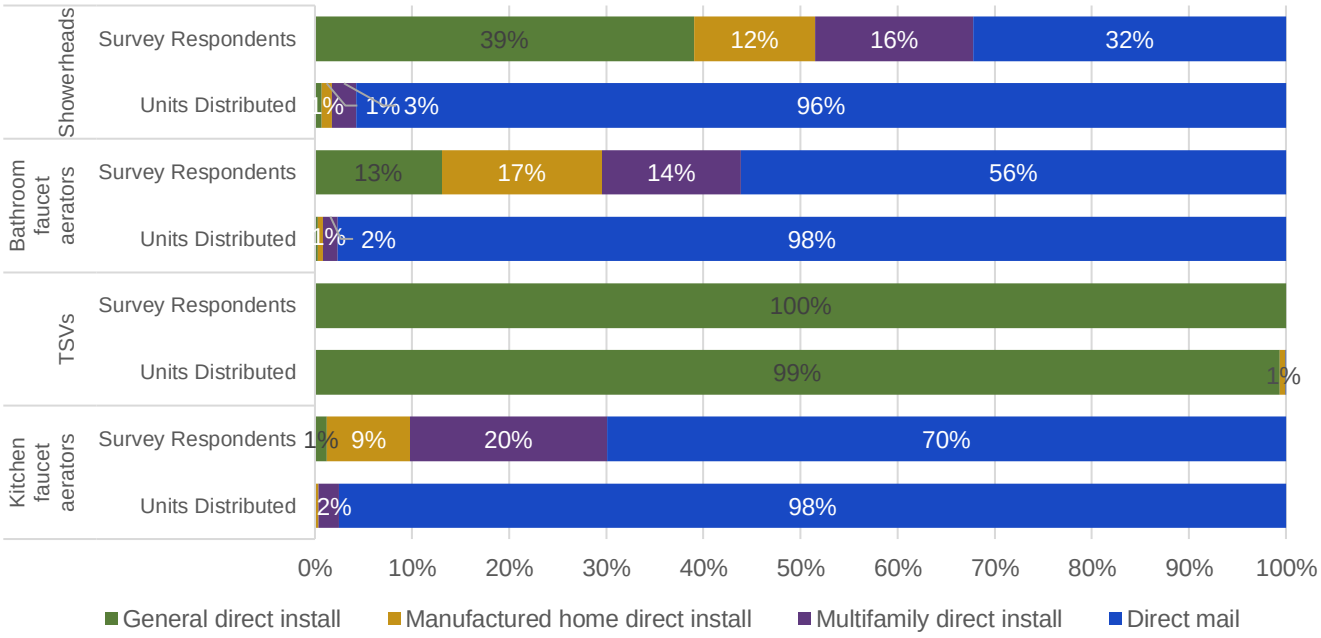
Table 15: Property Manager and Owner Survey Response Rate

Delivery Approach	MCE	PG&E	SCG	SD&GE	Total
Multifamily Direct Install	0	N/A	9%	22%	9%
Manufactured Home Direct Install	N/A	2%	0%	10%	5%
Total	**0**	**2%**	**7%**	**11%**	**7%**

2.3 Analysis Considerations and Weighting

Participants in general direct install programs and in manufactured home direct install programs responded to the survey invitation at a higher rate than participants who received kits through direct mail. Survey targets also overrepresented these participants to ensure the survey provided sufficient data on each delivery approach. As a result, household survey data overrepresent participants in general residential and manufactured home direct install programs and underrepresent participants in direct mail programs (Figure 2).

Figure 2: Share of Fixtures Distributed by Program Type in Household Survey Sample Relative to Tracking Data



Apex Analytics combined data from the building owner and manager survey with data from the household survey in calculating free ridership. Building owners and managers are primarily responsible for installation decisions in multifamily direct install programs. As a result, Apex based the free ridership estimate for multifamily direct install programs on data from the building owner and manager survey. In aggregating free ridership findings across program delivery types, Apex weighted by the number of units of each fixture type distributed through each program delivery type.

Apex Analytics initially assessed survey findings by program delivery approach. To calculate totals across delivery approaches, Apex weighted the delivery approach-level findings by the number of fixtures distributed through that delivery approach. Table 16 lists the total fixture quantities Apex used in these calculations. Apex used a similar approach to calculate values at the PA-level, weighting each delivery-approach level finding by the number of fixtures a given PA distributed using that approach. The totals used for these calculations are included in Appendix A.

Table 16: Fixture Totals Used in Weighting

Fixture Type	Manufactured Home Direct Install	Multifamily Direct Install	General Direct Install	Direct Mail	Total
Showerheads	8,423	19,962	5,557	774,508	808,450
Bathroom faucet aerators	6,047	16,190	2,976	1,055,476	1,077,713
Kitchen faucet aerators	1,912	11,298	51	527,738	800,880

3. Installation Rates

Not all of the water-saving fixtures programs provided to California households in PY 2018 were installed, and some that were installed were subsequently removed. An installation rate is the proportion of water-saving fixtures programs provided that are installed in participants' homes.

3.1 Installation Rate Approach

A notable proportion of household survey respondents reported they either did not receive one or more of the water fixture fixtures indicated in the PAs' program databases or reported they were not aware if they received the fixtures (Table 17).

Table 17: Awareness of Fixtures Received

Fixture Category	Proportion of Respondents Reporting Fixtures Not Received or Don't Know				
	Manufactured Home Direct Install	Multifamily Direct Install	General Direct Install	Direct Mail	Total
Showerheads	10%	50%	8%	36%	26%
Bathroom Faucet Aerators	19%	63%	17%	54%	46%
TSVs	No survey respondents received	Not distributed	25%	Not distributed	25%
Kitchen Faucet Aerators	14%	58%	0%	54%	50%

Apex Analytics treated these unaware respondents differently according to the type of program from which they received fixtures. Participants in direct install programs may not have been aware of all the fixtures the program technician installed. This is particularly true for participants in multifamily direct install programs, in which the property manager or owner was the primary decision-maker. As a result, Apex removed direct install program participants who reported they had not received a

fixture or were unaware if they received it from calculations of installation rates and free ridership for that fixture.

Direct mail programs require participants, as recipients, to actually install the fixture(s), compared to direct install programs. Thus, direct mail participants are likely to have greater awareness of the fixtures installed in their homes. In this analysis, Apex considered direct mail participants who reported they had not received fixtures or were unaware if they received them as not having installed the fixtures. It is plausible that kit recipients may not have been aware they received a kit or may not have known what one or more of the fixtures the kit contained were. In either case, however, it is unlikely the participant installed the fixtures.

3.2 Findings: Installation Rates

Consistent with direct install programs' approach of sending technicians to install fixtures in participants' homes, almost all respondents who received water fixture through direct install programs reported the fixtures they received had been installed at one time (Table 18). In contrast, majorities of respondents who received each type of fixture through direct mail programs, which rely on participants to install the fixtures on their own, reported the fixtures had never been installed.

Table 18: Proportion of Fixtures Installed at Any Time by Delivery Approach

Fixture Category	Manufactured Home Direct Install	Multifamily Direct Install*	General Direct Install**	Direct Mail	Total***
Showerheads	91%	100%	93%	37%	41%
Bathroom Faucet Aerators	97%	100%	96%	29%	30%
TSVs	No Survey Respondents Received	Not Distributed	97%	Not Distributed	97%
Kitchen Faucet Aerators	98%	100%	100%	27%	29%

* Based on property manager and owner survey data
**Includes income qualified (moderate income).
** Totals weighted by total number of units provided through each program delivery approach.

Installation rates varied somewhat by PA (Table 19). These differences reflect the mix of program delivery approaches used by each PA. PG&E, which did not distribute water fixtures by direct mail, had the highest installation rate for each fixture type offered by its programs.

Table 19: Proportion of Fixtures Installed at Any Time by PA

Fixture Category	PG&E	SCG	SDG&E	Total
Showerheads	92%	38%	77%	41%
Bathroom Faucet Aerators	98%	29%	57%	30%
TSVs	97%	No Survey Respondents Received	Not Distributed	97%
Kitchen Faucet Aerators	Not Distributed	27%	67%	29%
Proportion of Participants Receiving Fixtures Through Direct Mail	0	97%	85%	95%

Across program types, few respondents reported removing fixtures that had previously been installed (Table 20). The proportions of previously installed fixtures removed were relatively consistent across fixture types and delivery approaches. The majority of the differences in installation rates reflect fixtures that were never installed.

Table 20: Proportion of Fixtures Removed by Delivery Approach

Fixture Category	Manufactured Home Direct Install	Multifamily Direct Install*	General Direct Install**	Direct Mail	Total***
Showerheads	3%	2%	4%	2%	2%
Bathroom Faucet Aerators	6%	6%	6%	2%	2%
TSVs	No Survey Respondents Received	Not Distributed	4%	Not Distributed	4%
Kitchen Faucet Aerators	8%	11%	0%	2%	2%

* Based on property manager and owner survey data
**Includes income qualified (moderate income).
** Totals weighted by total number of units provided through each program delivery approach.

Table 21 shows the proportion of fixtures respondents reported removing after either a program technician (for direct install programs) or the customer themselves (for direct mail programs) installed them. As with program delivery

approaches, differences in removal of installed fixtures between PAs were relatively small.

Table 21: Proportion of Fixtures Removed by PA

Fixture Category	PG&E	SCG	SDG&E	Total
Showerheads	4%	2%	7%	2%
Bathroom Faucet Aerators	8%	2%	0%	2%
TSVs	4%	No Survey Respondents Received	Not Distributed	4%
Kitchen Faucet Aerators	Not Distributed	2%	0%	2%

Table 22 shows the proportion of fixtures survey respondents indicated were installed at the time of the survey (the proportion installed at any time less the proportion removed), by program delivery approach.

Table 22: Proportion of Fixtures Installed at Time of Survey, by Delivery Approach

Fixture Category	Manufactured Home Direct Install	Multifamily Direct Install*	General Direct Install**	Direct Mail	Total***
Showerheads	89%	98%	89%	35%	39%
Bathroom Faucet Aerators	91%	94%	91%	26%	28%
TSVs	No Survey Respondents Received	Not Distributed	93%	Not Distributed	93%
Kitchen Faucet Aerators	90%	89%	100%	25%	27%

* Based on property manager and owner survey data
**Includes income qualified (moderate income).
** Totals weighted by total number of units provided through each program delivery approach.

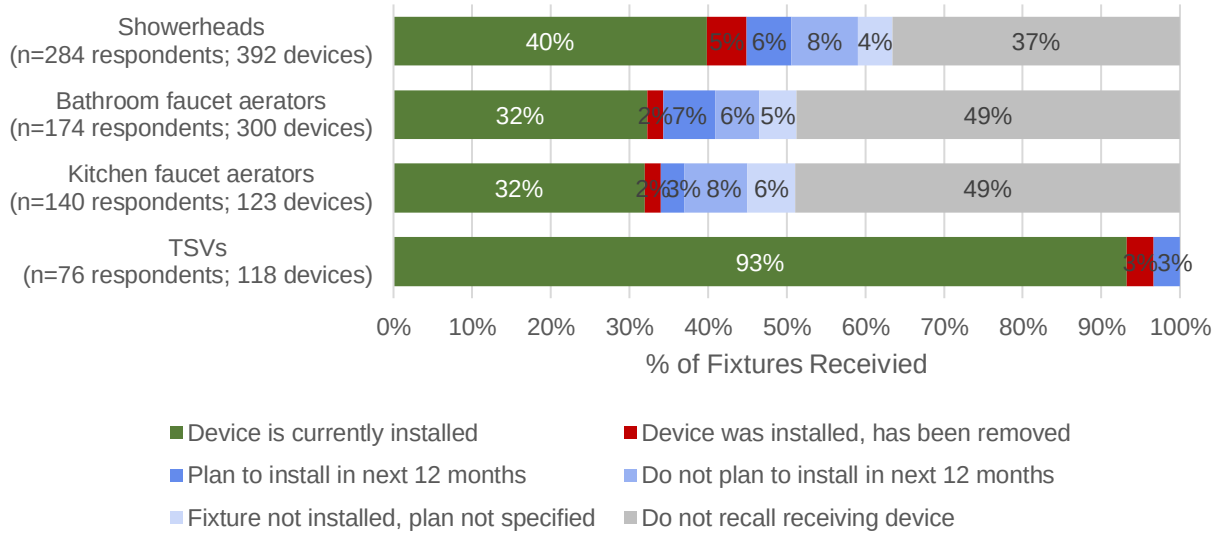
Table 23 shows the proportion of fixtures installed at the time of the survey by PA.

Table 23: Proportion of Fixtures Installed at Time of Survey, by PA

Fixture Category	PG&E	SCG	SDG&E	Total
Showerheads	88%	36%	70%	39%
Bathroom Faucet Aerators	89%	26%	57%	28%
TSVs	93%	No Survey Respondents Received	Not Distributed	93%
Kitchen Faucet Aerators	Not Distributed	25%	67%	27%

Notable proportions of survey respondents who received direct mail kits were not aware they received one or more of the water fixtures provided by the programs (Figure 3).[9] This was particularly true for faucet aerator fixtures. Few respondents who were aware of receiving fixtures reported choosing not to install them, and still fewer reported removing fixtures that had previously been installed.

Figure 3: Installation Status of Water Fixtures Received*

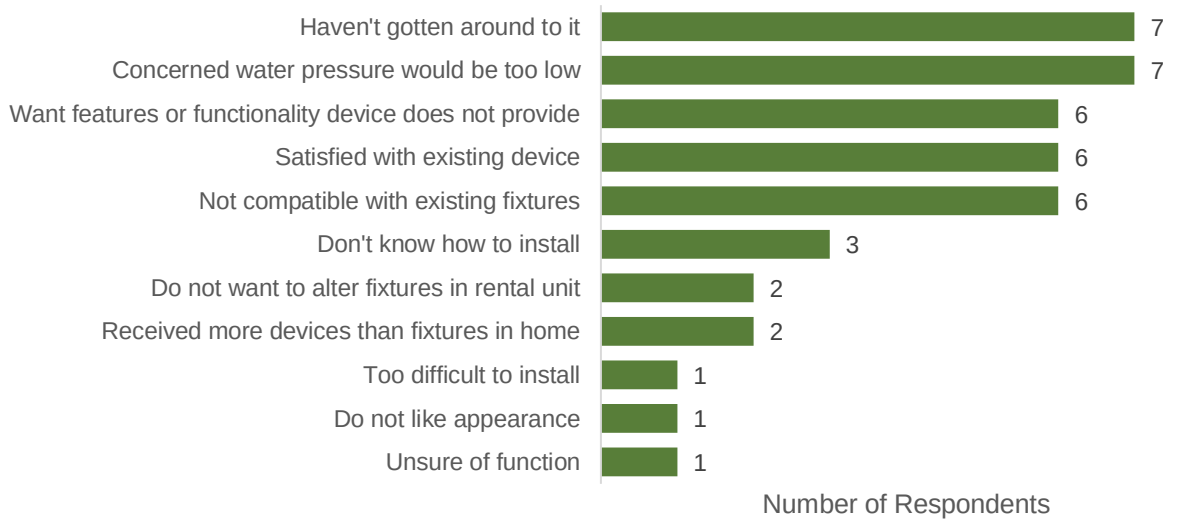


* Does not include multifamily direct install programs

[9] See section 3.1for a detailed discussion of how these respondents were treated in the analysis.

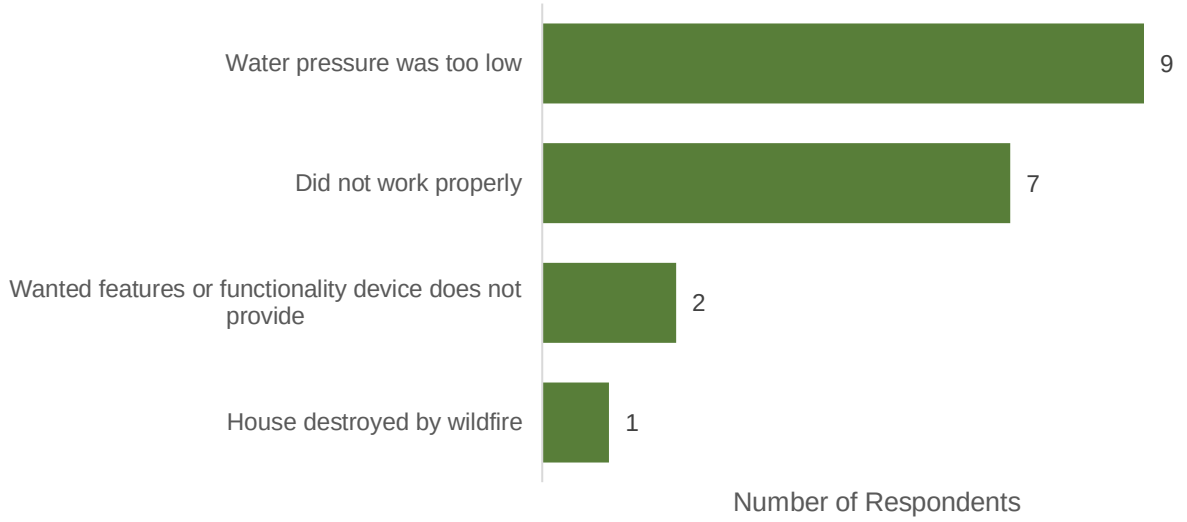
Households that chose not to install fixtures they received cited a range of reasons for not doing so (Figure 4). The most commonly-cited reasons reflect a lack of motivation to install the fixtures (respondents "had not gotten around to it" or were satisfied with their existing fixtures), or concerns about the fixtures' performance or functionality (water pressure would be too low or fixture does not have desired features). Few households saw the difficulty of installation as a barrier.

Figure 4: Reasons Given for Not Installing Fixture (n=49, multiple responses allowed)



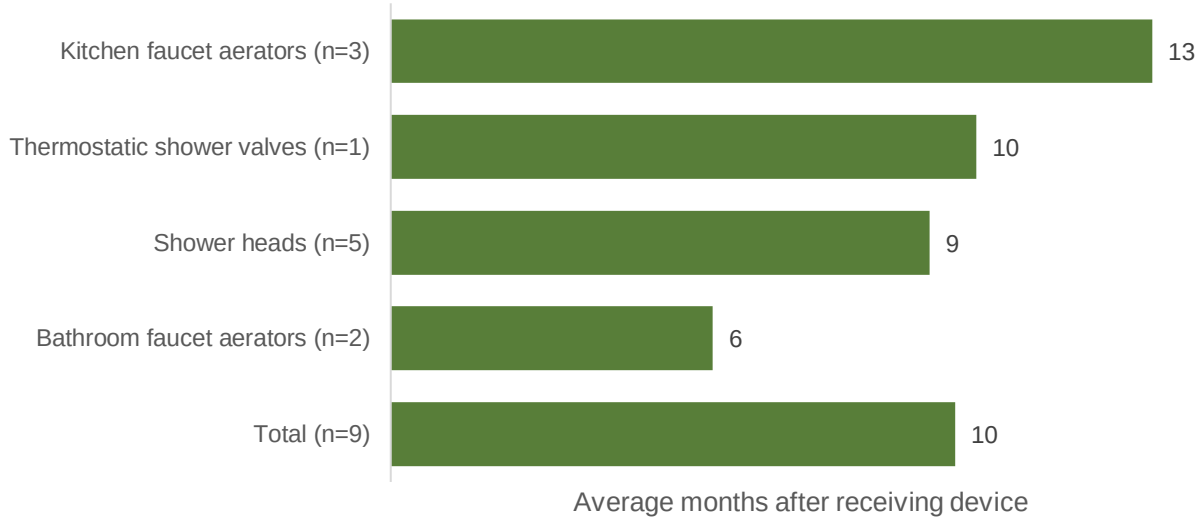
Relatively few households reported removing water fixtures that had been installed; as noted above, participants had never installed most of the water fixtures PAs distributed that were not installed at the time of the survey. The most common reasons surveyed households gave for removing water fixture that had previously been installed reflected dissatisfaction with the fixtures' performance. Most often, respondents reported that the water pressure was too low or the fixture did not work properly (Figure 5).

Figure 5: Reasons Given for Removing Installed Fixture (n=17, multiple responses allowed)



On average, household survey respondents who removed waters saving fixtures reported doing so approximately 10 months after receiving the fixtures (Figure 6). Respondents who had removed bathroom faucet aerators reported leaving the fixtures installed the shortest amount of time, on average.

Figure 6: Average Timing of Installed Fixture Removal (Months After Receiving Fixture)



4. Net-to-Gross

A net-to-gross ratio assesses the extent to which program efforts have influenced a market. It includes consideration of installations that would have occurred absent program efforts (free ridership) as well as installations motivated by the program

that did not receive direct program support. This section begins with a discussion of the approach used to assess net-to-gross inputs, followed by a summary of findings related to free ridership. California's net-to-gross protocols include a pre-determined adder for market effects at the portfolio level. As a result, Apex Analytics assessed qualitative indicators of spillover but did not calculate a spillover value.

4.1 Net-to-Gross Approach

Apex Analytics worked closely with other evaluation efforts to ensure the question battery and analysis approach used to assess net-to-gross would be consistent with the approaches used for other residential fixtures. Apex's assessment of free ridership draws on three metrics: quantity, timing, and efficiency, as summarized in Table 24.[10] Both the household and property manager surveys asked respondents to address these items for each fixture type they received.

[10] Free-ridership assesses the likelihood that a respondent would have installed similarly efficient fixtures in a similar timeframe absent program intervention.

Table 24: Free Ridership Elements

Metric	Question Wording	Response Options	Free Ridership Scoring
Quantity	If you had not received them from [Program], how likely is it that you would have purchased one or more of the following fixtures for your home?	Very likely	100%
		Somewhat likely	75%
		Neither likely nor unlikely	50%
		Somewhat unlikely	25%
		Very unlikely	0
Timing	If the [Program] had not provided you with them in [Month, Year], when would you have purchased each of the following fixtures?	At the same time or sooner	100%
		1 to 24 months later	(24 - # of months)/24
		More than 24 months later	0
		Never	0
		Don't know	100%
Efficiency	Water fixtures are available in a variety of flow rates. The fixtures you received from the [Program] save water and energy by reducing flow rates. If you had not received those fixtures, would the fixtures you purchased have had…	A higher flow rate	0
		The same flow rate	100%
		A lower flow rate	100%

Using these metrics in combination allows the study to more fully assess the amount of savings that could be attributed to fixtures that participants would have installed absent program support. Apex assigned each respondent a score for each free ridership metric based on their survey responses, and combined those scores into an overall free ridership score using the algorithm in Equation 1.

Equation 1: Free ridership Scoring Algorithm

$$Free\ Ridership = FRq * FRt * FRe$$

Apex Analytics calculated a free ridership score for each program-provided fixture installed in survey respondents' homes. Apex did not include fixtures participants reported were not installed in free ridership calculations. Overall free ridership estimates represent an average of these individual scores, weighted to reflect the proportion of fixtures distributed through the program type in which the respondent participated.[11]

[11] Section 3.3 provides a more detailed description of this study's weighting approach.

Spillover, which includes any energy saving fixtures installed or actions taken as a result of the program that did not receive direct program support, can be difficult to quantify. California accounts for spillover by applying a pre-determined adder to energy savings estimates. As a result, while this report qualitatively assessed actions taken outside of PA programs, and found a limited amount of activity, it does not provide a quantitative spillover estimate.

This study's free ridership estimates include only participants who reported the fixtures they received were installed, as the installation rate captures participants who did not install or removed their fixtures. As a result, free ridership findings are based on a subset of the survey sample (Table 25).

Table 25: Survey Sample Size Providing Free Ridership Estimates

Fixture Type	Manufactured Home Direct Install	Multifamily Direct Install[a]	General Direct Install	Direct Mail	Total
Showerheads	30	1,400	85	39	1,554
Bathroom faucet aerators	18	300	14	30	362
Kitchen faucet aerators	9	1,400	2[b]	29	1,440
TSVs	0	0	61	0	61

[a] Total number of dwelling units represented by survey respondents
[b] Given the small number of respondents, this evaluation does not provide a free ridership estimate for kitchen faucet aerators distributed through general direct install programs.

4.2 Findings: Free Ridership

As described in Section 4.1, free ridership assesses the proportion of program participants likely to have installed similarly efficient equipment in the absence of the program. A net-to-gross ratio presents the proportion of program participants who install the equipment as a result of program influence.[12] For example, a finding of 17% free ridership implies that 83% of participants installed a fixture as a result of the program. Table 26 presents net-to-gross findings by fixture category and program delivery approach. Net-to-gross values were generally lower for direct mail programs than they were for direct install programs, although multifamily property managers and building owners also reported relatively high free ridership, and thus low net-to-gross, values. Multifamily building owners and managers make decisions in a more complex environment than households, and while Apex adapted the free ridership battery for building owners and managers, it may not have fully captured this complexity. For example, in open-ended responses, individual respondents cited considerations including drought-related water restrictions and municipal energy and water benchmarking ordinances.

[12] Net-to-gross ratios frequently include estimates of both free-ridership and spillover; however, as this study does not develop spillover estimates, the figures reported here include only free-ridership.

Table 26: Net-to-Gross Ratio by Delivery Approach

Water Saving Fixture		Net-to-Gross Ratio				
		Manufactured Home Direct Install[1]	Multifamily Direct Install[2]	General Direct Install[1]	Direct Mail[1]	Total[3]
Shower-heads	**Estimate**	94%	76%	93%	83%	83%
	Margin of Error	15%	2%	9%	13%	7%
Bathroom faucet aerators	**Estimate**	96%	91%	98%	79%	79%
	Margin of Error	19%	5%	22%	15%	10%
TSVs	**Estimate**	Too few respondents	Not Provided	96%	Not Provided	96%
	Margin of Error			10%		10%
Kitchen faucet aerators	**Estimate**	95%	62%	Too few respondents	75%	75%
	Margin of Error	27%	2%		15%	13%

[1] Based on household survey responses
[2] Based on property manager and owner survey responses
[3] Totals weighted by total number of units provided through each program delivery approach as described in Section 2.3

Table 27 lists net-to-gross values by PA and fixture category. Differences in net-to-gross by PA reflect their respective program approaches. PG&E, which has higher net-to-gross values than SCG and SDG&E for all fixture categories, did not distribute fixtures by direct mail while SCG and SDG&E distributed most fixtures by direct mail.

Table 27: Net-to-Gross Ratio by PA

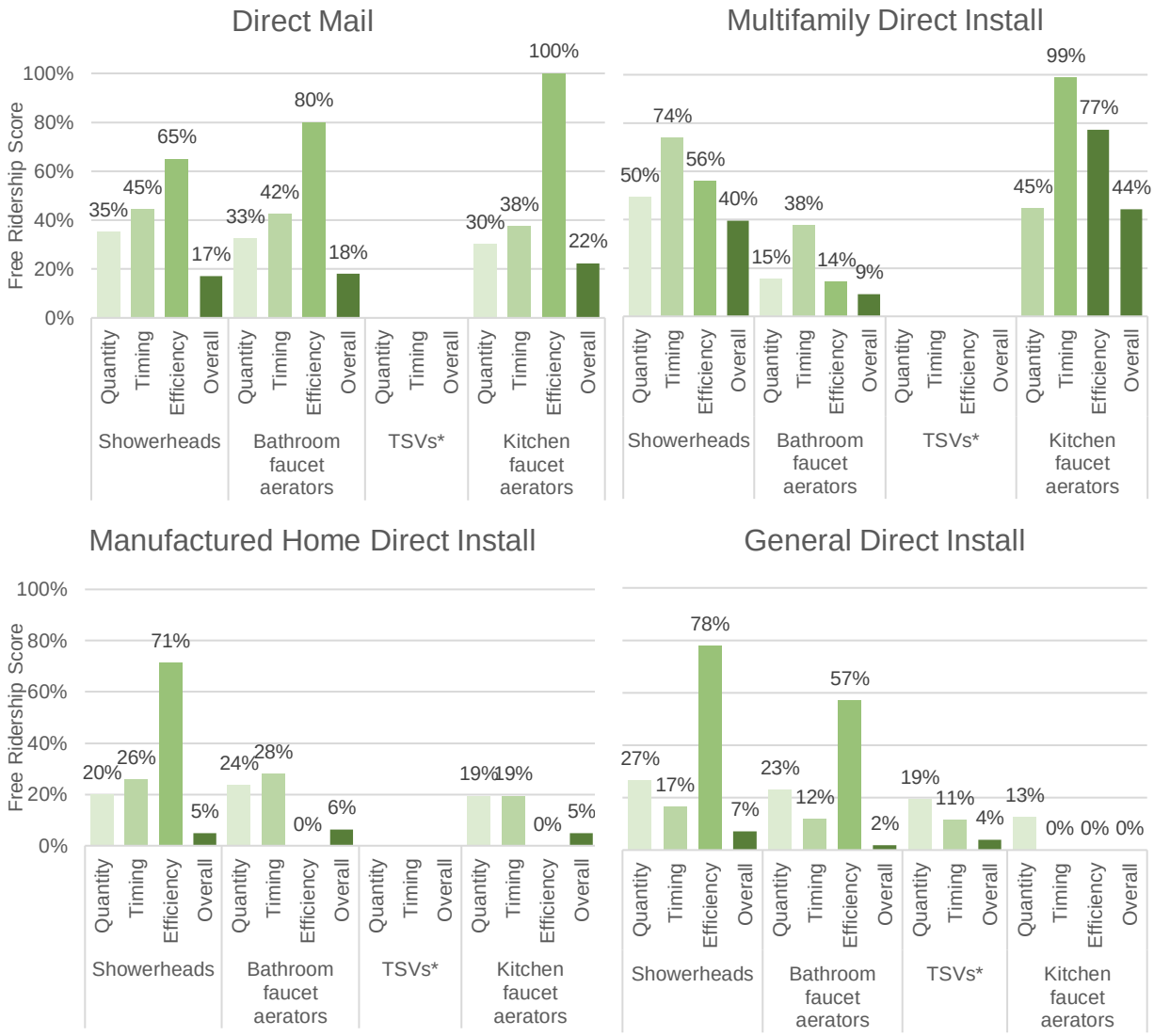
Fixture Type		PG&E	SCG	SDG&E	Total[1]
Showerheads	**Estimate**	94%	83%	80%	83%
	Margin of Error	8%	13%	20%	7%
Bathroom Faucet Aerators	**Estimate**	99%	78%	88%	79%
	Margin of Error	22%	13%	25%	10%
TSVs	**Estimate**	96%	Too few respondents	Not Provided	96%
	Margin of Error	10%			10%
Kitchen Faucet Aerators	**Estimate**	Not Provided	75%	79%	75%
	Margin of Error		15%	22%	13%

[1] Totals weighted by total number of units provided through each program delivery approach as described in section2.3.

Examining the components of free ridership individually suggests that, in general, programs increase the number of fixtures participants install and accelerate their

installation of those fixtures (Figure 7). Nonetheless, there was some variation between program types. Multifamily building owners and managers indicated they likely would have installed fixtures at the same time but may have chosen a less efficient option. Household survey respondents, in contrast, generally reported that any water fixtures they purchased outside a program would likely have a similarly low flow rate (and thus provide similar energy savings) to the ones they received.

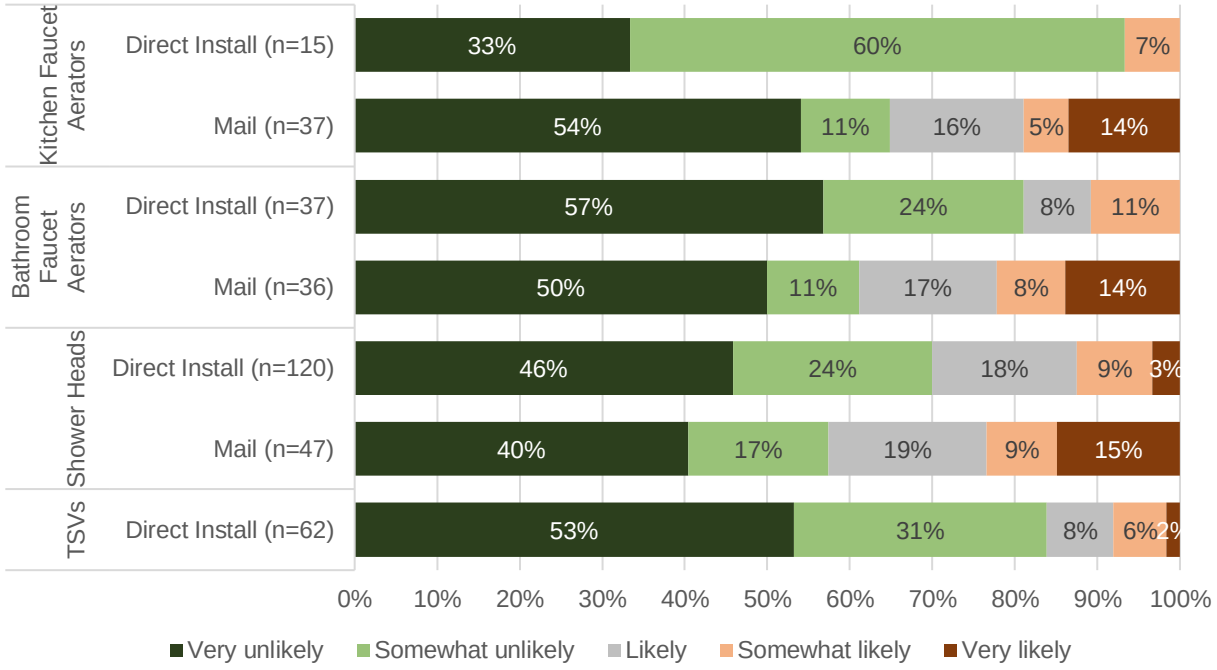
Figure 7: Free Ridership Components by Program Type



Most household survey respondents reported they were unlikely to have purchased water saving fixtures had they not received them from a program (Figure 8). For each fixture category, households who received the fixtures by mail were more likely to report they would have purchased the item had they not received it from the program than households who received the fixtures through direct install

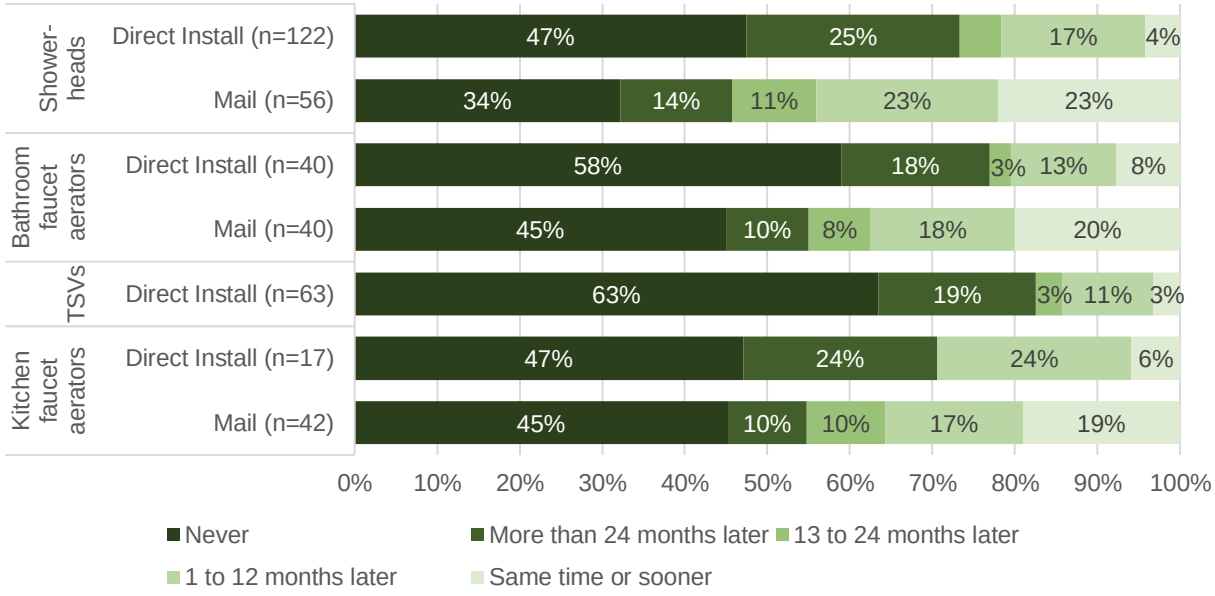
programs, although these differences were statistically significant (at a 90% confidence level) only for showerheads.

Figure 8: Likelihood of Purchasing Fixture Absent Program



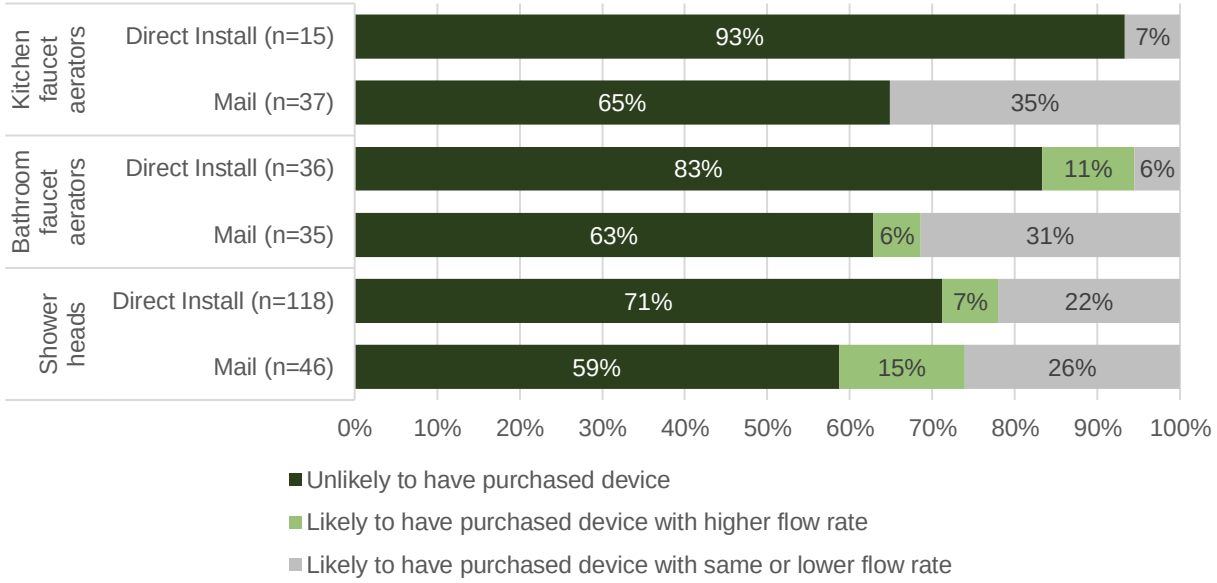
Consistent with household respondents' reports that they were unlikely to install the fixtures absent the program, most household survey respondents reported they never would have purchased the water saving fixtures they received or would have purchased them more than 24 months after they received them (Figure 9). Household respondents who received their fixtures through direct mail programs reported they would have purchased similar fixtures sooner than respondents who received fixtures through direct install programs. These differences were statistically significant for bathroom faucet aerators and showerheads at the 90% confidence level.

Figure 9: Timing of Purchase Absent Program



Few household survey respondents reported they would have purchased a water fixture with a higher flow rate had they not received the low-flow fixture through the program (Figure 10). Households more often reported they would not have purchased the fixture or would have purchased one with the same or lower flow rate. As with other metrics, households receiving fixtures through direct mail programs were more likely to report they would have purchased a similar fixture than those receiving fixtures through direct install programs.

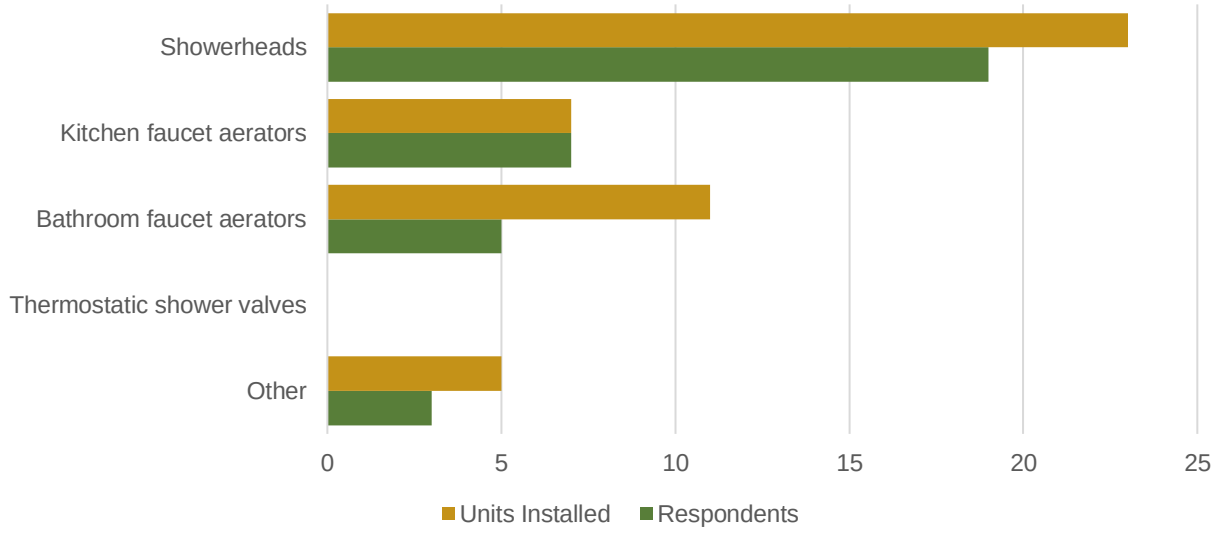
Figure 10: Efficiency of Likely Fixture Purchased Absent Program



4.3 Findings: Spillover

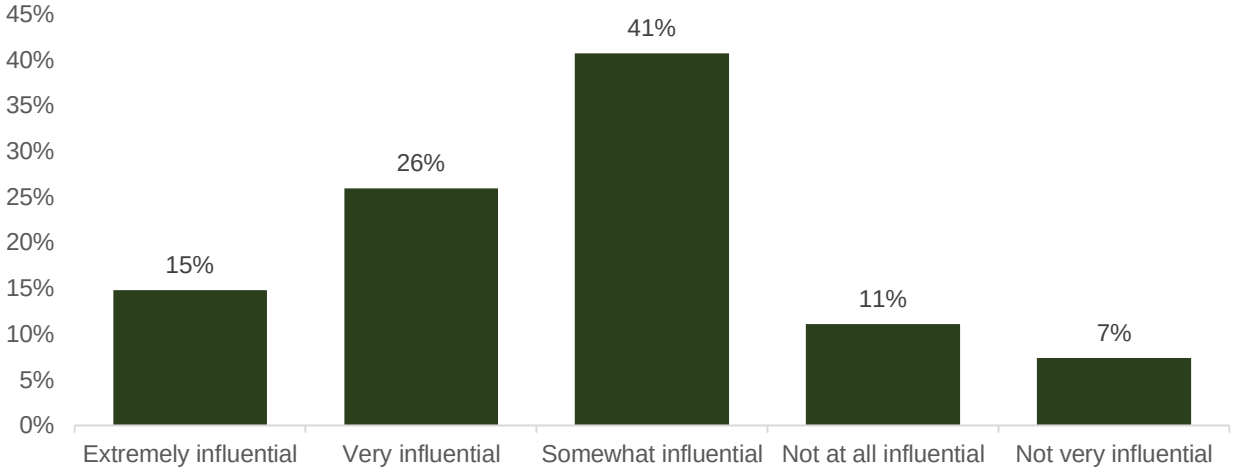
As noted above, this evaluation included a limited battery to qualitatively assess the extent to which programs are motivating participants to take action independently. Survey findings suggest that, while the programs are motivating participants to install additional fixtures, this effect is limited. For example, while 207 surveyed households reported receiving 357 showerheads from PA programs, 19 of those households reported installing 23 additional showerheads without program support (Figure 11).

Figure 11: Fixtures Installed Outside Program



Household survey respondents who installed water fixture fixtures outside of a program most often reported the program was somewhat influential in their installation decision (Figure 12). Fewer than half (41%) reported the program was very or extremely influential.

Figure 12: Influence of Program on Decision to Install Additional Fixtures (n=27)



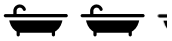
5. Findings: Factors Contributing to Water Usage

The household survey gathered data on factors likely to contribute to household water usage, and thus the energy savings potential of water saving fixtures. These factors included details of the residents of households receiving fixtures, their homes, and their water usage.

5.1 Home Characteristics

The number of bedrooms and bathrooms in participants' homes varied by dwelling type (Table 28). On average, participants living in multifamily buildings had the fewest bedrooms and bathrooms, while participants living in single family, detached homes had the most.

Table 28: Average Number of Bed- and Bathrooms by Dwelling Type

Dwelling Type	Average Bedrooms		Average Full Bathrooms		Average Half Bathrooms
Single family, detached		3.2		2.2	0.3
Manufactured home		2.3		1.9	0.2
Townhouse or row house		2.7		1.7	0.7
Apartment or condominium, 2-4 units		1.8		1.3	0.1
Apartment or condominium, ≥4 units		1.6		1.3	0.1
Total		2.6		1.9	0.3

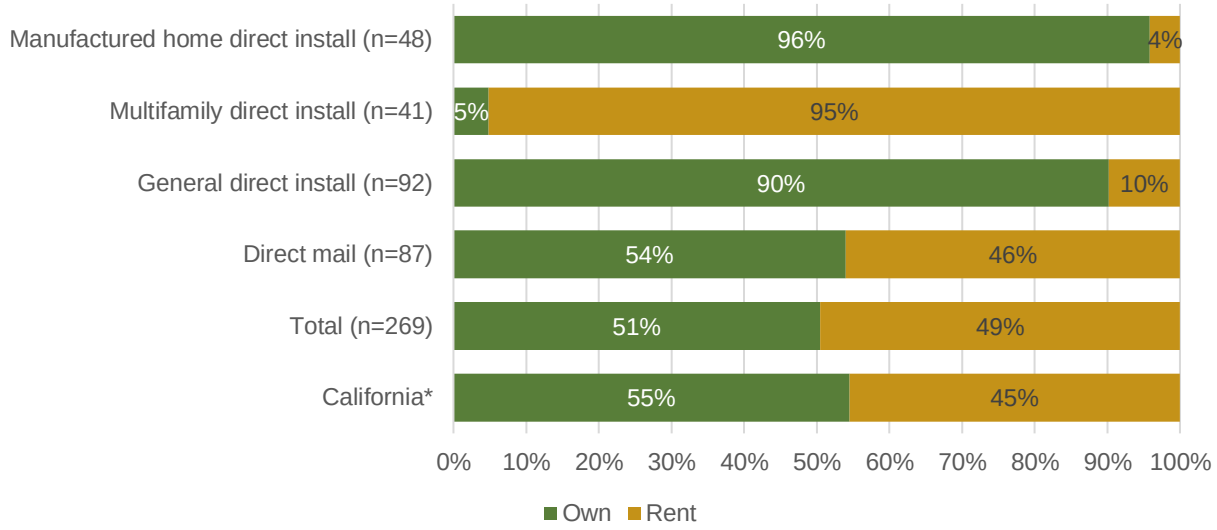
Corresponding to the number of bathrooms they reported, the numbers of showers and faucets household survey respondents reported in their homes also varied by dwelling type (Table 29).

Table 29: Average Number of Faucets and Showers by Dwelling Type

Dwelling Type	Average Kitchen Faucets		Average Bathroom Faucets		Average Showers	
Single family, detached		1.2		3.3		2.2
Manufactured home		1.1		2.5		1.9
Townhouse or row house		1.0		3.0		1.7
Apartment or condominium, 2-4 units		1.0		1.6		1.3
Apartment or condominium, ≥4 units		1.0		1.5		1.3
Total		1.1		2.6		1.9

Most surveyed participants in manufactured home direct install programs and general direct install programs reported owning their homes, while most multifamily direct install participants reported renting (Figure 13). The distribution of respondents that received water fixtures through direct mail programs was more reflective of California's population overall.

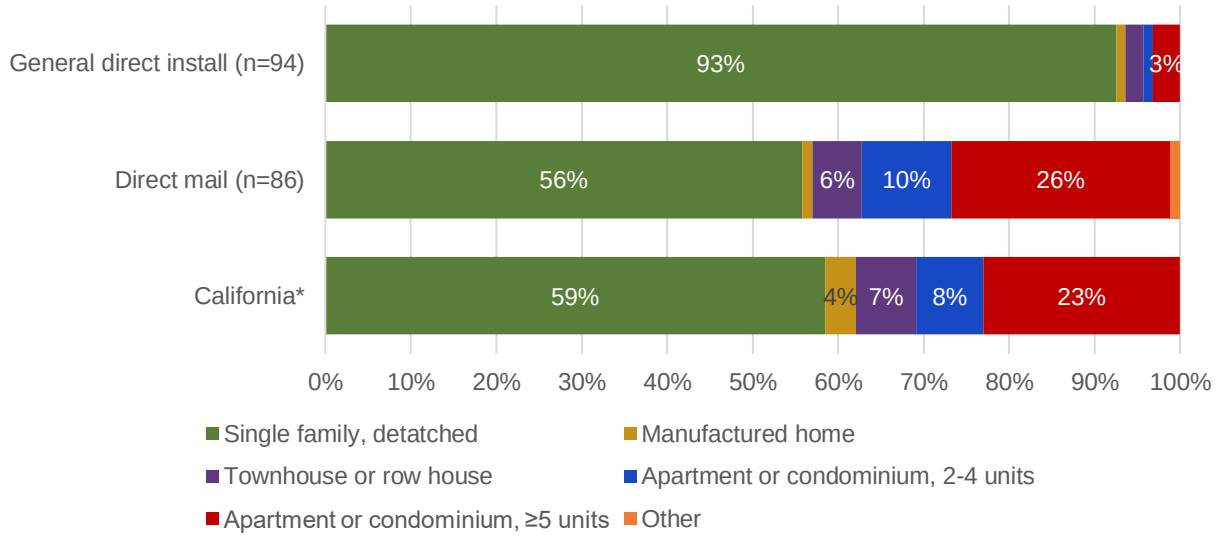
Figure 13: Tenure of Water Fixture Recipient Households



* Based on U.S. Census Bureau, 2013-2017 American Community Survey 5-year estimates

The distribution of dwelling types receiving water saving fixtures varied by delivery approach. PAs offered direct install programs targeting manufactured homes and multifamily units. Nonetheless, programs distributing fixtures through direct mail also served a notable number of multifamily units (Figure 14). General direct install programs primarily served single family homes.

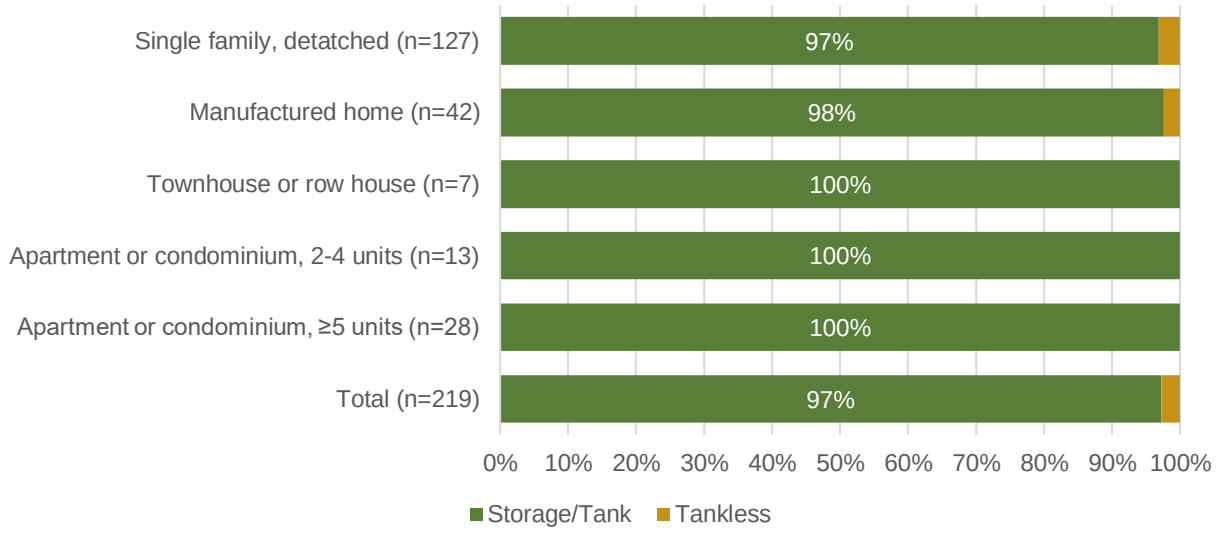
Figure 14: Water Fixture Recipient Dwelling Type



* Based on U.S. Census Bureau, 2013-2017 American Community Survey 5-year estimates

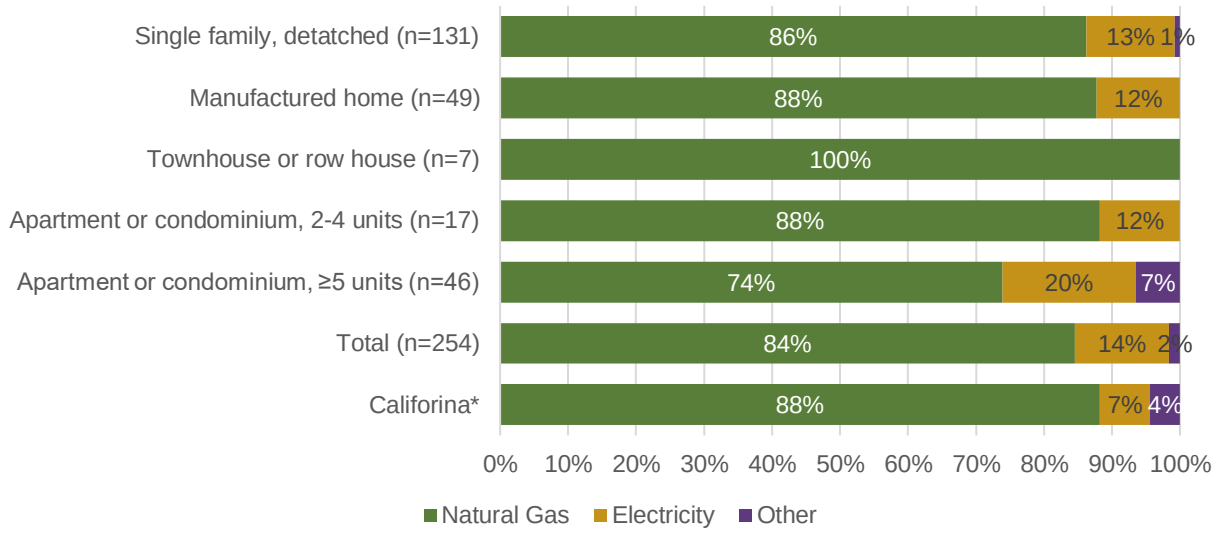
Across all housing types, a large majority of households that received water fixtures reported using water heaters with storage tanks (Figure 15). None of the households surveyed that lived in multifamily buildings reported having a tankless water heater.

Figure 15: Water Heater Type by Dwelling Type



Consistent with California's housing stock overall, most households that received water fixtures use natural gas as their primary water heating fuel (Figure 16). Residents of large multifamily buildings were most likely to report using electricity or other fuels for water heating.

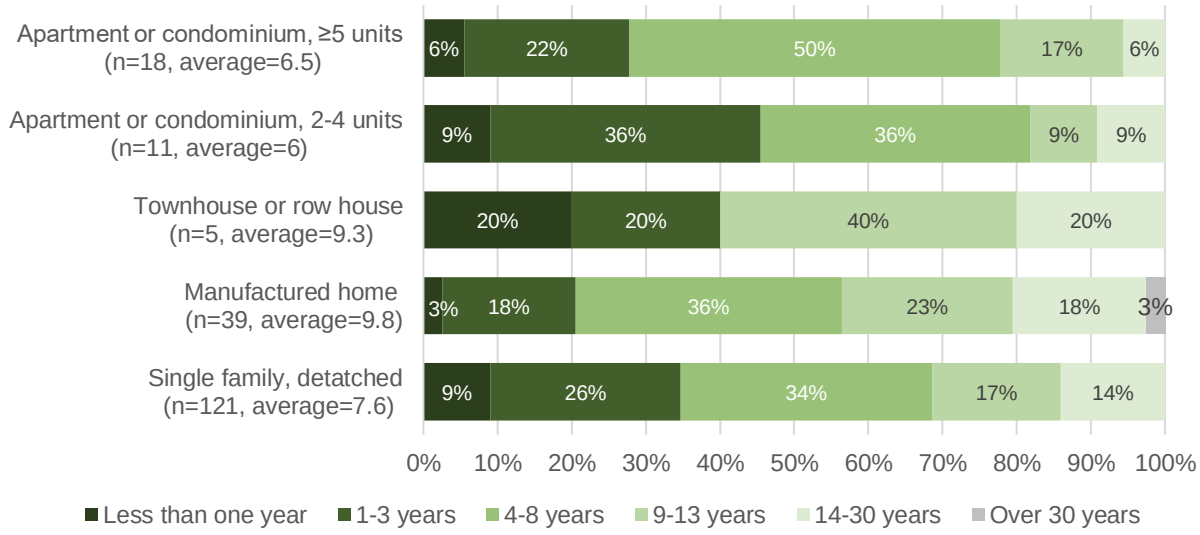
Figure 16: Water Heater Fuel by Dwelling Type



* Based on 2012 California Lighting and Appliance Saturation Survey (CLASS) data

Households receiving water fixtures most often reported their water heaters were between 4 and 8 years old (Figure 17). Those living in manufactured homes generally reported somewhat older water heaters than those living in other single-family homes.

Figure 17: Water Heater Age by Dwelling Type



5.1 Water Usage Behavior

The number of showers members of the surveyed households take per day using program-provided showerheads was relatively consistent across program delivery approaches (Table 30). The total number of showers taken per day using program-provided showerheads was lowest, on average, for participants in general direct install programs, likely reflecting the increased prevalence of small (1-2 person) households among these participants. The number of showers survey respondents reported per day is somewhat higher than one prior study frequently cited in water fixture savings calculations would suggest.[13] That study found an average of 0.6 showers per capita per day, suggesting a total of approximately 1.8 showers per household given the average of 3 people per household receiving water fixtures.

Table 30: Number of Showers Taken Per Day Using Program-Provided Showerheads

Delivery Approach	Average Showers Taken Per Day Using:		
	Most Used Showerhead	2nd Most-Used Showerhead	Total
Manufactured home direct install	1.5	1.2	2.2
Multifamily direct install	1.4	1.2	2.0
General direct install	1.5	1.3	1.6
Mail	1.6	1.4	2.5
Total	**1.5**	**1.3**	**2.1**

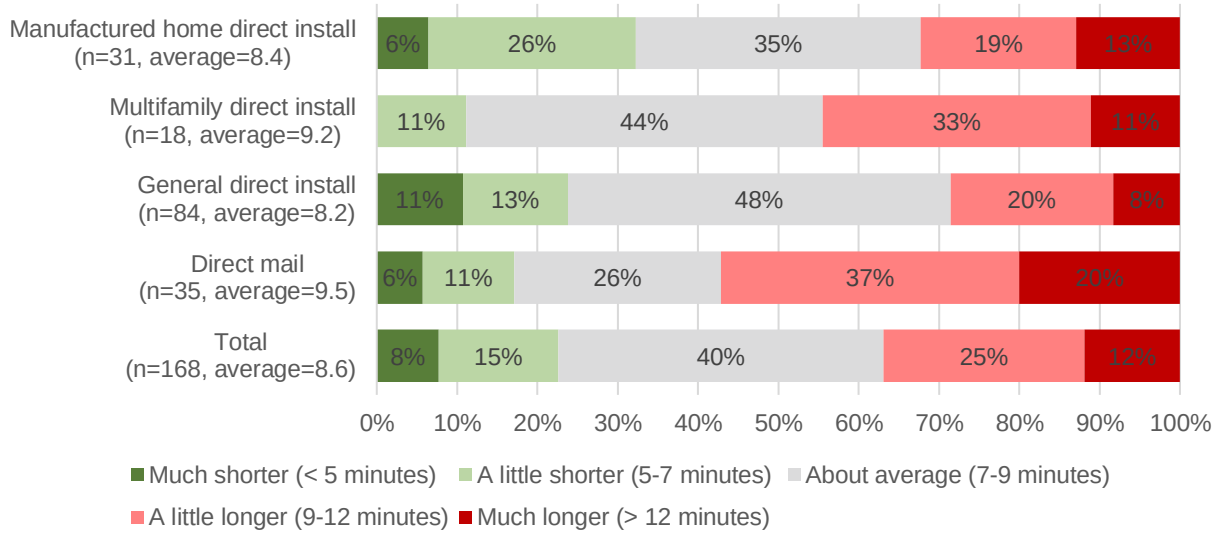
A 2016 study found the average length of showers in the United States is approximately 8 minutes,[14] this is consistent with a prior study that found an average shower length of 7.8 minutes.[15] This evaluation's household survey respondents most often reported their typical showers are close to that average, but more respondents reported taking longer-than-average showers than reported taking shorter-than-average showers (Figure 18).

[13] Cadmus and Opinion Dynamics Showerhead and Faucet Aerator Meter Study Memorandum dated June 2013, directed to Michigan Evaluation Working Group, cited in Illinois Statewide Technical Reference Manual: https://s3.amazonaws.com/ilsag/IL-TRM_Effective_01-01-20_v8.0_Vol_3_Res_10-17-19_Final.pdf

[14] Water Research Foundation. 2016. *Residential End Uses of Water, Version 2: Executive Report*. Retrieved from: https://www.circleofblue.org/wp-content/uploads/2016/04/WRF_REU2016.pdf

[15] Cadmus and Opinion Dynamics Showerhead and Faucet Aerator Meter Study Memorandum dated June 2013, directed to Michigan Evaluation Working Group, cited in Illinois Statewide Technical Reference Manual: https://s3.amazonaws.com/ilsag/IL-TRM_Effective_01-01-20_v8.0_Vol_3_Res_10-17-19_Final.pdf

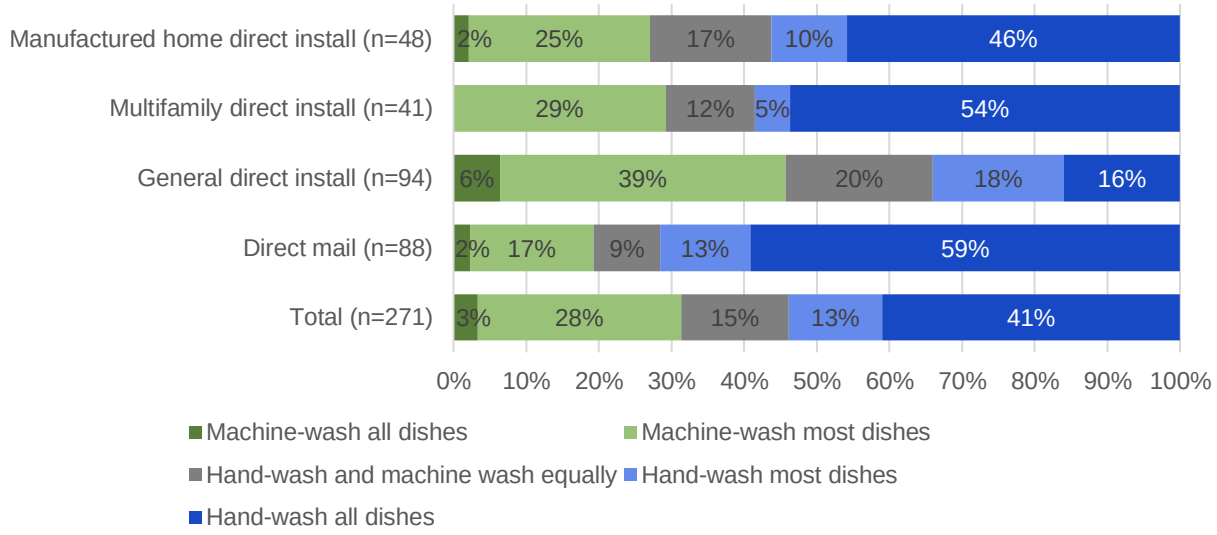
Figure 18: Typical Shower Length Relative to United States Average of ~8 Minutes



Most of the surveyed households that received water saving fixtures reported hand-washing most of their dishes, rather than using a dishwasher (Figure 19). Participants who received their fixtures through general direct install programs were the most likely to report machine washing their dishes. The 2012 California Lighting and Appliance Saturation Survey (CLASS) found that single family detached homes, which make up the majority of general direct install participants, were among the home types most likely to have a dishwasher (74% had a dishwasher).[16] Units in smaller multifamily buildings (2-4 units) were the least likely to have a dishwasher (50% had a dishwasher), while units in larger multifamily buildings and manufactured homes were equally likely to have dishwashers (in both cases, 68% had a dishwasher).

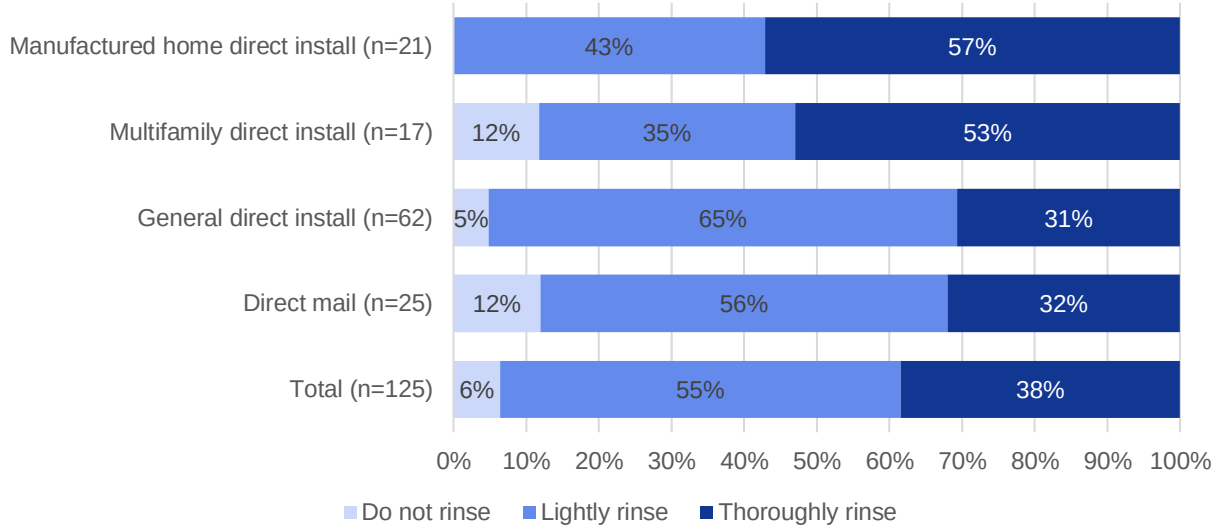
[16] KEMA, Inc. 2014. California Lighting and Appliance Saturation Study (CLASS 2012). Prepared for California Public Utilities Commission, Energy Division. Accessed February 25, 2020 from https://webtools.dnvgl.com/projects62/Default.aspx?tabid=190

Figure 19: Dishwasher Use



Household survey respondents who use dishwashers most often reported they lightly rinse their dishes before putting them in the dishwasher, although a notable proportion of respondents reported thoroughly rinsing their dishes (Figure 20).

Figure 20: Extent to which Respondents Rinse Dishes before Putting in Dishwasher

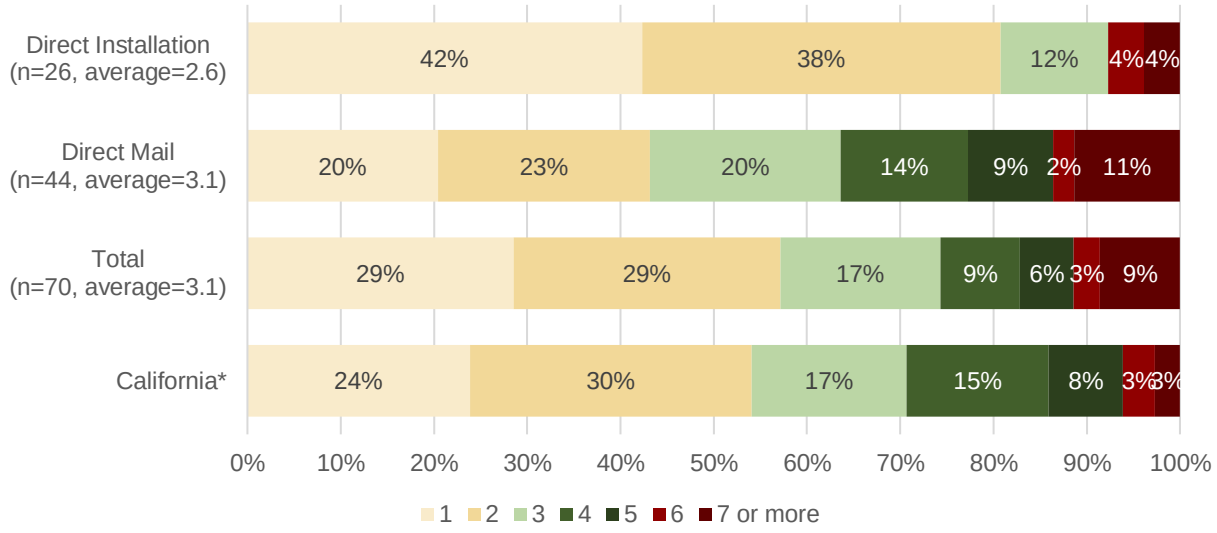


5.2 Resident Demographics

The number of individuals in a household is a key determinant of household water usage. The distribution of sizes of households receiving water fixtures from all programs combined generally reflected California's population (Figure 21). However, there were notable differences in household size between households

receiving water fixtures through direct install programs and those receiving water fixtures through direct mail programs. Households receiving direct install water fixtures were generally smaller, with 80% consisting of two residents or fewer, relative to 54% of California's population. Households receiving direct mail fixtures, in contrast, were generally larger, with 22% consisting of 5 residents or more, relative to 14% of California's population.

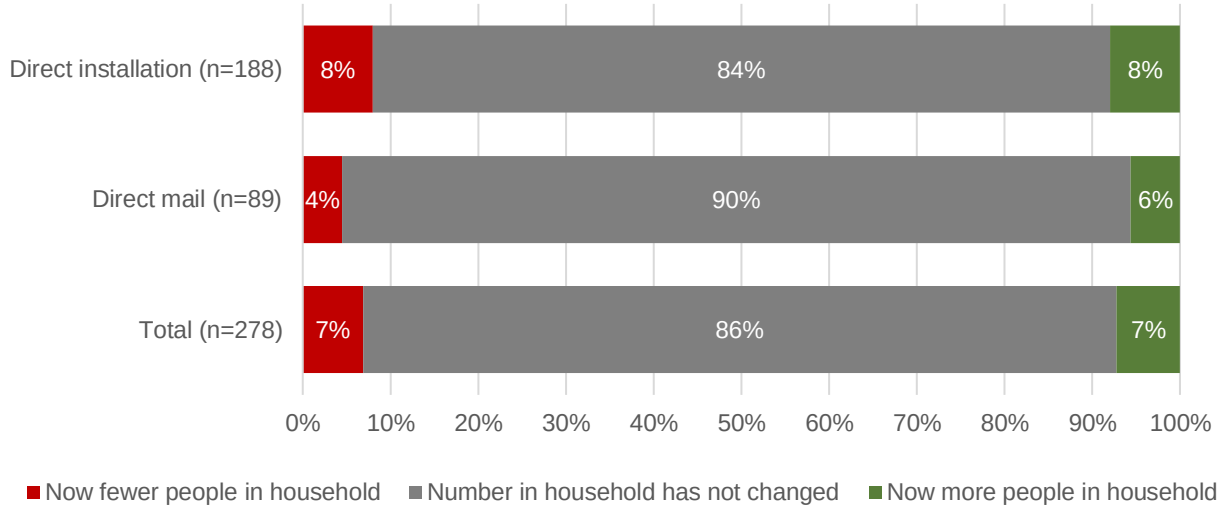
Figure 21: Household Size Distribution of Households Receiving Water Fixtures, Relative to California Population



* Based on U.S. Census Bureau, 2013-2017 American Community Survey 5-year estimates

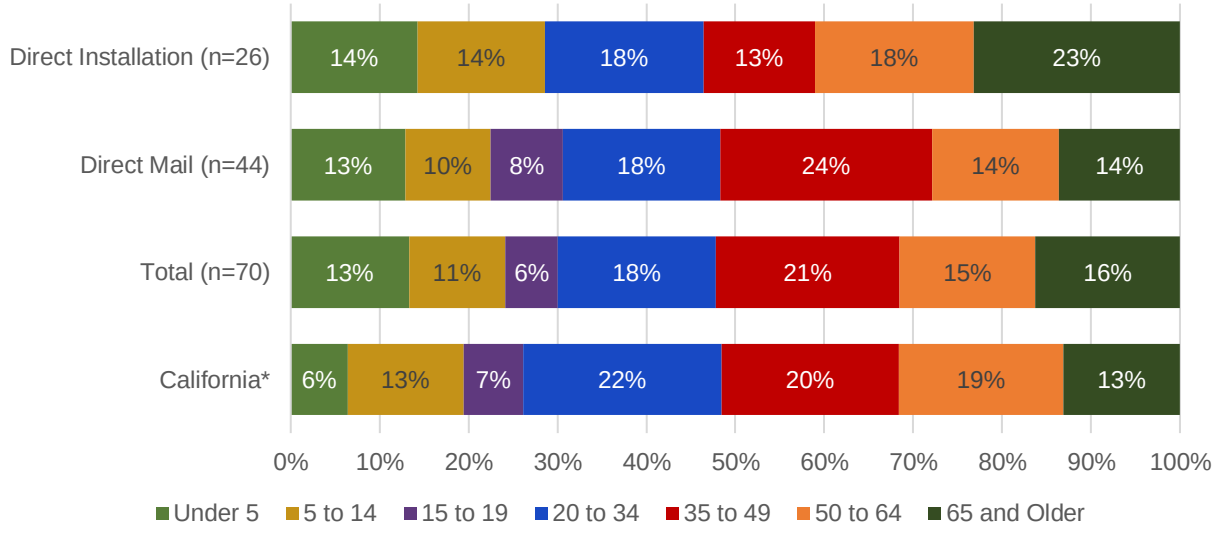
Most household survey respondents reported the size of their households had not changed since they received their water saving fixtures. Those who reported changes to their household sizes were relatively evenly divided between those who reported their households had grown and those who reported their households had gotten smaller.

Figure 22: Change in Household Size Since Receiving Water Fixtures



Households receiving water fixtures included a larger proportion of people under the age of 5 relative to California's population (Figure 23). Residents of households participating in direct install programs were also more likely to be over the age of 65 than the overall population of California.

Figure 23: Age Distribution of Residents of Households Receiving Water Fixtures, Relative to California Population



* Based on U.S. Census Bureau, 2013-2017 American Community Survey 5-year estimates

6. Conclusions and Recommendations

Apex Analytics draws the following conclusions based on the results of this research.

- **Conclusion 1: Mailing kits is a riskier, though lower-cost, approach to distributing water saving fixtures than direct installation.** Direct mail programs had both a lower installation rate than direct install programs and higher free ridership. Some households receiving kits in the mail reported they did not have sinks or showers on which to install all of the fixtures included in the kits. Participants also may not recognize some fixture types. Households may be more likely to request kits when the need to replace a water fixture arises, increasing their likelihood of being free riders.
  - **Recommendation 1:** PAs sending water fixtures in mailed kits should consider opportunities for participants to customize the kits they receive and investigate whether opportunities exist for the accompanying materials to more clearly explain how to use each of the fixtures included.
- **Conclusion 2: Multifamily building owners and managers differ from participants making decisions for an individual household in their approach to replacing water fixtures.** While household survey respondents indicated that programs motivated them to install more water-saving fixtures and do so sooner than they otherwise would, building owners and managers indicated that the programs had a greater influence on the efficiency of the fixtures they installed than the timing. Property owners and managers cited considerations like ongoing maintenance, water restrictions, and benchmarking ordinances in their installation decisions.
  - **Recommendation 2:** PAs should monitor local policies influencing multifamily buildings. PAs should work to leverage those policies to encourage building owners and managers to install more efficient water fixtures where appropriate and consider the effects those polices might have on program attribution

Appendices

Appendix A: Gross and Net Lifecycle Savings

Gross Lifecycle Savings (MWh)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
PGE	General Direct Install - Bathroom faucet aerators	4	5	1.37	0.0%	1.37
PGE	General Direct Install - Multiple - Shower Head + TSV	97	146	1.51	0.0%	1.51
PGE	General Direct Install - Showerheads	41	50	1.21	0.0%	1.21
PGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0			
PGE	Mfg Home Direct Install - Showerheads	0	0			
PGE	**Total**	**141**	**200**	**1.42**	**0.0%**	**1.42**
SCG	Direct Mail - Bathroom faucet aerators	0	0			
SCG	Direct Mail - Kitchen faucet aerators	0	0			
SCG	Direct Mail - Showerheads	0	0			
SCG	Direct Mail - Thermostatic shower valves	0	0			
SCG	MF Direct Install - Bathroom faucet aerators	0	0			
SCG	MF Direct Install - Kitchen faucet aerators	0	0			
SCG	MF Direct Install - Showerheads	0	0			
SCG	Mfg Home Direct Install - Bathroom faucet aerators	0	0			
SCG	Mfg Home Direct Install - Kitchen faucet aerators	0	0			
SCG	Mfg Home Direct Install - Showerheads	0	0			
SCG	Mfg Home Direct Install - Thermostatic shower valves	0	0			
SCG	Passthru - Aerators	0	0			
SCG	Passthru - Showerheads	0	0			
SCG	**Total**	**0**	**0**			
SDGE	Direct Mail - Multiple - SDG&E Kit	628	330	0.53	0.0%	0.53
SDGE	General Direct Install - Bathroom faucet aerators	0	1	1.54	0.0%	1.54
SDGE	General Direct Install - Kitchen faucet aerators	1	1	1.69	0.0%	1.69
SDGE	General Direct Install - Showerheads	3	4	1.21	0.0%	1.21
SDGE	MF Direct Install - Bathroom faucet aerators	11	18	1.59	0.0%	1.59
SDGE	MF Direct Install - Kitchen faucet aerators	114	172	1.51	0.0%	1.51
SDGE	MF Direct Install - Showerheads	183	243	1.33	0.0%	1.33
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	1	1	1.18	0.0%	1.18
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	2	3	1.17	0.0%	1.17

Gross Lifecycle Savings (MWh)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
SDGE	Mfg Home Direct Install - Showerheads	10	12	1.21	0.0%	1.21
SDGE	**Total**	**954**	**785**	**0.82**	**0.0%**	**0.82**
MCE	MF Direct Install - Bathroom faucet aerators	0	0			
MCE	MF Direct Install - Kitchen faucet aerators	0	0			
MCE	MF Direct Install - Showerheads	0	0			
MCE	**Total**	**0**	**0**			
	Statewide	***1,095***	***985***	***0.90***	***0.0%***	***0.90***

Net Lifecycle Savings (MWh)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
PGE	General Direct Install - Bathroom faucet aerators	2	5	2.20	0.0%	0.64	1.03	0.64	1.03
PGE	General Direct Install - Multiple - Shower Head + TSV	72	143	1.97	0.0%	0.75	0.98	0.75	0.98
PGE	General Direct Install - Showerheads	31	49	1.58	0.0%	0.75	0.98	0.75	0.98
PGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0						
PGE	Mfg Home Direct Install - Showerheads	0	0						
PGE	**Total**	**106**	**197**	**1.86**	**0.0%**	**0.75**	**0.98**	**0.75**	**0.98**
SCG	Direct Mail - Bathroom faucet aerators	0	0						
SCG	Direct Mail - Kitchen faucet aerators	0	0						
SCG	Direct Mail - Showerheads	0	0						
SCG	Direct Mail - Thermostatic shower valves	0	0						
SCG	MF Direct Install - Bathroom faucet aerators	0	0						
SCG	MF Direct Install - Kitchen faucet aerators	0	0						
SCG	MF Direct Install - Showerheads	0	0						
SCG	Mfg Home Direct Install - Bathroom faucet aerators	0	0						
SCG	Mfg Home Direct Install - Kitchen faucet aerators	0	0						
SCG	Mfg Home Direct Install - Showerheads	0	0						
SCG	Mfg Home Direct Install - Thermostatic shower valves	0	0						
SCG	Passthru - Aerators	0	0						
SCG	Passthru - Showerheads	0	0						
SCG	**Total**	**0**	**0**						
SDGE	Direct Mail - Multiple - SDG&E Kit	383	280	0.73	0.0%	0.61	0.85	0.61	0.85
SDGE	General Direct Install - Bathroom faucet aerators	0	1	2.39	0.0%	0.67	1.03	0.67	1.03
SDGE	General Direct Install - Kitchen faucet aerators	0	1	2.66	0.0%	0.67	1.05	0.67	1.05
SDGE	General Direct Install - Showerheads	2	4	1.57	0.0%	0.75	0.98	0.75	0.98
SDGE	MF Direct Install - Bathroom faucet aerators	8	16	1.96	0.0%	0.70	0.86	0.70	0.86
SDGE	MF Direct Install - Kitchen faucet aerators	80	115	1.44	0.0%	0.70	0.67	0.70	0.67
SDGE	MF Direct Install - Showerheads	137	197	1.44	0.0%	0.75	0.81	0.75	0.81
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	0	1	1.85	0.0%	0.64	1.01	0.64	1.01
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	2	3	1.82	0.0%	0.64	1.00	0.64	1.00

Net Lifecycle Savings (MWh)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
SDGE	Mfg Home Direct Install - Showerheads	7	12	1.59	0.0%	0.75	0.99	0.75	0.99
SDGE	**Total**	**621**	**629**	**1.01**	**0.0%**	**0.65**	**0.80**	**0.65**	**0.80**
MCE	MF Direct Install - Bathroom faucet aerators	0	0						
MCE	MF Direct Install - Kitchen faucet aerators	0	0						
MCE	MF Direct Install - Showerheads	0	0						
MCE	**Total**	**0**	**0**						
	Statewide	***726***	***826***	***1.14***	***0.0%***	***0.66***	***0.84***	***0.66***	***0.84***

Gross Lifecycle Savings (MW)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
PGE	General Direct Install - Bathroom faucet aerators	0.0	0.0	1.37	0.0%	1.37
PGE	General Direct Install - Multiple - Shower Head + TSV	0.0	0.0	1.51	0.0%	1.51
PGE	General Direct Install - Showerheads	0.0	0.0	1.21	0.0%	1.21
PGE	Mfg Home Direct Install - Bathroom faucet aerators	0.0	0.0			
PGE	Mfg Home Direct Install - Showerheads	0.0	0.0			
PGE	**Total**	**0.0**	**0.0**	**1.42**	**0.0%**	**1.42**
SCG	Direct Mail - Bathroom faucet aerators	0.0	0.0			
SCG	Direct Mail - Kitchen faucet aerators	0.0	0.0			
SCG	Direct Mail - Showerheads	0.0	0.0			
SCG	Direct Mail - Thermostatic shower valves	0.0	0.0			
SCG	MF Direct Install - Bathroom faucet aerators	0.0	0.0			
SCG	MF Direct Install - Kitchen faucet aerators	0.0	0.0			
SCG	MF Direct Install - Showerheads	0.0	0.0			
SCG	Mfg Home Direct Install - Bathroom faucet aerators	0.0	0.0			
SCG	Mfg Home Direct Install - Kitchen faucet aerators	0.0	0.0			
SCG	Mfg Home Direct Install - Showerheads	0.0	0.0			
SCG	Mfg Home Direct Install - Thermostatic shower valves	0.0	0.0			
SCG	Passthru - Aerators	0.0	0.0			
SCG	Passthru - Showerheads	0.0	0.0			
SCG	**Total**	**0.0**	**0.0**			
SDGE	Direct Mail - Multiple - SDG&E Kit	0.1	0.0	0.53	0.0%	0.53
SDGE	General Direct Install - Bathroom faucet aerators	0.0	0.0	1.54	0.0%	1.54
SDGE	General Direct Install - Kitchen faucet aerators	0.0	0.0	1.69	0.0%	1.69
SDGE	General Direct Install - Showerheads	0.0	0.0	1.21	0.0%	1.21
SDGE	MF Direct Install - Bathroom faucet aerators	0.0	0.0	1.59	0.0%	1.59
SDGE	MF Direct Install - Kitchen faucet aerators	0.0	0.0	1.51	0.0%	1.51
SDGE	MF Direct Install - Showerheads	0.0	0.0	1.33	0.0%	1.33
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	0.0	0.0	1.18	0.0%	1.18
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	0.0	0.0	1.17	0.0%	1.17

Gross Lifecycle Savings (MW)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
SDGE	Mfg Home Direct Install - Showerheads	0.0	0.0	1.21	0.0%	1.21
SDGE	**Total**	**0.1**	**0.1**	**0.82**	**0.0%**	**0.82**
MCE	MF Direct Install - Bathroom faucet aerators	0.0	0.0			
MCE	MF Direct Install - Kitchen faucet aerators	0.0	0.0			
MCE	MF Direct Install - Showerheads	0.0	0.0			
MCE	**Total**	**0.0**	**0.0**			
	Statewide	***0.1***	***0.1***	***0.90***	***0.0%***	***0.90***

Net Lifecycle Savings (MW)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
PGE	General Direct Install - Bathroom faucet aerators	0.0	0.0	2.20	0.0%	0.64	1.03	0.64	1.03
PGE	General Direct Install - Multiple - Shower Head + TSV	0.0	0.0	1.97	0.0%	0.75	0.98	0.75	0.98
PGE	General Direct Install - Showerheads	0.0	0.0	1.58	0.0%	0.75	0.98	0.75	0.98
PGE	Mfg Home Direct Install - Bathroom faucet aerators	0.0	0.0						
PGE	Mfg Home Direct Install - Showerheads	0.0	0.0						
PGE	**Total**	**0.0**	**0.0**	**1.86**	**0.0%**	**0.75**	**0.98**	**0.75**	**0.98**
SCG	Direct Mail - Bathroom faucet aerators	0.0	0.0						
SCG	Direct Mail - Kitchen faucet aerators	0.0	0.0						
SCG	Direct Mail - Showerheads	0.0	0.0						
SCG	Direct Mail - Thermostatic shower valves	0.0	0.0						
SCG	MF Direct Install - Bathroom faucet aerators	0.0	0.0						
SCG	MF Direct Install - Kitchen faucet aerators	0.0	0.0						
SCG	MF Direct Install - Showerheads	0.0	0.0						
SCG	Mfg Home Direct Install - Bathroom faucet aerators	0.0	0.0						
SCG	Mfg Home Direct Install - Kitchen faucet aerators	0.0	0.0						
SCG	Mfg Home Direct Install - Showerheads	0.0	0.0						
SCG	Mfg Home Direct Install - Thermostatic shower valves	0.0	0.0						
SCG	Passthru - Aerators	0.0	0.0						
SCG	Passthru - Showerheads	0.0	0.0						
SCG	**Total**	**0.0**	**0.0**						
SDGE	Direct Mail - Multiple - SDG&E Kit	0.0	0.0	0.73	0.0%	0.61	0.85	0.61	0.85
SDGE	General Direct Install - Bathroom faucet aerators	0.0	0.0	2.39	0.0%	0.67	1.03	0.67	1.03
SDGE	General Direct Install - Kitchen faucet aerators	0.0	0.0	2.66	0.0%	0.67	1.05	0.67	1.05
SDGE	General Direct Install - Showerheads	0.0	0.0	1.57	0.0%	0.75	0.98	0.75	0.98
SDGE	MF Direct Install - Bathroom faucet aerators	0.0	0.0	1.96	0.0%	0.70	0.86	0.70	0.86
SDGE	MF Direct Install - Kitchen faucet aerators	0.0	0.0	1.44	0.0%	0.70	0.67	0.70	0.67
SDGE	MF Direct Install - Showerheads	0.0	0.0	1.44	0.0%	0.75	0.81	0.75	0.81
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	0.0	0.0	1.85	0.0%	0.64	1.01	0.64	1.01
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	0.0	0.0	1.82	0.0%	0.64	1.00	0.64	1.00

Net Lifecycle Savings (MW)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
SDGE	Mfg Home Direct Install - Showerheads	0.0	0.0	1.59	0.0%	0.75	0.99	0.75	0.99
SDGE	**Total**	**0.1**	**0.1**	**1.01**	**0.0%**	**0.65**	**0.80**	**0.65**	**0.80**
MCE	MF Direct Install - Bathroom faucet aerators	0.0	0.0						
MCE	MF Direct Install - Kitchen faucet aerators	0.0	0.0						
MCE	MF Direct Install - Showerheads	0.0	0.0						
MCE	**Total**	**0.0**	**0.0**						
	Statewide	***0.1***	***0.1***	***1.14***	***0.0%***	***0.66***	***0.84***	***0.66***	***0.84***

Gross Lifecycle Savings (MTherms)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
PGE	General Direct Install - Bathroom faucet aerators	2	3	1.37	0.0%	1.37
PGE	General Direct Install - Multiple - Shower Head + TSV	162	244	1.51	0.0%	1.51
PGE	General Direct Install - Showerheads	35	43	1.21	0.0%	1.21
PGE	Mfg Home Direct Install - Bathroom faucet aerators	2	2	1.37	0.0%	1.37
PGE	Mfg Home Direct Install - Showerheads	140	170	1.21	0.0%	1.21
PGE	**Total**	**342**	**462**	**1.35**	**0.0%**	**1.35**
SCG	Direct Mail - Bathroom faucet aerators	4,358	2,635	0.60	0.0%	0.60
SCG	Direct Mail - Kitchen faucet aerators	8,653	5,031	0.58	0.0%	0.58
SCG	Direct Mail - Showerheads	15,169	20,687	1.36	0.0%	1.36
SCG	Direct Mail - Thermostatic shower valves	0	0	1.58	0.0%	1.58
SCG	MF Direct Install - Bathroom faucet aerators	58	81	1.41	0.0%	1.41
SCG	MF Direct Install - Kitchen faucet aerators	189	253	1.34	0.0%	1.34
SCG	MF Direct Install - Showerheads	649	1,443	2.22	0.0%	2.22
SCG	Mfg Home Direct Install - Bathroom faucet aerators	24	32	1.37	0.0%	1.37
SCG	Mfg Home Direct Install - Kitchen faucet aerators	44	59	1.35	0.0%	1.35
SCG	Mfg Home Direct Install - Showerheads	119	240	2.02	0.0%	2.02
SCG	Mfg Home Direct Install - Thermostatic shower valves	2	3	1.37	0.0%	1.37
SCG	Passthru - Aerators	4,375	4,375	1.00	100.0%	
SCG	Passthru - Showerheads	6,829	6,829	1.00	100.0%	
SCG	**Total**	**40,465**	**41,667**	**1.03**	**27.7%**	**1.04**
SDGE	Direct Mail - Multiple - SDG&E Kit	639	336	0.53	0.0%	0.53
SDGE	General Direct Install - Bathroom faucet aerators	0	1	1.54	0.0%	1.54
SDGE	General Direct Install - Kitchen faucet aerators	1	1	1.69	0.0%	1.69
SDGE	General Direct Install - Showerheads	3	3	1.21	0.0%	1.21
SDGE	MF Direct Install - Bathroom faucet aerators	2	3	1.59	0.0%	1.59
SDGE	MF Direct Install - Kitchen faucet aerators	19	28	1.51	0.0%	1.51
SDGE	MF Direct Install - Showerheads	31	41	1.33	0.0%	1.33
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	1	1	1.18	0.0%	1.18
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	3	3	1.17	0.0%	1.17

Gross Lifecycle Savings (MTherms)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
SDGE	Mfg Home Direct Install - Showerheads	11	13	1.21	0.0%	1.21
SDGE	**Total**	**708**	**430**	**0.61**	**0.0%**	**0.61**
MCE	MF Direct Install - Bathroom faucet aerators	2	1	0.94	0.0%	0.94
MCE	MF Direct Install - Kitchen faucet aerators	14	12	0.89	0.0%	0.89
MCE	MF Direct Install - Showerheads	33	32	0.98	0.0%	0.98
MCE	**Total**	**48**	**46**	**0.95**	**0.0%**	**0.95**
	Statewide	***41,564***	***42,604***	***1.03***	***27.0%***	***1.03***

Net Lifecycle Savings (MTherms)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
PGE	General Direct Install - Bathroom faucet aerators	1	3	2.20	0.0%	0.64	1.03	0.64	1.03
PGE	General Direct Install - Multiple - Shower Head + TSV	121	239	1.97	0.0%	0.75	0.98	0.75	0.98
PGE	General Direct Install - Showerheads	27	42	1.58	0.0%	0.75	0.98	0.75	0.98
PGE	Mfg Home Direct Install - Bathroom faucet aerators	1	3	2.16	0.0%	0.64	1.01	0.64	1.01
PGE	Mfg Home Direct Install - Showerheads	105	168	1.59	0.0%	0.75	0.99	0.75	0.99
PGE	**Total**	**256**	**455**	**1.78**	**0.0%**	**0.75**	**0.98**	**0.75**	**0.98**
SCG	Direct Mail - Bathroom faucet aerators	2,615	2,213	0.85	0.0%	0.60	0.84	0.60	0.84
SCG	Direct Mail - Kitchen faucet aerators	5,192	4,024	0.78	0.0%	0.60	0.80	0.60	0.80
SCG	Direct Mail - Showerheads	9,101	18,205	2.00	0.0%	0.60	0.88	0.60	0.88
SCG	Direct Mail - Thermostatic shower valves	0	0	2.65	0.0%	0.60	1.01	0.60	1.01
SCG	MF Direct Install - Bathroom faucet aerators	44	70	1.60	0.0%	0.76	0.86	0.76	0.86
SCG	MF Direct Install - Kitchen faucet aerators	143	169	1.18	0.0%	0.76	0.67	0.76	0.67
SCG	MF Direct Install - Showerheads	515	1,169	2.27	0.0%	0.79	0.81	0.79	0.81
SCG	Mfg Home Direct Install - Bathroom faucet aerators	18	33	1.83	0.0%	0.76	1.01	0.76	1.01
SCG	Mfg Home Direct Install - Kitchen faucet aerators	33	59	1.78	0.0%	0.76	1.00	0.76	1.00
SCG	Mfg Home Direct Install - Showerheads	99	237	2.39	0.0%	0.83	0.99	0.83	0.99
SCG	Mfg Home Direct Install - Thermostatic shower valves	2	3	1.70	0.0%	0.81	1.01	0.81	1.01
SCG	Passthru - Aerators	2,800	2,800	1.00	100.0%	0.64	0.64		
SCG	Passthru - Showerheads	5,121	5,121	1.00	100.0%	0.75	0.75		
SCG	**Total**	**25,681**	**34,103**	**1.33**	**30.8%**	**0.63**	**0.82**	**0.61**	**0.86**
SDGE	Direct Mail - Multiple - SDG&E Kit	390	285	0.73	0.0%	0.61	0.85	0.61	0.85
SDGE	General Direct Install - Bathroom faucet aerators	0	1	2.46	0.0%	0.65	1.03	0.65	1.03
SDGE	General Direct Install - Kitchen faucet aerators	0	1	2.75	0.0%	0.65	1.05	0.65	1.05
SDGE	General Direct Install - Showerheads	2	3	1.58	0.0%	0.75	0.98	0.75	0.98
SDGE	MF Direct Install - Bathroom faucet aerators	1	3	1.96	0.0%	0.70	0.86	0.70	0.86
SDGE	MF Direct Install - Kitchen faucet aerators	13	19	1.44	0.0%	0.70	0.67	0.70	0.67
SDGE	MF Direct Install - Showerheads	23	33	1.44	0.0%	0.75	0.81	0.75	0.81
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	0	1	1.85	0.0%	0.64	1.01	0.64	1.01
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	2	3	1.82	0.0%	0.64	1.00	0.64	1.00

Net Lifecycle Savings (MTherms)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
SDGE	Mfg Home Direct Install - Showerheads	8	13	1.59	0.0%	0.75	0.99	0.75	0.99
SDGE	**Total**	**441**	**362**	**0.82**	**0.0%**	**0.62**	**0.84**	**0.62**	**0.84**
MCE	MF Direct Install - Bathroom faucet aerators	1	1	0.98	0.0%	0.82	0.86	0.82	0.86
MCE	MF Direct Install - Kitchen faucet aerators	12	8	0.67	0.0%	0.89	0.67	0.89	0.67
MCE	MF Direct Install - Showerheads	29	26	0.90	0.0%	0.88	0.81	0.88	0.81
MCE	**Total**	**43**	**36**	**0.84**	**0.0%**	**0.88**	**0.77**	**0.88**	**0.77**
	Statewide	***26,420***	***34,955***	***1.32***	***30.0%***	***0.64***	***0.82***	***0.61***	***0.86***

Gross First Year Savings (MWh)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
PGE	General Direct Install - Bathroom faucet aerators	0	0	1.37	0.0%	1.37
PGE	General Direct Install - Multiple - Shower Head + TSV	10	15	1.51	0.0%	1.51
PGE	General Direct Install - Showerheads	4	5	1.21	0.0%	1.21
PGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0			
PGE	Mfg Home Direct Install - Showerheads	0	0			
PGE	**Total**	**14**	**20**	**1.42**	**0.0%**	**1.42**
SCG	Direct Mail - Bathroom faucet aerators	0	0			
SCG	Direct Mail - Kitchen faucet aerators	0	0			
SCG	Direct Mail - Showerheads	0	0			
SCG	Direct Mail - Thermostatic shower valves	0	0			
SCG	MF Direct Install - Bathroom faucet aerators	0	0			
SCG	MF Direct Install - Kitchen faucet aerators	0	0			
SCG	MF Direct Install - Showerheads	0	0			
SCG	Mfg Home Direct Install - Bathroom faucet aerators	0	0			
SCG	Mfg Home Direct Install - Kitchen faucet aerators	0	0			
SCG	Mfg Home Direct Install - Showerheads	0	0			
SCG	Mfg Home Direct Install - Thermostatic shower valves	0	0			
SCG	Passthru - Aerators	0	0			
SCG	Passthru - Showerheads	0	0			
SCG	**Total**	**0**	**0**			
SDGE	Direct Mail - Multiple - SDG&E Kit	190	100	0.53	0.0%	0.53
SDGE	General Direct Install - Bathroom faucet aerators	0	0	1.54	0.0%	1.54
SDGE	General Direct Install - Kitchen faucet aerators	0	0	1.69	0.0%	1.69
SDGE	General Direct Install - Showerheads	1	1	1.21	0.0%	1.21
SDGE	MF Direct Install - Bathroom faucet aerators	3	5	1.59	0.0%	1.59
SDGE	MF Direct Install - Kitchen faucet aerators	35	52	1.51	0.0%	1.51
SDGE	MF Direct Install - Showerheads	55	74	1.33	0.0%	1.33
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0	1.18	0.0%	1.18
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	1	1	1.17	0.0%	1.17

Gross First Year Savings (MWh)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
SDGE	Mfg Home Direct Install - Showerheads	3	4	1.21	0.0%	1.21
SDGE	**Total**	**289**	**238**	**0.82**	**0.0%**	**0.82**
MCE	MF Direct Install - Bathroom faucet aerators	0	0			
MCE	MF Direct Install - Kitchen faucet aerators	0	0			
MCE	MF Direct Install - Showerheads	0	0			
MCE	**Total**	**0**	**0**			
	Statewide	***303***	***258***	***0.85***	***0.0%***	***0.85***

Net First Year Savings (MWh)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
PGE	General Direct Install - Bathroom faucet aerators	0	0	2.20	0.0%	0.64	1.03	0.64	1.03
PGE	General Direct Install - Multiple - Shower Head + TSV	7	14	1.97	0.0%	0.75	0.98	0.75	0.98
PGE	General Direct Install - Showerheads	3	5	1.58	0.0%	0.75	0.98	0.75	0.98
PGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0						
PGE	Mfg Home Direct Install - Showerheads	0	0						
PGE	**Total**	**11**	**20**	**1.86**	**0.0%**	**0.75**	**0.98**	**0.75**	**0.98**
SCG	Direct Mail - Bathroom faucet aerators	0	0						
SCG	Direct Mail - Kitchen faucet aerators	0	0						
SCG	Direct Mail - Showerheads	0	0						
SCG	Direct Mail - Thermostatic shower valves	0	0						
SCG	MF Direct Install - Bathroom faucet aerators	0	0						
SCG	MF Direct Install - Kitchen faucet aerators	0	0						
SCG	MF Direct Install - Showerheads	0	0						
SCG	Mfg Home Direct Install - Bathroom faucet aerators	0	0						
SCG	Mfg Home Direct Install - Kitchen faucet aerators	0	0						
SCG	Mfg Home Direct Install - Showerheads	0	0						
SCG	Mfg Home Direct Install - Thermostatic shower valves	0	0						
SCG	Passthru - Aerators	0	0						
SCG	Passthru - Showerheads	0	0						
SCG	**Total**	**0**	**0**						
SDGE	Direct Mail - Multiple - SDG&E Kit	116	85	0.73	0.0%	0.61	0.85	0.61	0.85
SDGE	General Direct Install - Bathroom faucet aerators	0	0	2.39	0.0%	0.67	1.03	0.67	1.03
SDGE	General Direct Install - Kitchen faucet aerators	0	0	2.66	0.0%	0.67	1.05	0.67	1.05
SDGE	General Direct Install - Showerheads	1	1	1.57	0.0%	0.75	0.98	0.75	0.98
SDGE	MF Direct Install - Bathroom faucet aerators	2	5	1.96	0.0%	0.70	0.86	0.70	0.86
SDGE	MF Direct Install - Kitchen faucet aerators	24	35	1.44	0.0%	0.70	0.67	0.70	0.67
SDGE	MF Direct Install - Showerheads	42	60	1.44	0.0%	0.75	0.81	0.75	0.81
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0	1.85	0.0%	0.64	1.01	0.64	1.01
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	0	1	1.82	0.0%	0.64	1.00	0.64	1.00

Net First Year Savings (MWh)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
SDGE	Mfg Home Direct Install - Showerheads	2	4	1.59	0.0%	0.75	0.99	0.75	0.99
SDGE	**Total**	**188**	**191**	**1.01**	**0.0%**	**0.65**	**0.80**	**0.65**	**0.80**
MCE	MF Direct Install - Bathroom faucet aerators	0	0						
MCE	MF Direct Install - Kitchen faucet aerators	0	0						
MCE	MF Direct Install - Showerheads	0	0						
MCE	**Total**	**0**	**0**						
	Statewide	***199***	***210***	***1.06***	***0.0%***	***0.66***	***0.82***	***0.66***	***0.82***

Gross First Year Savings (MW)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
PGE	General Direct Install - Bathroom faucet aerators	0.0	0.0	1.37	0.0%	1.37
PGE	General Direct Install - Multiple - Shower Head + TSV	0.0	0.0	1.51	0.0%	1.51
PGE	General Direct Install - Showerheads	0.0	0.0	1.21	0.0%	1.21
PGE	Mfg Home Direct Install - Bathroom faucet aerators	0.0	0.0			
PGE	Mfg Home Direct Install - Showerheads	0.0	0.0			
PGE	**Total**	**0.0**	**0.0**	**1.42**	**0.0%**	**1.42**
SCG	Direct Mail - Bathroom faucet aerators	0.0	0.0			
SCG	Direct Mail - Kitchen faucet aerators	0.0	0.0			
SCG	Direct Mail - Showerheads	0.0	0.0			
SCG	Direct Mail - Thermostatic shower valves	0.0	0.0			
SCG	MF Direct Install - Bathroom faucet aerators	0.0	0.0			
SCG	MF Direct Install - Kitchen faucet aerators	0.0	0.0			
SCG	MF Direct Install - Showerheads	0.0	0.0			
SCG	Mfg Home Direct Install - Bathroom faucet aerators	0.0	0.0			
SCG	Mfg Home Direct Install - Kitchen faucet aerators	0.0	0.0			
SCG	Mfg Home Direct Install - Showerheads	0.0	0.0			
SCG	Mfg Home Direct Install - Thermostatic shower valves	0.0	0.0			
SCG	Passthru - Aerators	0.0	0.0			
SCG	Passthru - Showerheads	0.0	0.0			
SCG	**Total**	**0.0**	**0.0**			
SDGE	Direct Mail - Multiple - SDG&E Kit	0.0	0.0	0.53	0.0%	0.53
SDGE	General Direct Install - Bathroom faucet aerators	0.0	0.0	1.54	0.0%	1.54
SDGE	General Direct Install - Kitchen faucet aerators	0.0	0.0	1.69	0.0%	1.69
SDGE	General Direct Install - Showerheads	0.0	0.0	1.21	0.0%	1.21
SDGE	MF Direct Install - Bathroom faucet aerators	0.0	0.0	1.59	0.0%	1.59
SDGE	MF Direct Install - Kitchen faucet aerators	0.0	0.0	1.51	0.0%	1.51
SDGE	MF Direct Install - Showerheads	0.0	0.0	1.33	0.0%	1.33
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	0.0	0.0	1.18	0.0%	1.18
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	0.0	0.0	1.17	0.0%	1.17

Gross First Year Savings (MW)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
SDGE	Mfg Home Direct Install - Showerheads	0.0	0.0	1.21	0.0%	1.21
SDGE	**Total**	**0.0**	**0.0**	**0.82**	**0.0%**	**0.82**
MCE	MF Direct Install - Bathroom faucet aerators	0.0	0.0			
MCE	MF Direct Install - Kitchen faucet aerators	0.0	0.0			
MCE	MF Direct Install - Showerheads	0.0	0.0			
MCE	**Total**	**0.0**	**0.0**			
	Statewide	***0.0***	***0.0***	***0.85***	***0.0%***	***0.85***

Net First Year Savings (MW)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
PGE	General Direct Install - Bathroom faucet aerators	0.0	0.0	2.20	0.0%	0.64	1.03	0.64	1.03
PGE	General Direct Install - Multiple - Shower Head + TSV	0.0	0.0	1.97	0.0%	0.75	0.98	0.75	0.98
PGE	General Direct Install - Showerheads	0.0	0.0	1.58	0.0%	0.75	0.98	0.75	0.98
PGE	Mfg Home Direct Install - Bathroom faucet aerators	0.0	0.0						
PGE	Mfg Home Direct Install - Showerheads	0.0	0.0						
PGE	**Total**	**0.0**	**0.0**	**1.86**	**0.0%**	**0.75**	**0.98**	**0.75**	**0.98**
SCG	Direct Mail - Bathroom faucet aerators	0.0	0.0						
SCG	Direct Mail - Kitchen faucet aerators	0.0	0.0						
SCG	Direct Mail - Showerheads	0.0	0.0						
SCG	Direct Mail - Thermostatic shower valves	0.0	0.0						
SCG	MF Direct Install - Bathroom faucet aerators	0.0	0.0						
SCG	MF Direct Install - Kitchen faucet aerators	0.0	0.0						
SCG	MF Direct Install - Showerheads	0.0	0.0						
SCG	Mfg Home Direct Install - Bathroom faucet aerators	0.0	0.0						
SCG	Mfg Home Direct Install - Kitchen faucet aerators	0.0	0.0						
SCG	Mfg Home Direct Install - Showerheads	0.0	0.0						
SCG	Mfg Home Direct Install - Thermostatic shower valves	0.0	0.0						
SCG	Passthru - Aerators	0.0	0.0						
SCG	Passthru - Showerheads	0.0	0.0						
SCG	**Total**	**0.0**	**0.0**						
SDGE	Direct Mail - Multiple - SDG&E Kit	0.0	0.0	0.73	0.0%	0.61	0.85	0.61	0.85
SDGE	General Direct Install - Bathroom faucet aerators	0.0	0.0	2.39	0.0%	0.67	1.03	0.67	1.03
SDGE	General Direct Install - Kitchen faucet aerators	0.0	0.0	2.66	0.0%	0.67	1.05	0.67	1.05
SDGE	General Direct Install - Showerheads	0.0	0.0	1.57	0.0%	0.75	0.98	0.75	0.98
SDGE	MF Direct Install - Bathroom faucet aerators	0.0	0.0	1.96	0.0%	0.70	0.86	0.70	0.86
SDGE	MF Direct Install - Kitchen faucet aerators	0.0	0.0	1.44	0.0%	0.70	0.67	0.70	0.67
SDGE	MF Direct Install - Showerheads	0.0	0.0	1.44	0.0%	0.75	0.81	0.75	0.81
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	0.0	0.0	1.85	0.0%	0.64	1.01	0.64	1.01
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	0.0	0.0	1.82	0.0%	0.64	1.00	0.64	1.00

Net First Year Savings (MW)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
SDGE	Mfg Home Direct Install - Showerheads	0.0	0.0	1.59	0.0%	0.75	0.99	0.75	0.99
SDGE	**Total**	**0.0**	**0.0**	**1.01**	**0.0%**	**0.65**	**0.80**	**0.65**	**0.80**
MCE	MF Direct Install - Bathroom faucet aerators	0.0	0.0						
MCE	MF Direct Install - Kitchen faucet aerators	0.0	0.0						
MCE	MF Direct Install - Showerheads	0.0	0.0						
MCE	**Total**	**0.0**	**0.0**						
	Statewide	***0.0***	***0.0***	***1.06***	***0.0%***	***0.66***	***0.82***	***0.66***	***0.82***

Gross First Year Savings (MTherms)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
PGE	General Direct Install - Bathroom faucet aerators	0	0	1.37	0.0%	1.37
PGE	General Direct Install - Multiple - Shower Head + TSV	16	24	1.51	0.0%	1.51
PGE	General Direct Install - Showerheads	4	4	1.21	0.0%	1.21
PGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0	1.37	0.0%	1.37
PGE	Mfg Home Direct Install - Showerheads	14	17	1.21	0.0%	1.21
PGE	**Total**	**34**	**46**	**1.35**	**0.0%**	**1.35**
SCG	Direct Mail - Bathroom faucet aerators	653	395	0.60	0.0%	0.60
SCG	Direct Mail - Kitchen faucet aerators	1,297	754	0.58	0.0%	0.58
SCG	Direct Mail - Showerheads	2,542	2,069	0.81	0.0%	0.81
SCG	Direct Mail - Thermostatic shower valves	0	0	1.58	0.0%	1.58
SCG	MF Direct Install - Bathroom faucet aerators	9	12	1.41	0.0%	1.41
SCG	MF Direct Install - Kitchen faucet aerators	28	38	1.34	0.0%	1.34
SCG	MF Direct Install - Showerheads	109	144	1.33	0.0%	1.33
SCG	Mfg Home Direct Install - Bathroom faucet aerators	4	5	1.37	0.0%	1.37
SCG	Mfg Home Direct Install - Kitchen faucet aerators	7	9	1.35	0.0%	1.35
SCG	Mfg Home Direct Install - Showerheads	20	24	1.21	0.0%	1.21
SCG	Mfg Home Direct Install - Thermostatic shower valves	0	0	0.93	0.0%	0.93
SCG	Passthru - Aerators	656	656	1.00	100.0%	
SCG	Passthru - Showerheads	1,141	1,141	1.00	100.0%	
SCG	**Total**	**6,465**	**5,247**	**0.81**	**27.8%**	**0.74**
SDGE	Direct Mail - Multiple - SDG&E Kit	194	102	0.53	0.0%	0.53
SDGE	General Direct Install - Bathroom faucet aerators	0	0	1.54	0.0%	1.54
SDGE	General Direct Install - Kitchen faucet aerators	0	0	1.69	0.0%	1.69
SDGE	General Direct Install - Showerheads	1	1	1.21	0.0%	1.21
SDGE	MF Direct Install - Bathroom faucet aerators	1	1	1.59	0.0%	1.59
SDGE	MF Direct Install - Kitchen faucet aerators	6	8	1.51	0.0%	1.51
SDGE	MF Direct Install - Showerheads	9	12	1.33	0.0%	1.33
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0	1.18	0.0%	1.18
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	1	1	1.17	0.0%	1.17

Gross First Year Savings (MTherms)

PA	Standard Report Group	Ex-Ante Gross	Ex-Post Gross	GRR	% Ex-Ante Gross Pass Through	Eval GRR
SDGE	Mfg Home Direct Install - Showerheads	3	4	1.21	0.0%	1.21
SDGE	**Total**	**215**	**130**	**0.61**	**0.0%**	**0.61**
MCE	MF Direct Install - Bathroom faucet aerators	0	0	0.94	0.0%	0.94
MCE	MF Direct Install - Kitchen faucet aerators	1	1	0.89	0.0%	0.89
MCE	MF Direct Install - Showerheads	3	3	0.98	0.0%	0.98
MCE	**Total**	**5**	**5**	**0.95**	**0.0%**	**0.95**
	Statewide	***6,718***	***5,428***	***0.81***	***26.7%***	***0.74***

Net First Year Savings (MTherms)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
PGE	General Direct Install - Bathroom faucet aerators	0	0	2.20	0.0%	0.64	1.03	0.64	1.03
PGE	General Direct Install - Multiple - Shower Head + TSV	12	24	1.97	0.0%	0.75	0.98	0.75	0.98
PGE	General Direct Install - Showerheads	3	4	1.58	0.0%	0.75	0.98	0.75	0.98
PGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0	2.16	0.0%	0.64	1.01	0.64	1.01
PGE	Mfg Home Direct Install - Showerheads	11	17	1.59	0.0%	0.75	0.99	0.75	0.99
PGE	**Total**	**26**	**45**	**1.78**	**0.0%**	**0.75**	**0.98**	**0.75**	**0.98**
SCG	Direct Mail - Bathroom faucet aerators	392	332	0.85	0.0%	0.60	0.84	0.60	0.84
SCG	Direct Mail - Kitchen faucet aerators	778	603	0.78	0.0%	0.60	0.80	0.60	0.80
SCG	Direct Mail - Showerheads	1,525	1,820	1.19	0.0%	0.60	0.88	0.60	0.88
SCG	Direct Mail - Thermostatic shower valves	0	0	2.65	0.0%	0.60	1.01	0.60	1.01
SCG	MF Direct Install - Bathroom faucet aerators	7	10	1.60	0.0%	0.76	0.86	0.76	0.86
SCG	MF Direct Install - Kitchen faucet aerators	21	25	1.18	0.0%	0.76	0.67	0.76	0.67
SCG	MF Direct Install - Showerheads	86	117	1.36	0.0%	0.79	0.81	0.79	0.81
SCG	Mfg Home Direct Install - Bathroom faucet aerators	3	5	1.83	0.0%	0.76	1.01	0.76	1.01
SCG	Mfg Home Direct Install - Kitchen faucet aerators	5	9	1.78	0.0%	0.76	1.00	0.76	1.00
SCG	Mfg Home Direct Install - Showerheads	17	24	1.43	0.0%	0.84	0.99	0.84	0.99
SCG	Mfg Home Direct Install - Thermostatic shower valves	0	0	1.16	0.0%	0.81	1.01	0.81	1.01
SCG	Passthru - Aerators	420	420	1.00	100.0%	0.64	0.64		
SCG	Passthru - Showerheads	856	856	1.00	100.0%	0.75	0.75		
SCG	**Total**	**4,109**	**4,222**	**1.03**	**31.0%**	**0.64**	**0.80**	**0.61**	**0.85**
SDGE	Direct Mail - Multiple - SDG&E Kit	118	87	0.73	0.0%	0.61	0.85	0.61	0.85
SDGE	General Direct Install - Bathroom faucet aerators	0	0	2.46	0.0%	0.65	1.03	0.65	1.03
SDGE	General Direct Install - Kitchen faucet aerators	0	0	2.75	0.0%	0.65	1.05	0.65	1.05
SDGE	General Direct Install - Showerheads	1	1	1.58	0.0%	0.75	0.98	0.75	0.98
SDGE	MF Direct Install - Bathroom faucet aerators	0	1	1.96	0.0%	0.70	0.86	0.70	0.86
SDGE	MF Direct Install - Kitchen faucet aerators	4	6	1.44	0.0%	0.70	0.67	0.70	0.67
SDGE	MF Direct Install - Showerheads	7	10	1.44	0.0%	0.75	0.81	0.75	0.81
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0	1.85	0.0%	0.64	1.01	0.64	1.01
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	0	1	1.82	0.0%	0.64	1.00	0.64	1.00

Net First Year Savings (MTherms)

PA	Standard Report Group	Ex-Ante Net	Ex-Post Net	NRR	% Ex-Ante Net Pass Through	Ex-Ante NTG	Ex-Post NTG	Eval Ex-Ante NTG	Eval Ex-Post NTG
SDGE	Mfg Home Direct Install - Showerheads	3	4	1.59	0.0%	0.75	0.99	0.75	0.99
SDGE	**Total**	**133**	**110**	**0.82**	**0.0%**	**0.62**	**0.84**	**0.62**	**0.84**
MCE	MF Direct Install - Bathroom faucet aerators	0	0	0.98	0.0%	0.82	0.86	0.82	0.86
MCE	MF Direct Install - Kitchen faucet aerators	1	1	0.67	0.0%	0.89	0.67	0.89	0.67
MCE	MF Direct Install - Showerheads	3	3	0.90	0.0%	0.88	0.81	0.88	0.81
MCE	**Total**	**4**	**4**	**0.84**	**0.0%**	**0.88**	**0.77**	**0.88**	**0.77**
	Statewide	***4,273***	***4,380***	***1.03***	***29.9%***	***0.64***	***0.81***	***0.61***	***0.86***

Appendix B: Per Unit (Quantity) Gross and Net Energy Savings

Per Unit (Quantity) Gross Energy Savings (kWh)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
PGE	General Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	10.0	1.7	0.2	0.2
PGE	General Direct Install - Multiple - Shower Head + TSV	0	0.0%	0.0%	10.0	34.6	3.5	3.5
PGE	General Direct Install - Showerheads	0	0.0%	0.0%	10.0	43.7	4.4	4.4
PGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	10.0	0.0	0.0	0.0
PGE	Mfg Home Direct Install - Showerheads	0	0.0%	0.0%	10.0	0.0	0.0	0.0
SCG	Direct Mail - Bathroom faucet aerators	0	0.0%	0.0%	6.7	0.0	0.0	0.0
SCG	Direct Mail - Kitchen faucet aerators	0	0.0%	0.0%	6.7	0.0	0.0	0.0
SCG	Direct Mail - Showerheads	0	100.0%	0.0%	10.0	0.0	0.0	0.0
SCG	Direct Mail - Thermostatic shower valves	0	0.0%	0.0%	3.3	0.0	0.0	0.0
SCG	MF Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	6.7	0.0	0.0	0.0
SCG	MF Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	6.7	0.0	0.0	0.0
SCG	MF Direct Install - Showerheads	0	100.0%	0.0%	10.0	0.0	0.0	0.0
SCG	Mfg Home Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	6.7	0.0	0.0	0.0
SCG	Mfg Home Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	6.7	0.0	0.0	0.0
SCG	Mfg Home Direct Install - Showerheads	0	100.0%	0.0%	10.0	0.0	0.0	0.0
SCG	Mfg Home Direct Install - Thermostatic shower valves	0	100.0%	0.0%	10.0	0.0	0.0	0.0
SCG	Passthru - Aerators	1	0.0%		6.7	0.0	0.0	0.0
SCG	Passthru - Showerheads	1	99.9%		10.0	0.0	0.0	0.0
SDGE	Direct Mail - Multiple - SDG&E Kit	0	0.0%	0.0%	3.3	15.3	4.6	4.6
SDGE	General Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	3.3	5.0	1.5	1.5
SDGE	General Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	3.3	22.0	6.7	6.7
SDGE	General Direct Install - Showerheads	0	0.0%	0.0%	3.3	18.1	5.5	5.5
SDGE	MF Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	3.3	12.5	3.8	3.8
SDGE	MF Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	3.3	66.9	20.3	20.3
SDGE	MF Direct Install - Showerheads	0	0.0%	0.0%	3.3	88.6	26.9	26.9
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	3.3	2.2	0.7	0.7
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	3.3	12.5	3.8	3.8
SDGE	Mfg Home Direct Install - Showerheads	0	0.0%	0.0%	3.3	14.8	4.5	4.5
MCE	MF Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	10.0	0.0	0.0	0.0
MCE	MF Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	10.0	0.0	0.0	0.0

Per Unit (Quantity) Gross Energy Savings (kWh)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
MCE	MF Direct Install - Showerheads	0	0.0%	0.0%	10.0	0.0	0.0	0.0

Per Unit (Quantity) Gross Energy Savings (Therms)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
PGE	General Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	10.0	1.1	0.1	0.1
PGE	General Direct Install - Multiple - Shower Head + TSV	0	0.0%	0.0%	10.0	58.0	5.8	5.8
PGE	General Direct Install - Showerheads	0	0.0%	0.0%	10.0	37.7	3.8	3.8
PGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	10.0	1.2	0.1	0.1
PGE	Mfg Home Direct Install - Showerheads	0	0.0%	0.0%	10.0	40.8	4.1	4.1
SCG	Direct Mail - Bathroom faucet aerators	0	0.0%	0.0%	6.7	2.6	0.4	0.4
SCG	Direct Mail - Kitchen faucet aerators	0	0.0%	0.0%	6.7	9.9	1.5	1.5
SCG	Direct Mail - Showerheads	0	100.0%	0.0%	10.0	27.5	2.7	2.7
SCG	Direct Mail - Thermostatic shower valves	0	0.0%	0.0%	3.3	7.1	2.2	2.2
SCG	MF Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	6.7	5.5	0.8	0.8
SCG	MF Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	6.7	29.0	4.3	4.3
SCG	MF Direct Install - Showerheads	0	100.0%	0.0%	10.0	83.8	8.4	8.4
SCG	Mfg Home Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	6.7	9.0	1.4	1.4
SCG	Mfg Home Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	6.7	35.1	5.3	5.3
SCG	Mfg Home Direct Install - Showerheads	0	100.0%	0.0%	10.0	69.2	6.9	6.9
SCG	Mfg Home Direct Install - Thermostatic shower valves	0	100.0%	0.0%	10.0	102.0	10.2	10.2
SCG	Passthru - Aerators	1	0.0%		6.7	14.6	2.2	2.2
SCG	Passthru - Showerheads	1	99.9%		10.0	34.2	5.7	3.4
SDGE	Direct Mail - Multiple - SDG&E Kit	0	0.0%	0.0%	3.3	15.5	4.7	4.7
SDGE	General Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	3.3	3.8	1.2	1.2
SDGE	General Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	3.3	17.3	5.2	5.2
SDGE	General Direct Install - Showerheads	0	0.0%	0.0%	3.3	14.7	4.5	4.5
SDGE	MF Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	3.3	2.0	0.6	0.6
SDGE	MF Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	3.3	10.9	3.3	3.3
SDGE	MF Direct Install - Showerheads	0	0.0%	0.0%	3.3	15.0	4.5	4.5
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	3.3	2.4	0.7	0.7
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	3.3	13.3	4.0	4.0
SDGE	Mfg Home Direct Install - Showerheads	0	0.0%	0.0%	3.3	16.5	5.0	5.0
MCE	MF Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	10.0	6.1	0.6	0.6
MCE	MF Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	10.0	43.8	4.4	4.4

Per Unit (Quantity) Gross Energy Savings (Therms)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
MCE	MF Direct Install - Showerheads	0	0.0%	0.0%	10.0	87.0	8.7	8.7

Per Unit (Quantity) Net Energy Savings (kWh)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
PGE	General Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	10.0	1.8	0.2	0.2
PGE	General Direct Install - Multiple - Shower Head + TSV	0	0.0%	0.0%	10.0	33.9	3.4	3.4
PGE	General Direct Install - Showerheads	0	0.0%	0.0%	10.0	42.8	4.3	4.3
PGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	10.0	0.0	0.0	0.0
PGE	Mfg Home Direct Install - Showerheads	0	0.0%	0.0%	10.0	0.0	0.0	0.0
SCG	Direct Mail - Bathroom faucet aerators	0	0.0%	0.0%	6.7	0.0	0.0	0.0
SCG	Direct Mail - Kitchen faucet aerators	0	0.0%	0.0%	6.7	0.0	0.0	0.0
SCG	Direct Mail - Showerheads	0	100.0%	0.0%	10.0	0.0	0.0	0.0
SCG	Direct Mail - Thermostatic shower valves	0	0.0%	0.0%	3.3	0.0	0.0	0.0
SCG	MF Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	6.7	0.0	0.0	0.0
SCG	MF Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	6.7	0.0	0.0	0.0
SCG	MF Direct Install - Showerheads	0	100.0%	0.0%	10.0	0.0	0.0	0.0
SCG	Mfg Home Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	6.7	0.0	0.0	0.0
SCG	Mfg Home Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	6.7	0.0	0.0	0.0
SCG	Mfg Home Direct Install - Showerheads	0	100.0%	0.0%	10.0	0.0	0.0	0.0
SCG	Mfg Home Direct Install - Thermostatic shower valves	0	100.0%	0.0%	10.0	0.0	0.0	0.0
SCG	Passthru - Aerators	1	0.0%		6.7	0.0	0.0	0.0
SCG	Passthru - Showerheads	1	99.9%		10.0	0.0	0.0	0.0
SDGE	Direct Mail - Multiple - SDG&E Kit	0	0.0%	0.0%	3.3	13.0	3.9	3.9
SDGE	General Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	3.3	5.2	1.6	1.6
SDGE	General Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	3.3	23.1	7.0	7.0
SDGE	General Direct Install - Showerheads	0	0.0%	0.0%	3.3	17.7	5.4	5.4
SDGE	MF Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	3.3	10.8	3.3	3.3
SDGE	MF Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	3.3	44.8	13.6	13.6
SDGE	MF Direct Install - Showerheads	0	0.0%	0.0%	3.3	71.8	21.8	21.8
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	3.3	2.3	0.7	0.7
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	3.3	12.5	3.8	3.8
SDGE	Mfg Home Direct Install - Showerheads	0	0.0%	0.0%	3.3	14.7	4.4	4.4
MCE	MF Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	10.0	0.0	0.0	0.0
MCE	MF Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	10.0	0.0	0.0	0.0

Per Unit (Quantity) Net Energy Savings (kWh)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
MCE	MF Direct Install - Showerheads	0	0.0%	0.0%	10.0	0.0	0.0	0.0

Per Unit (Quantity) Net Energy Savings (Therms)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
PGE	General Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	10.0	1.1	0.1	0.1
PGE	General Direct Install - Multiple - Shower Head + TSV	0	0.0%	0.0%	10.0	56.9	5.7	5.7
PGE	General Direct Install - Showerheads	0	0.0%	0.0%	10.0	36.9	3.7	3.7
PGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	10.0	1.2	0.1	0.1
PGE	Mfg Home Direct Install - Showerheads	0	0.0%	0.0%	10.0	40.4	4.0	4.0
SCG	Direct Mail - Bathroom faucet aerators	0	0.0%	0.0%	6.7	2.2	0.3	0.3
SCG	Direct Mail - Kitchen faucet aerators	0	0.0%	0.0%	6.7	8.0	1.2	1.2
SCG	Direct Mail - Showerheads	0	100.0%	0.0%	10.0	24.2	2.4	2.4
SCG	Direct Mail - Thermostatic shower valves	0	0.0%	0.0%	3.3	7.2	2.2	2.2
SCG	MF Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	6.7	4.7	0.7	0.7
SCG	MF Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	6.7	19.4	2.9	2.9
SCG	MF Direct Install - Showerheads	0	100.0%	0.0%	10.0	67.9	6.8	6.8
SCG	Mfg Home Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	6.7	9.1	1.4	1.4
SCG	Mfg Home Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	6.7	35.1	5.3	5.3
SCG	Mfg Home Direct Install - Showerheads	0	100.0%	0.0%	10.0	68.5	6.9	6.9
SCG	Mfg Home Direct Install - Thermostatic shower valves	0	100.0%	0.0%	10.0	103.1	10.3	10.3
SCG	Passthru - Aerators	1	0.0%		6.7	9.4	1.4	1.4
SCG	Passthru - Showerheads	1	99.9%		10.0	25.6	4.3	2.6
SDGE	Direct Mail - Multiple - SDG&E Kit	0	0.0%	0.0%	3.3	13.2	4.0	4.0
SDGE	General Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	3.3	3.9	1.2	1.2
SDGE	General Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	3.3	18.2	5.5	5.5
SDGE	General Direct Install - Showerheads	0	0.0%	0.0%	3.3	14.4	4.4	4.4
SDGE	MF Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	3.3	1.7	0.5	0.5
SDGE	MF Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	3.3	7.3	2.2	2.2
SDGE	MF Direct Install - Showerheads	0	0.0%	0.0%	3.3	12.1	3.7	3.7
SDGE	Mfg Home Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	3.3	2.4	0.7	0.7
SDGE	Mfg Home Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	3.3	13.3	4.0	4.0
SDGE	Mfg Home Direct Install - Showerheads	0	0.0%	0.0%	3.3	16.4	5.0	5.0
MCE	MF Direct Install - Bathroom faucet aerators	0	0.0%	0.0%	10.0	5.2	0.5	0.5
MCE	MF Direct Install - Kitchen faucet aerators	0	0.0%	0.0%	10.0	29.4	2.9	2.9

Per Unit (Quantity) Net Energy Savings (Therms)

PA	Standard Report Group	Pass Through	% ER Ex-Ante	% ER Ex-Post	Average EUL (yr)	Ex-Post Lifecycle	Ex-Post First Year	Ex-Post Annualized
MCE	MF Direct Install - Showerheads	0	0.0%	0.0%	10.0	70.5	7.0	7.0

Appendix C: IESR Recommendations Resulting from the Evaluation Research

Study ID	Study Type	Study Title	CPUC Study Manager
Group A Residential Sector	Impact Evaluation	Water-Saving Fixtures: A Residential and Multifamily Survey to Inform Program Year 2018 Impact Evaluation	Peter Franzese

Rec #	Program or Database	Summary of Findings	Additional Supporting Information	Best Practice/Recommendation	Recipient	Affected Workpaper or DEER
1	Multiple Programs Delivering Water-Saving Fixtures	Programs delivering fixtures through direct mail have lower installation rates and higher free-ridership rates than direct install programs	Section 3 Section 4	PAs sending water fixtures in mailed kits should consider opportunities for participants to customize the kits they receive and investigate whether opportunities exist for the accompanying materials to more clearly explain how to use each of the fixtures included.	All PAs	
2	Multiple Programs Delivering	Multifamily building owners differ from participants in their	Section 4	PAs should monitor local policies influencing multifamily buildings. PAs	All PAs	

	Water-Saving Fixtures	approach to replacing water fixtures		should work to leverage those policies to encourage building owners and managers to install more efficient water fixtures where appropriate and consider the effects those policies might have on program net-to-gross values.		

Appendix D: Detailed Findings Tables

Fixtures Distributed

Fixture	IOU	Manufactured Home Direct Install	Multifamily Direct Install	General Direct Install	Mail	Total
Kitchen Faucet Aerators	SCG	1,687	8,721	0	506,106	516,514
	SDG&E	225	2,577	51	21,632	24,434
	PG&E	0	0	0	0	0
Bathroom Faucet Aerators	SCG	3,568	14,740	0	1,012,212	1,030,520
	SDG&E	335	1,450	136	43,264	45,049
	PG&E	2,144	0	2,840	0	2,144
Shower-heads	SCG	3,460	17,218	0	752,876	773,554
	SDG&E	806	2,744	211	21,632	25,182
	PG&E	4,157	0	5,346	0	4,157

Free Ridership

Fixture Type	PA	Manufactured Home Direct Install		Multifamily Direct Install			General Direct Install		Mail		Total	
		Estimate	Sample Size	Estimate	Sample Size		Estimate	Sample Size	Estimate	Sample Size	Estimate	Sample Size
					Respon-dents	Units Managed						
Kitchen Faucet Aerators	SCG	5%	9	35%	8	507	Did Not Use Delivery Approach		25%	17	25%	533
	SDG&E	-	0	50%	1	1,100	0	2	18%	12	21%	1,114
	PG&E	Not Provided		Did Not Use Delivery Approach			Not Provided		Did Not Use Delivery Approach		Not Provided	
	Total	5%	9	38%	9	1,607	0	2	25%	29	25%	1,647
Bathroom Faucet Aerators	SCG	7%	17	9%	9	705	Did Not Use Delivery Approach		22%	20	22%	742
	SDG&E	-	0	-	0	0	0	1	12%	10	12%	11
	PG&E	0%	1	Did Not Use Delivery Approach			2%	13	Did Not Use Delivery Approach		1%	14
	Total	4%	18	9%	9	705	2%	14	21%	30	1%	767
Showerheads	SCG	5%	15	20%	10	739	Did Not Use Delivery Approach		17%	27	17%	781
	SDG&E	25%	1	50%	2	259	0	4	17%	12	20%	276
	PG&E	3%	14	Did Not Use Delivery Approach			-	81	Did Not Use Delivery Approach		5%	95
	Total	6%	30	24%	12	998	7%	85	17%	39	17%	1,152
TSVs	SCG	-	0	Not Provided			Did Not Use Delivery Approach		Not Provided		-	0
	SDG&E	Not Provided		Not Provided			Not Provided		Not Provided		Not Provided	
	PG&E	Not Provided		Did Not Use Delivery Approach			4%	61	Did Not Use Delivery Approach		4%	61
	Total	-	0	Not Provided			4%	61	Not Provided		4%	61

Installation Rate

Fixture Type	PA	Manufactured Home Direct Install			Multifamily Direct Install				General Direct Install			Mail			Total		
		Estimate			Estimate		Sample Size		Estimate			Estimate			Estimate		
		Currently Installed	Removed	Sample Size	Currently Installed	Removed	Respondents	Units Managed	Currently Installed	Removed	Sample Size	Currently Installed	Removed	Sample Size	Currently Installed	Removed	Sample Size
Kitchen Faucet Aerators	SCG	90%	8%	10	86%	14%	5	300	Did Not Use Delivery Approach			24%	2%	80	25%	2%	390
	SDG&E	-	-	0	100%	0%	1	1,100	100%	0%	2	63%	0%	19	67%	0%	1,121
	PG&E	Not Provided			Not Provided				Not Provided			Did Not Use Delivery Approach			Did Not Use Delivery Approach		
	Total	90%	8%	10	89%	11%	6	1,400	100%	0%	2	25%	2%	99	27%	2%	1,511
Bathroom Faucet Aerators	SCG	93%	2%	17	94%	6%	6	498	Did Not Use Delivery Approach			25%	2%	79	26%	2%	594
	SDG&E	-	-	0	-	-	0	0	100%	0%	1	56%	0%	20	57%	0%	21
	PG&E	88%	13%	4	Did Not Use Delivery Approach				90%	6%	17	Did Not Use Delivery Approach				9%	21
	Total	91%	6%	21	94%	6%	6	498	91%	6%	18	26%	2%	99	28%	2%	636
Showerheads	SCG	88%	3%	17	97%	3%	6	498	Did Not Use Delivery Approach			34%	2%	83	36%	2%	598
	SDG&E	100%	0%	1	98%	2%	2	1,210	100%	0%	4	65%	8%	20	70%	7%	1,235
	PG&E	88%	5%	16	Did Not Use Delivery Approach				88%	6%	92	Did Not Use Delivery Approach				5%	108
	Total	89%	4%	34	98%	2%	8	1,708	89%	6%	96	35%	2%	103	37%	2%	1,941
TSVs	SCG	-	-	0	Not Provided				Not Provided			Not Provided			-	-	0
	SDG&E	Not Provided			Not Provided				Not Provided			Not Provided			Not Provided		
	PG&E	Not Provided			Did Not Use Delivery Approach				93%	4%	66	Did Not Use Delivery Approach			93%	4%	66
	Total	-	-	0	Not Provided				93%	4%	66	Not Provided			93%	4%	66

Appendix E: Sampling Plan

This memo describes the sampling approach Apex Analytics plans to use in surveying customers and property managers who received water saving measures as part of the PY 2018 residential sector impact evaluation. It begins with a review of the programs providing measures and the population overall, followed by a discussion of the sampling approach for each population.

Population Description

The evaluation team identified 14 programs administered by Marin Clean Energy (MCE), Pacific Gas & Electric (PG&E), Southern California Gas (SCG) and San Diego Gas & Electric (SDGE) that claimed gas savings for water saving fixtures provided to California ratepayers in PY 2018. In total, these programs served more than 120,000 unique households and properties managed by 530 organizations (Table 31).

Table 31: Population Receiving Water Fixtures in PY 2018 by Program

PA	Program Name	Customers Served	
		Households	Property Managers/Owners
MCE	Multifamily Comprehensive	256	5
PG&E	Residential Energy Fitness	3,640	0
	Direct Install for Manufactured Homes	1,705	70
	Redwood Coast	12	0
SCG	Plug Load and Appliances	81,388	0
	Multifamily Direct Therm Savings	5,970	179
	Manufactured and Mobile Homes	1,046	203
	Community Language Education & Outreach	21	0
	Plug Load and Appliances - POS	N/A	N/A
	LivingWise	N/A	N/A
SDG&E	Home Energy Efficiency Rebates (HEER)	21,173	0
	Multifamily Energy Efficiency Rebates (MFEER)	6,310	25
	Comprehensive Manufactured and Mobile Homes	572	48
	Middle Income Direct Install (MIDI)	158	0
Total		**122,251**	**530**

As Table 32 describes, the programs providing water fixtures vary in the method by which they deliver measures and in the populations they serve.

Table 32: Water Fixture Delivery Approaches and Populations Served

Delivery Approach	Programs	Population Served		
		Single Family	Multi-family	Mfrd. Homes
Direct Install	MCE Multifamily Comprehensive		✓	
	PG&E Residential Energy Fitness	✓	✓	✓
	PG&E Direct Install for Manufactured Homes			✓
	PG&E Redwood Coast	✓	✓	✓
	SCG Multifamily Direct Therm Savings		✓	
	SCG Manufactured and Mobile Homes			✓
	SDG&E MFEER		✓	
	SDG&E Comprehensive Manufactured and Mobile Homes			✓
	SDG&E MIDI	✓*	✓*	✓*
Mail	SCG Plug Load and Appliances	✓	✓	✓
	SDG&E HEER	✓	✓	✓
Event Giveaway	SCG CLEO	✓	✓	✓
School Kit	SCG LivingWise	✓	✓	✓
Point-of-Sale Discount	SCG Plug Load and Appliances Point of Sale	✓	✓	✓

** Income qualified (moderate income)*

All of the programs listed in Table 31 provided low-flow showerheads and bathroom faucet aerators in 2018 (Table 33). None of PG&E's programs provided kitchen faucet aerators, while none of SDG&E's programs provided thermostatic shower valves (TSVs).

Table 33: Water Fixture Measures Provided by Program

PA	Program	Measures Provided			
		Shower heads	Bathroom Aerators	Kitchen Aerators	TSVs
MCE	Multifamily Comprehensive	✓	✓	✓	
PG&E	Residential Energy Fitness	✓	✓		✓
	Direct Install for Manufactured Homes	✓	✓		
	Redwood Coast	✓	✓		✓
SCG	Plug Load and Appliances	✓	✓	✓	✓
	Multifamily Direct Therm Savings	✓	✓	✓	
	Manufactured and Mobile Homes	✓	✓	✓	✓
	Community Language Education & Outreach	✓	✓	✓	✓
	Plug Load and Appliances - POS	✓	✓		✓
	LivingWise	✓	✓	✓	
SDG&E	Home Energy Efficiency Rebates (HEER)	✓	✓	✓	

	Multifamily Energy Efficiency Rebates (MFEER)	✓	✓	✓	
	Comprehensive Manufactured and Mobile Homes	✓	✓	✓	
	Middle Income Direct Install (MIDI)	✓	✓	✓	

Household Survey Sampling

As described in the *Residential Sector Impact Evaluation Workplan*, the evaluation team will target a sample of 300 complete surveys with households that received water-saving fixtures. In response to Apex Analytics' data request, the IOUs provided data on water saving measures provided through each of the programs listed in Table 31.[17] Apex transformed the provided data to identify individual program participants and develop participant-level records of measures received and other program participation details. Finally, Apex differentiated between household and property manager participants based on factors including the number of distinct addresses associated with the record and the number of measures received.

Participant-level data were not available for two programs, SCG's Plug Load and Appliance – POS program and SCG's LivingWise program due to the program structures; these programs will not be sampled due to this constraint. The evaluation team will ultimately apply average values to both programs, potentially adjusting LivingWise values to reflect findings from survey results provided by the program implementer. As Table 34 describes, the evaluation team has stratified that target sample to ensure survey findings provide insight across IOUs and delivery approaches.

Table 34: Household Survey Target Sample by Strata

Delivery Approach	PG&E		SCG		SDG&E		Total	
	Pop.	Target	Pop.	Target	Pop.	Target	Pop.	Target
Multifamily Direct Install	-	-	5,970	70	6,310	0*	12,280	70
Manufactured Home Direct Install	1,705	30	1,046	35	572	5	3,323	70
General Residential Direct Install	3,652	70	-	-	-	-	3,652	70
Moderate Income Direct Install	-	-	-	-	158	10	158	10
Direct Mail Distribution	-	-	81,388	50	21,173	20	102,561	70
Event Giveaway	-	-	21	10	-	-	21	10

[17] Participation data files received included: MCE-HotWaterSavingsFixture-DataRequest-2019_1031.xslx (from MCE); EE_EEStats_30937_DR_ED_192-Q01_Atch01-CONF.xlsx and subsequent files with additional contact information (from PG&E); DR 30938 HotWaterFixtures.xlsx (from SCG); and EESTATS 309399_SDG&E Response.xslx (from SDG&E).

Total	5,357	100	88,425	165	28,213	35	121,995	300

** All available contact information for SDG&E's Multifamily Energy Efficiency Rebates program was at the property manager and owner level.*

Note: MCE is not included in the household sample as data received from MCE included only property manager contacts.

The evaluation team will also ensure that survey findings reflect diversity of measures received. Given the distribution of measures provided, the evaluation team anticipates that the sample listed in Table 34 will provide a sufficient number of responses about each measure type. However, Apex will closely monitor survey responses and target subsequent rounds of survey outreach to fill any gaps in data covering particular measure types.

Property Manager/Owner Survey Sampling

The *Residential Sector Impact Evaluation Workplan* does not list a target sample size for the survey of property managers and owners. Given the size of the property manager/owner population, the evaluation team has set a sampling target of 61, sufficient for 90% confidence with 10% precision at the full sample level. While a larger sample would allow for greater precision in analyses of sub-sets of the population, property managers and owners are a difficult population to reach, and Apex anticipates it would be a challenge to achieve a sample notably larger than 61 respondents. Apex also notes that, as each respondent represents multiple dwelling units receiving measures, precision may be greater at the dwelling unit-level.

Table 35 lists sampling targets for the property manager survey by IOU and delivery approach. It is important to note, however, that the populations within some of the strata are small and it may not be possible to meet each of the targets. Apex anticipates the need to reach out to the entire population of property managers and owners to reach the overall target of 61 respondents.

Table 35: Property Manager Survey Sample by Strata

Delivery Approach	MCE		PG&E		SCG		SDG&E		Total	
	Pop.	Target	Pop.	Target	Pop.	Target	Pop.	Target	Pop.	Target
Multifamily Direct Install	5	1	-	-	179	30	25	6	209	37
Manufactured Home Direct Install	-	-	70	8	203	14	48	2	321	24
Total	5	1	70	8	382	44	73	8	530	61

Survey Approach

Apex will collect data from both populations via web surveys with email invitations. As the household population is large, Apex will randomly select a groups of participating households 20 times the size of each sampling target (by IOU and delivery approach) to receive survey invitations. Apex will send each selected household an initial invitation email. Selected households who have not yet completed the survey, clicked the "unsubscribe" link, or otherwise asked not to be contacted will receive up to two follow-up emails encouraging them to participate. Apex will vary the language in the initial invitation and each follow-up email to appeal to the widest range of respondents and will draw on survey best practices in crafting invitation emails. If this initial outreach effort does not meet Apex's sampling targets, Apex will randomly select additional respondents to receive survey invitations. Apex does not plan to offer an incentive for respondents completing the household survey.

Apex's general survey approach for multifamily property managers and owners will be similar to the approach described for households. Potential respondents will receive an initial email invitation, followed by up to two reminder emails for those who have not yet completed the survey. Apex's survey approach for property managers and owners will differ from the approach for participants in two key ways that reflect the smaller population of property managers and owners and the traditional difficulty energy efficiency researchers have experienced in reaching them:

- Apex will send survey invitations to the full population of property managers and owners, rather than drawing a random sample to receive invitations.
- Apex will offer a $20 electronic gift card as an incentive to property owners and managers who complete the survey. Apex anticipates that this incentive will be sufficient given the brevity of the property manager and owner survey (estimated: 5 minutes).

Appendix F: Survey Guides

Participant Survey Guide

Instrument Information

Table 36: Overview of Data Collection Activity

Descriptor	This Instrument
Instrument Type	Web Survey
Estimated Time to Complete	5-7 minutes

Population Description	Program participants receiving hot water saving fixture measures
Type of Sampling	Stratified random
Contact Sought	Household member knowledgeable about fixtures received
Fielding Firm	Apex Analytics

Table 37: Database Inputs

Field	Description	Values
PA	Name of program administrator	PG&E, Southern California Gas Company, SDG&E, Marin Clean Energy
Program Name	Name of program providing measures	Residential Energy Fitness Program, Home Upgrade Program, LivingWise, etc.
Qty KAerators	Quantity of kitchen aerators received	Numeric (e.g. 1)
Qty BAerators	Quantity of bathroom aerators received	Numeric (e.g. 2)
Qty Showerheads	Quantity of showerheads received	Numeric (e.g. 2)
Qty TSV	Quantity of thermostatic shower valves received	Numeric (e.g. 1)
Part. Month/Year	Month and year in which participant received measures	[MONTH] [YEAR] (e.g. August 2018)

Instrument

Initial Survey Invitation Email

From: <CA Water Fixtures Evaluation feedback@apexanalyticsllc.com>

Subject: Share your experience to help water and energy savings programs

Dear [First Name],

Yours was one of a select group of households that received water saving devices like showerheads and faucet aerators through [**PA**]'s [**Program Name**] in 2018. [**PA**] and the California Public Utilities Commission (CPUC) would like your input and perspectives to understand how to best structure future programs.

Please click on the link below to complete a five-minute survey on your experiences with the water saving devices you received.

[SURVEY LINK]

Apex Analytics, an independent research firm, is conducting this research on behalf of the CPUC. The information gathered will be used solely for research purposes and your individual responses will be kept completely confidential. If you would like to validate the legitimacy of this survey, you may click here { HYPERLINK http://cpuc.ca.gov/validsurvey} or contact the CPUC study manager, Peter Franzese at Peter.Franzese@cpuc.ca.gov. If you have technical difficulties or need assistance completing the survey, please contact Apex Analytics at feedback@apexanalyticsllc.com.

Thank you for helping Californians save energy and water.

Survey Reminder Email

From: <CA Water Fixtures Evaluation feedback@apexanalyticsllc.com>

Subject: Join other Californians to improve water and energy saving programs

Dear [First Name],

A few days ago, we sent you an invitation to participate in an important survey that will help improve water and energy saving programs in California. We have heard from XX households around the state, but we still need your feedback. Will you help us meet our goal of 300 respondents?

Please click on the link below. The survey takes only seven minutes to complete.

[SURVEY LINK]

Apex Analytics, an independent research firm, is conducting this research on behalf of the California Public Utilities Commission (CPUC). The information gathered will be used solely for research purposes and your individual responses will be kept completely confidential. If you would like to validate the legitimacy of this survey, you may click here {HYPERLINK http://cpuc.ca.gov/validsurvey} or contact the CPUC study manager, Peter Franzese at Peter.Franzese@cpuc.ca.gov. If you have technical difficulties or need assistance completing the survey, please contact Apex Analytics at feedback@apexanalyticsllc.com.

Thank you for helping Californians save energy and water.

Final Survey Reminder Email

From: <CA Water Fixtures Evaluation feedback@apexanalyticsllc.com>

Subject: Last chance to share your experience and improve energy and water saving programs

Dear [First Name],

As one of a limited number of households that received water-saving devices from [PA]'s [Program Name], your perspective and experience are important. However,

your time to share them is running out. We need to hear from you by [Date] to include your feedback in an important study that will help the California Public Utilities Commission (CPUC) best guide future energy and water saving programs.

Please click the link below to complete the seven-minute survey.

[SURVEY LINK]

Apex Analytics, an independent research firm, is conducting this research on behalf of the California Public Utilities Commission (CPUC). The information gathered will be used solely for research purposes and your individual responses will be kept completely confidential. If you would like to validate the legitimacy of this survey, you may contact the CPUC study manager, Peter Franzese at Peter.Franzese@cpuc.ca.gov. If you have technical difficulties or need assistance completing the survey, please contact Apex Analytics at feedback@apexanalyticsllc.com.

Thank you for helping Californians save energy and water.

Survey Welcome Page

Thank you for providing feedback about your experience with the water saving devices you received through [**PA**]'s [**Program Name**]. This survey should take about five minutes to complete. When completing the survey, please provide responses that reflect not just yourself but all members of the household that received the water saving devices. Please try to answer all the questions.

Need help?

Apex Analytics is conducting this research on behalf of the California Public Utilities Commission (CPUC). If you have technical difficulties or need assistance completing the survey, please contact Apex Analytics at feedback@apexanalyticsllc.com.

Verification [ASK ALL]

[ASK ALL]

Q1. Our records indicate that your household received the following water-saving devices from [**Program Name**]. Is that correct?

[MATRIX QUESTION – SELECT ONE]

[RANDOMIZE, DISPLAY PICTURES OF EACH MEASURE] Item	1. Yes	2. No, did not receive device	3. Received device, but quantity is incorrect	98 DK
a) [IF QTY KAERATORS > 0] [**Qty KAerators**] kitchen faucet aerators				
b) [IF QTY BAERATORS > 0] [**Qty BAerators**] bathroom faucet aerators				

c) [IF QTY SHOWERHEADS > 0] [**QTY Showerheads**] showerheads				
d) [IF QTY TSV > 0] [**QTY TSV**] thermostatic shower valves				

[IF ALL ITEMS IN Q1=2 OR 98]
Thank you for your time, unfortunately it appears that you are not the type of household we were hoping to reach for our study. We appreciate your willingness to participate. [TERMINATE SURVEY]

[IF ANY ITEM IN Q1=3]
Q2. How many of each device did you receive?

[MATRIX QUESTION – SELECT ONE]

Item	0	1	2	3	4	5	6	7	8	9	10
[IF Q1A=3] Kitchen faucet aerators											
[IF Q1B=3] Bathroom faucet aerators											
[IF Q1C=3] Showerheads											
[IF Q1D=3] Thermostatic shower valves											

[ASK ALL]
Q3. Which of the devices you received from [**Program Name**] are currently installed in your home?

[MATRIX QUESTION – SELECT ONE]

[LOGIC] Item	1. All the devices I received are currently installed	2. Some of the devices I received are currently installed	3. None of the devices I received are currently installed	98 DK
a) [IF QTY KAERATORS >0 AND (Q1A ≠ 2 OR 98)] Kitchen faucet aerators				
b) [IF QTY BAERATORS >0 AND (Q1B ≠ 2 OR 98)] Bathroom faucet aerators				
c) [IF QTY SHOWERHEADS >0 AND (Q1C ≠ 2 OR 98)] Showerheads				
d) [IF QTY TSV >0 AND (Q1D ≠ 2 OR 98)] Thermostatic shower valves				

[IF ANY ITEM IN Q3=2]
Q4. How many of each device you received from [**Program Name**] are currently installed in your home?

[MATRIX QUESTION – NUMERIC RESPONSE]

Item	Enter Quantity	98 DK
[IF Q3A=2] Kitchen faucet aerators (quantity received = QTY)		
[IF Q3B=2] Bathroom faucet aerators (quantity received = QTY)		
[IF Q3C=2] Showerheads (quantity received = QTY)		
[IF Q3D=2] Thermostatic shower valves (quantity received = QTY)		

[CALCULATE INSTALLED QUANTITY VARIABLE:
Installed KAerators = IF Q3A=1, **QTY KAerators**, IF Q3A=3, 0, ELSE Q4A RESPONSE
Installed BAerators = IF Q3B=1, **QTY BAerators**, IF Q3B=3, 0, ELSE Q4B RESPONSE
Installed Showerheads = IF Q3C=1, **QTY Showerhead**, IF Q3C=3, 0, ELSE Q4C RESPONSE
Installed TSV = IF Q3D=1, **QTY TSV**, IF Q3D = 3, 0, ELSE Q4D RESPONSE]

[ASK ALL]
Q5. Who made the decision to install the water saving devices you received from [Program Name] in your home?

[SINGLE RESPONSE]

1. Myself
2. Another household member
3. Landlord
4. Property manager
96. Other, please specify: [OPEN-ENDED RESPONSE]

[IF ANY ITEM IN Q3=2 OR 3]
Q6. Which of the following best describes the devices you received from [**Program Name**] that are not currently installed?

[MATRIX QUESTION – MULTIPLE RESPONSE]

[LOGIC] Item	1. I plan to install it in the next 12 months	2. I do not plan to install it in the next 12 months	3. It was installed but has been removed
[IF Q3A=2 OR 3] Kitchen faucet aerators			
[IF Q3B=2 OR 3] Bathroom faucet aerators			
[IF Q3C=2 OR 3] Showerheads			
[IF Q3D=2 OR 3] Thermostatic shower valves			

[IF ANY ITEM IN Q6=1]
Q7. How likely are you to install the devices you received from [**Program Name**] in the next 12 months?

[MATRIX QUESTION: SCALE]

[LOGIC] Item	1 – Not at all likely	2 – Not Very likely	3 – Somewhat likely	4 – Very likely	5 – Extremely likely
[IF Q6A=1] Kitchen faucet aerators					
[IF Q6B=1] Bathroom faucet aerators					
[IF Q6C=1] Showerheads					
[IF Q6D=1] Thermostatic shower valves					

[IF ANY ITEM IN Q5=1 OR 2, REPEAT FOR ALL ITEMS FOR WHICH Q5=1 OR 2]
Q8. Why haven't you installed the [**Device**] you received from [**Program Name**]?

[MULTIPLE RESPONSE; RANDOMIZE ITEMS]

1. Don't know how to install it
2. Installation is too difficult
3. Just haven't gotten around to it
4. Concerned water pressure will be too low
5. Do not like appearance of device
6. Want features or functionality device does not provide
7. Device is damaged
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[IF ANY ITEM IN Q6=3]
Q9. When did you remove the devices you received from [**Program Name**] that had been installed in your home? Please enter two digits for the month and four digits for the year.

[MATRIX QUESTION – NUMERIC RESPONSE]

[LOGIC] Item	Month (XX)	Year (20XX)
[IF Q6A=3] Kitchen faucet aerators		
[IF Q6B=3] Bathroom faucet aerators		
[IF Q6C=3] Showerheads		
[IF Q6D=3] Thermostatic shower valves		

[IF ANY ITEM IN Q6=3, REPEAT FOR ALL ITEMS FOR WHICH Q6=3]
Q10. Why did you remove the [**Device**] you received from [**Program Name**]?

[MULTIPLE RESPONSE]

1. Water pressure was too low
2. Did not like appearance of device
3. Device did not work properly
4. Wanted features or functionality device did not provide

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

Free-Ridership [IF ANY ITEM IN Q3=1 OR 2 AND Q5 = 1, 2, OR 96]

The next questions focus on what you might have done had you not received the water saving devices from [**Program Name**].

[ASK ALL]
Q11. If you had not received them from [**Program Name**], how likely is it that you would have purchased one or more of each of the following devices for use in your home?

[MATRIX QUESTION – SCALE]

[LOGIC] Item	1 – Very unlikely	2 – Somewhat unlikely	3 – Likely	4 – Somewhat Likely	5 – Very Likely
a) [IF QTY KAERATORS >0 AND (Q1A ≠ 2 OR 98)] Kitchen faucet aerators					
b) [IF QTY BAERATORS >0 AND (Q1B ≠ 2 OR 98)] Bathroom faucet aerators					
c) [IF QTY SHOWERHEADS >0 AND (Q1C ≠ 2 OR 98)] Showerheads					
d) [IF QTY TSV >0 AND (Q1D ≠ 2 OR 98)] Thermostatic shower valves					

[ASK ALL]
Q12. If [**Program Name**] had not provided you with them in 2018, when would you have purchased each of the following devices?

[MATRIX QUESTION – SINGLE RESPONSE]

[LOGIC] Item	1. At the same time or sooner	2. 1 to 24 months later	3. More than 24 months later	4. Never
a) [IF Q11A = 3, 4, OR 5] Kitchen faucet aerators				
b) [IF Q11B = 3, 4, OR 5] Bathroom faucet aerators				
c) [IF Q11C = 3, 4, OR 5] Showerheads				

d) [IF Q11D = 3, 4, OR 5] Thermostatic shower valves				

[IF ANY ITEM IN Q12=2, REPEAT FOR ALL ITEMS FOR WHICH Q12=2]
Q13. How many months later would you have purchased the [**Device**]?

[DROP DOWN QUESTION – SINGLE RESPONSE]

1. Drop down: 0-24 months

[IF ANY ITEM IN Q11=3, 4, OR 5]
Q14. Water fixtures are available in a variety of styles and flow rates. The devices you received from [**Program Name**] save water and energy by reducing flow rates. If you had not received those devices, would the devices you purchased have had…

[MATRIX QUESTION – SINGLE RESPONSE]

[LOGIC] Item	1. A higher flow rate	2. The same flow rate	3. A lower flow rate
a) [IF Q11A = 3, 4, OR 5] Kitchen faucet aerators			
b) [IF Q11B = 3, 4, OR 5] Bathroom faucet aerators			
c) [IF Q11C = 3, 4, OR 5] Showerheads			

Spillover [ASK ALL]

[ASK ALL]
Q15. Has your household purchased any additional water saving fixtures like showerheads or faucet aerators as a result of your experience with the devices you received through [**Program Name**]?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know

[IF Q15=1]
Q16. Which devices did you purchase?

[MULTIPLE RESPONSE]

1. Showerheads
2. Kitchen faucet aerators
3. Bathroom faucet aerators
4. Thermostatic shower valves
5. Other, please specify: _____

[IF Q15=A, REPEAT FOR ALL ITEMS SELECTED IN Q16]

Q17. How many [**Device**] did you purchase?

[SINGLE RESPONSE]

1. 0
2. 1
3. 2
4. 3
5. 4
6. 5
7. 6
8. 7
9. 8
10. 9
11. 10

[IF Q15=1]

Q18. Did your utility install or provide this/these additional water saving devices or give you a rebate to reduce their cost?

[MATRIX QUESTION – SINGLE RESPONSE]

[LOGIC] Item	Yes	No	98 DK
a) [If Q16a≠1 or 98] Showerheads			
b) [If Q16b≠1 or 98] Kitchen faucet aerators			
c) [If Q16c≠1 or 98] Bathroom faucet aerators			
d) [If Q16d≠1 or 98] Thermostatic shower valves			
e) [If Q16e≠1 or 98] [**Open-ended response from Q10**]			

[IF Q15=1]

Q19. How influential was your experience with the devices you received through [**Program Name**] in your decision to purchase additional water saving devices?

[SINGLE RESPONSE]

1. Not at all influential
2. Not very influential
3. Somewhat influential
4. Very influential
5. Extremely influential

Hot Water Usage [ASK ALL]

The following questions will help us understand how much water your household uses.

[ASK ALL]

Q20. Including yourself, how many people in each of the following age ranges currently live in your household?

[MATRIX QUESTION – SINGLE RESPONSE]

	0 people	1 person	2 people	3 people	4 people	5+ people
Under 5 years						
5 to 14 years						
15 to 19 years						
20 to 34 years						
35 to 49 years						
50 to 64 years						
65 years and older						

[ASK ALL]
Q21. How, if at all, has the makeup of your household changed since you received your devices from [**Program Name**] in [**Part. Month/Year**]?

[SINGLE RESPONSE]

1. There are now more people in the household
2. There are now fewer people in the household
3. The number of people in the household has not changed

[IF Q21=1 OR 2]
Q22. Including yourself, how many people in each of the following age ranges lived in your household in [**Part. Month/Year**]?

[MATRIX QUESTION – SINGLE RESPONSE]

	0	1	2	3	4	5+
Under 5 years						
5 to 14 years						
15 to 19 years						
20 to 34 years						
35 to 49 years						
50 to 64 years						
65 years and older						

[ASK ALL]
Q23. How many bedrooms are in your home?

[SINGLE RESPONSE]

1. Studio

2. 1
3. 2
4. 3
5. 4
6. 5
7. 6 or more

[ASK ALL]
Q24. How many full bathrooms (bathrooms with a tub and/or a shower) are in your home?

[SINGLE RESPONSE]

1. 0
2. 1
3. 2
4. 3
5. 4
6. 5+

[ASK ALL]

Q25. How many half baths (bathrooms with a sink and toilet only) are in your home?

[SINGLE RESPONSE]

1. 0
2. 1
3. 2
4. 3
5. 4
6. 5+

[ASK ALL]
Q26. How many bathroom faucets do you have in your home?

[SINGLE RESPONSE]

1. 0
2. 1
3. 2
4. 3
5. 4
6. 5
7. 6
8. 7
9. 8
10. 9
11. 10

Q27. How many kitchen faucets do you have in your home?

[SINGLE RESPONSE]

1. 0

2. 1
3. 2
4. 3
5. 4
6. 5
7. 6
8. 7
9. 8
10. 9
11. 10

Q28. How many showerheads do you have in your home?

[SINGLE RESPONSE]

1. 0
2. 1
3. 2
4. 3
5. 4
6. 5
7. 6
8. 7
9. 8
10. 9
11. 10

[IF INSTALLED SHOWERHEADS>0]

Q29. About how many showers do people in your household take each day using the *most used* showerhead you received from [**Program Name**]?

[SINGLE RESPONSE]

1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10+
11. N/A

[IF INSTALLED SHOWERHEADS>1]

Q30. About how many showers do people in your household take each day using the *second most used* showerhead you received from [**Program Name**]?

[SINGLE RESPONSE]

1. 1

2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10+
11. N/A

[IF INSTALLED SHOWERHEADS >2]

Q31. About how many showers do people in your household take each day using the *third most used* showerhead you received from [**Program Name**]?

[SINGLE RESPONSE]

1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 10+
11. N/A

[IF Q3C=1 OR 2]

Q32. The typical shower length for people in the United States is approximately 8 minutes. On average, do people in your household typically take showers that are:

[SINGLE RESPONSE]

1. Much longer than typical (longer than 12 minutes)
2. A little longer than typical (9-12 minutes)
3. About typical (7-9 minutes)
4. A little shorter than typical (5-7 minutes)
5. Much shorter than typical (less than 5 minutes)

[IF INSTALLED KAERATORS>0]

Q33. What portion of your household's dirty dishes do you or others hand-wash?

[SINGLE RESPONSE]

1. Hand-wash all dishes, do not have or do not use an automatic dishwasher
2. Hand-wash most dishes, rarely use automatic dishwasher
3. Hand-wash and machine-wash dishes about equally
4. Machine-wash most dishes, hand-wash relatively few
5. Machine-wash all dishes, do not hand-wash

[IF Q33=3, 4, OR 5]

Q34. How thoroughly do you or others in your household typically rinse dirty dishes before putting them in the dishwasher?

[SINGLE RESPONSE]

1. Do not rinse dishes before putting them in dishwasher
2. Give dishes a light rinse before putting them in dishwasher, some food residue may remain
3. Thoroughly rinse dishes before putting them in dishwasher, little or no food residue remains

Demographics [ASK ALL]

[ASK ALL]
Q35. Do you own or rent your home?

[SINGLE RESPONSE]

1. Own
2. Rent
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK ALL]
Q36. Which of the following best describes your home?

[SINGLE RESPONSE]

1. Single-family, detached house
2. Townhouse or row house (shares one or more exterior walls with other units, but not roof or floor)
3. Apartment or condominium in building with 2-4 units
4. Apartment or condominium in building with 5 or more units
5. Mobile home
96. Other, please specify: [OPEN-ENDED RESPONSE]

[ASK ALL]
Q37. Do you primarily use gas, electricity, or some other fuel for water heating in your home?

[SINGLE RESPONSE]

1. Natural gas (from gas utility)
2. Electricity
3. Bottled gas (propane, LP)
4. Solar hot water
96. Other, please specify: [OPEN-ENDED RESPONSE]
97. I do not have a water heater in my home
98. Don't know

[IF Q37≠4, 97, OR 98]
Q38. What type of water heater does your home primarily use?

[SINGLE RESPONSE – INCLUDE IMAGES]

1. Storage/tank
2. Tankless

3. [IF Q37=2] Heat pump
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK ALL]
Q39. How old is your primary water heater?

[SINGLE RESPONSE]

1. Less than one year
2. 4-8 years
3. 9-13 years
4. 14-30 years
5. Over 30 years
98. Don't know

[ASK ALL]
Q40. Please select the range that best describes your household's total annual income in 2019.

[SINGLE RESPONSE]

1. Less than $10,000
2. $10,000 to $14,999
3. $15,000 to $24,999
4. $25,000 to $34,999
5. $35,000 to $49,999
6. $50,000 to $74,999
7. $75,000 to $99,999
8. $100,000 to $149,999
9. $150,000 to $199,999
10. $200,000 or more
98. Don't know

Property Manager Survey Guide

Instrument Information

Table 38: Overview of Data Collection Activity

Descriptor	This Instrument
Instrument Type	Web Survey
Estimated Time to Complete	TBD – likely 5-10 minutes
Population Description	Property managers receiving hot water saving fixture measures for their multifamily properties
Type of Sampling	Stratified random
Contact Sought	Property manager knowledgeable on the decision to participate

Fielding Firm	Apex Analytics

Table 39: Database Inputs

Field	Description	Values
PA	Name of program administrator	PG&E, Southern California Gas Company, SDG&E, Marin Clean Energy
Program Name	Name of program providing measures	Residential Energy Fitness Program, Home Upgrade Program, LivingWise, etc.
Qty KAerators	Quantity of kitchen aerators received	Numeric (e.g. 1)
Qty BAerators	Quantity of bathroom aerators received	Numeric (e.g. 2)
Qty Showerheads	Quantity of showerheads received	Numeric (e.g. 2)
Qty TSV	Quantity of thermostatic shower valves received	Numeric (e.g. 1)

Instrument

Initial Survey Invitation Email

From: <CA Water Fixtures Evaluation feedback@apexanalyticsllc.com>

Subject: Share your experience to help water and energy savings programs

Dear [First Name],

Your property at [**Address 1**] was one of a select group of properties that received water saving devices like showerheads and faucet aerators through [**PA**]'s [**Program Name**] in 2018. [**PA**] and the California Public Utilities Commission (CPUC) would like your input and perspectives to understand how to best structure future programs.

Please click on the link below to complete a 5 minute survey on your experiences with the program that provided the water saving devices. As a thank-you for your participation, you will receive a $20 electronic gift card that you can redeem at a variety of retailers.

[SURVEY LINK]

The CPUC has contracted with Apex Analytics, an independent research firm, to administer this survey. The information gathered will be used solely for research purposes and your individual responses will be kept completely confidential. If you would like to validate the legitimacy of this survey, you may visit http://cpuc.ca.gov/validsurvey or contact the CPUC study manager, Peter Franzese at

Peter.Franzese@cpuc.ca.gov. If you have technical difficulties or need assistance completing the survey, please contact Apex Analytics at feedback@apexanalyticsllc.com.

Thank you for helping Californians save energy and water.

Survey Reminder Email

From: <CA Water Fixtures Evaluation feedback@apexanalyticsllc.com>

Subject: Join other Californians to improve water and energy saving programs

Dear [First Name],

A few days ago, we sent you an invitation to participate in an important survey that will help improve water and energy saving programs in California. We have heard from XX property owners and managers around the state, but we still need your feedback. Will you help us meet our goal of 60 respondents?

Please click on the link below. The survey takes only 5 minutes to complete, and as a thank you for your participation, you will receive a $20 electronic gift card that you can redeem at a variety of retailers.

[SURVEY LINK]

The California Public Utilities Commission (CPUC) has contracted with Apex Analytics, an independent research firm, to administer this survey. The information gathered will be used solely for research purposes and your individual responses will be kept completely confidential. If you would like to validate the legitimacy of this survey, you may visit http://cpuc.ca.gov/validsurvey or contact the CPUC study manager, Peter Franzese at Peter.Franzese@cpuc.ca.gov. If you have technical difficulties or need assistance completing the survey, please contact Apex Analytics at feedback@apexanalyticsllc.com.

Thank you for helping Californians save energy and water.

Final Survey Reminder Email

From: <CA Water Fixtures Evaluation feedback@apexanalyticsllc.com>

Subject: Last chance to share your experience and improve energy and water saving programs

Dear [First Name],

As the owner or manager of one of a limited number of properties that received water-saving devices from [PA]'s [Program Name], your perspective and experience are important. However, your time to share them is running out. We need to hear from you by [Date] to include your feedback in an important study that will help the

California Public Utilities Commission (CPUC) best guide future energy and water saving programs.

Please click the link below to complete the X-minute survey. To thank you for your time, we are offering a $20 electronic gift card that you can redeem at a variety of retailers.

[SURVEY LINK]

The California Public Utilities Commission (CPUC) has contracted with Apex Analytics, an independent research firm, to administer this survey. The information gathered will be used solely for research purposes and your individual responses will be kept completely confidential. If you would like to validate the legitimacy of this survey, you may visit http://cpuc.ca.gov/validsurvey or contact the CPUC study manager, Peter Franzese at Peter.Franzese@cpuc.ca.gov. If you have technical difficulties or need assistance completing the survey, please contact Apex Analytics at feedback@apexanalyticsllc.com.

Thank you for helping Californians save energy and water.

Survey Welcome Page

Thank you for providing feedback about your experience with the water saving devices your property at [**Address 1**] received through [**PA**]'s [**Program Name**]. This survey should take about X minutes to complete.

Need help?

The CPUC has contracted with Apex Analytics to administer this survey. If you have technical difficulties or need assistance completing the survey, please contact Apex Analytics at support@apexanalyticsllc.com.

Screening [ASK ALL]

[ASK ALL]

S1. Our records indicate that [**IOU**]'s [**Program Name**] provided water saving devices like showerheads and faucet aerators as part of the energy efficiency upgrades completed in [**Part. Month/Year**] at your property at [**Address_1**]. Are you familiar with those upgrades?

[SINGLE RESPONSE]

1. Yes
2. No

[IF S1=2]

S2. Who else could we contact that might be more familiar with the energy efficiency improvements [**Program Name**] supported at [**Address_1**]?

[SINGLE RESPONSE]

1. Property manager

2. Onsite facilities management staff (e.g. super)
3. Building owner or owner's staff member
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[IF S2=1, 2, 3, OR 96]
S3. Please provide contact information so we can reach out to that person directly:

2. Name: [OPEN-ENDED RESPONSE]
3. Email: [OPEN-ENDED RESPONSE]
4. Phone: [OPEN-ENDED RESPONSE]

[ASK ALL]
S4. Who was the primary decision-maker that agreed to the energy efficiency improvements [**Program Name**] supported at [**Address_1**]?

[SINGLE RESPONSE]

1. Me
2. Someone else from my organization
3. The residents at [**Address 1**]
4. Homeowner's Association
96. Other, please specify: [OPEN-ENDED RESPONSE]

[IF S1=2 OR S4=3]
S5. We appreciate your willingness to support our research. Unfortunately, we need to hear from people who are familiar with the energy upgrades [**Program Name**] provided. Thank you very much for your time and information.

[IF S4 = 4]

S6. Please provide contact information so we can reach out to a representative of the Homeowner's Association directly:

1. Name: [OPEN ENDED RESPONSE]
2. Email: [OPEN ENDED RESPONSE]
3. Phone: [OPEN ENDED RESPONSE]

Verification [ASK ALL]

[ASK ALL]
Q41. Our records indicate that [**IOU**]'s [**Program Name**] provided the following water-saving devices to your properties. Is that correct?

[MATRIX QUESTION – SELECT ONE]

[RANDOMIZE, DISPLAY PICTURES OF EACH MEASURE] Item	1. Yes	2. No, did not receive device	3. Received device, but quantity is incorrect	4. Received device, but unsure of quantity	98 DK
a) [IF QTY KAERATORS > 0] [**Qty KAerators**] kitchen faucet aerators					

b) [IF QTY BAERATORS > 0] [**Qty BAerators**] bathroom faucet aerators					
c) [IF QTY SHOWERHEADS > 0] [**QTY Showerheads**] showerheads					
d) [IF QTY TSV > 0] [**QTY TSV**] thermostatic shower valves					

[IF ANY ITEM IN Q1=3]
Q42. How many of each device did you receive?

[MATRIX QUESTION – NUMERIC RESPONSE]

Item	Enter Quantity
[IF Q1A=3] Kitchen faucet aerators	
[IF Q1B=3] Bathroom faucet aerators	
[IF Q1C=3] Showerheads	
[IF Q1D=3] Thermostatic shower valves	

[ASK ALL]
Q43. Our records indicate that there are [**n_units**] individual dwelling units in the properties supported by [**IOU**]. Is that correct?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know

Q44. How many individual dwelling units are there throughout your properties supported by [**IOU**]?

[SINGLE RESPONSE]

1. [NUMERIC RESPONSE]

[ASK ALL]
Q45. How many of the residential units at your properties received water-saving devices as part of the energy efficiency improvements you made through [**Program Name**] in [**Part. Month/Year**]?

[SINGLE RESPONSE]

1. [NUMERIC RESPONSE]

[ASK ALL]
Q46. To the best of your knowledge, have any of the devices you received from [**Program Name**] been removed from your properties?

[SINGLE RESPONSE]

1. Yes
2. No

98. Don't know

[IF Q46=1]
Q47. Which of the devices you received from [**Program Name**] have been removed from your properties?

[MATRIX QUESTION – SELECT ONE]

[LOGIC] Item	1. None of the devices I received have been removed	2. Some of the devices I received have been removed	3. All of the devices I received have been removed	98 DK
a) [IF QTY KAERATORS >0 AND (Q1A ≠ 2 OR 98)] Kitchen faucet aerators				
b) [IF QTY BAERATORS >0 AND (Q1B ≠ 2 OR 98)] Bathroom faucet aerators				
c) [IF QTY SHOWERHEADS >0 AND (Q1C ≠ 2 OR 98)] Showerheads				
d) [IF QTY TSV >0 AND (Q1D ≠ 2 OR 98)] Thermostatic shower valves				

[IF ANY ITEM IN Q3=2]
Q48. How many of the devices you received from [**Program Name**] have been removed from your properties?

[MATRIX QUESTION – NUMERIC RESPONSE]

Item	Enter Quantity
[IF Q3A=2] Kitchen faucet aerators	
[IF Q3B=2] Bathroom faucet aerators	
[IF Q3C=2] Showerheads	
[IF Q3D=2] Thermostatic shower valves	

[CALCULATE INSTALLED QUANTITY VARIABLE:
Installed KAerators = IF Q3A=3, 0, ELSE: (IF Q1A=1, **QTY KAerators**, IF Q1A=2, 0, ELSE Q42A RESPONSE) – Q4A RESPONSE
Installed BAerators = IF Q3B=3, 0, ELSE: (IF Q1B=1, **QTY BAerators**, IF Q1B=2, 0, ELSE Q42B RESPONSE) – Q4B RESPONSE
Installed Showerheads = IF Q3C=3, 0, ELSE: (IF Q1C=1, **QTY Showerheads**, IF Q1C=2, 0, ELSE Q42C RESPONSE) – Q4C RESPONSE
Installed TSV = IF Q3D=3, 0, ELSE: (IF Q1D=1, **QTY TSV**, IF Q1D=2, 0, ELSE Q42D RESPONSE) – Q4D RESPONSE]

[IF ANY ITEM IN Q3=2 OR 3]
Q49. When did you first remove one or more of the devices you received from [**Program Name**] that had been installed at your properties? Please enter two digits for the month and four digits for the year.

[MATRIX QUESTION – NUMERIC RESPONSE]

[LOGIC] Item	Date first device removed	
	Month (XX)	Year (20XX)
[IF Q3A=2 OR 3] Kitchen faucet aerators		
[IF Q3B=2 OR 3] Bathroom faucet aerators		
[IF Q3C=2 OR 3] Showerheads		
[IF Q3D=2 OR 3] Thermostatic shower valves		

Q50. When did you most recently remove one of more of the devices you received from [**PROGRAM NAME**] that had been installed at your properties? Please enter two digits for the month and four digits for the year.

[MATRIX QUESTION – NUMERIC RESPONSE]

[LOGIC] Item	Date most recent device removed	
	Month (XX)	Year (20XX)
[IF Q3A=2 OR 3] Kitchen faucet aerators		
[IF Q3B=2 OR 3] Bathroom faucet aerators		
[IF Q3C=2 OR 3] Showerheads		
[IF Q3D=2 OR 3] Thermostatic shower valves		

[IF ANY ITEM IN Q3=2 OR 3, REPEAT FOR ALL ITEMS FOR WHICH Q3=2 OR 3]

Q51. Why did you remove one or more of the [**Device**] you received from [**Program Name**]?

[MULTIPLE RESPONSE]

1. Water pressure was too low
2. Did not like appearance of device
3. Device did not work properly
4. Wanted features or functionality device did not provide
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

Free-Ridership [IF ANY ITEM IN Q3=1 OR 2]

The next questions focus on what you might have done had you not received the water saving devices from [**Program Name**].

[ASK ALL]
Q52. If you had not received them from [**Program Name**], how likely is it that you would have purchased and installed the following devices in your property at your properties?

[MATRIX QUESTION – SCALE]

[LOGIC] Item	1 – Very unlikely	2 – Somewhat unlikely	3 – Neither likely nor unlikely	4 – Somewhat Likely	5 – Very Likely
a) [IF QTY KAERATORS >0 AND (Q1A ≠ 2 OR 98)] Kitchen faucet aerators					
b) [IF QTY BAERATORS >0 AND (Q1B ≠ 2 OR 98)] Bathroom faucet aerators					
c) [IF QTY SHOWERHEADS >0 AND (Q1C ≠ 2 OR 98)] Showerheads					
d) [IF QTY TSV >0 AND (Q1D ≠ 2 OR 98)] Thermostatic shower valves					

[ASK ALL]
Q53. If [**Program Name**] had not provided you with them in [**Part. Month/Year**], when would you have purchased each of the following devices?

[MATRIX QUESTION – SINGLE RESPONSE]

[LOGIC] Item	1. At the same time or sooner	2. 1 to 24 months later	3. More than 24 months later	4. Never	DK
a) [IF Q11A = 3, 4, OR 5] Kitchen faucet aerators					
b) [IF Q11B = 3, 4, OR 5] Bathroom faucet aerators					
c) [IF Q11C = 3, 4, OR 5] Showerheads					
d) [IF Q11D = 3, 4, OR 5] Thermostatic shower valves					

[IF ANY ITEM IN Q12=2, REPEAT FOR ALL ITEMS IN Q11=2]
Q54. How many months later would you have purchased the [**DEVICE**]?

[DROP DOWN – SINGLE RESPONSE]

1. 0-24 MONTHS [SELECT ONE]

[IF ANY ITEM IN Q11=3, 4, OR 5]

Q55. Water fixtures are available in a variety of flow rates. The devices you received from [**Program Name**] save water and energy by reducing flow rates. If you had not received those devices, would the devices you purchased have had…

[MATRIX QUESTION – SINGLE RESPONSE]

[LOGIC] Item	1. A higher flow rate	2. The same flow rate	3. A lower flow rate
a) [IF Q11A = 3, 4, OR 5] Kitchen faucet aerators			
b) [IF Q11B = 3, 4, OR 5] Bathroom faucet aerators			
c) [IF Q11C = 3, 4, OR 5] Showerheads			

[IF ANY ITEM IN Q12=1, 2, OR 3]

Q56. If you had not received them from [**Program Name**], how many of each type of water saving device would you have purchased and installed at your properties?

[MATRIX QUESTION – NUMERIC RESPONSE]

[LOGIC] Item	Enter Quantity:
a) [IF Q12A = 1, 2, OR 3] Kitchen faucet aerators	
b) [IF Q12B = 1, 2, OR 3] Bathroom faucet aerators	
c) [IF Q12C = 1, 2, OR 3] Showerheads	
d) [IF Q12D = 1, 2, OR 3] Thermostatic shower valves	

[ ]

Q57. Your responses to the previous questions indicate that you would have installed the following water-saving devices absent [**PROGRAM NAME**]. For each type of device, please explain, in your own words, why you would have made that decision?

[**MATRIX QUESTION – OPEN ENDED RESPONSE**]

	Reasoning for decision:
Kitchen faucet aerators	
Bathroom faucet aerators	
Showerheads	
Thermostatic shower valves	

Demographics [ASK ALL]

[ASK ALL]

Q58. Which of the following best describes your properties that received water-saving devices from [IOU]?

[SINGLE RESPONSE]

1. Single-family detached home(s); not attached to another home
2. Townhouses or row houses (share one or more exterior walls with other units, but not roof or floor)
3. Apartment or condominium building
4. Mobile home(s)
96. Other, please specify: [OPEN-ENDED RESPONSE]

[ASK ALL]

Q59. Which of the following housing types best describe the properties that received water-saving devices from [IOU]? Select all that apply.

[MULTIPLE RESPONSE]

1. Most/all units are income qualified
2. Most/all units are senior housing
3. Most/all units are student housing
4. Most/all units are temporary or employee or migrant housing
5. Most/all units are market rate housing
6. Mix of two or more housing types
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK ALL]

Q60. Do the residential units at your properties which received water-saving devices from [IOU] primarily use gas, electricity, or some other fuel for water heating?

[SINGLE RESPONSE]

1. Natural gas (from gas utility)
2. Electricity
3. Bottled gas (propane, LP)
4. Solar hot water
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK ALL]

Q61. Is there an individual water heater for each residential unit at properties which received water-saving devices from [IOU], or do units receive hot water from one or more central water heaters or boilers serving multiple units?

[SINGLE RESPONSE]

1. Individual water heater for each unit
2. Central water heater or boiler
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[IF Q37≠4, 97, OR 98 AND Q61=1]

Q62. What type of water heaters do the residential units that received water-saving devices from [**IOU**] primarily use?

[SINGLE RESPONSE]

1. Storage/tank
2. Tankless
3. [IF Q37=2] Heat pump
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK ALL]

Q63. On average, how old is/are the water heater(s) at your properties that received water-saving devices?

[SINGLE RESPONSE]

1. Less than one year
2. 4-8 years
3. 9-13 years
4. 14-30 years
5. Over 30 years
98. Don't know

[ASK ALL]

Q64. Approximately what years were the properties that received water-saving devices built?

[SINGLE RESPONSE]

1. Before 1940
2. 1940-1969
3. 1970-1979
4. 1980-1989
5. 1990-1999
6. 2000-2009
7. 2010-2019
98. Don't know

We appreciate you taking the time to help improve water and energy-saving programs in California. To thank you for your time, we will email you a $20 electronic gift card that can be redeemed at a variety of retailers. Please enter the email address where you would like to receive your gift card as well as your first and last name. You should receive the electronic gift card within the next 2-3 business days from our partners at Tango (noreply@tangocard.com).

Email	
First Name	
Last Name	

Appendix G: Response to Comments

Table 40: Response to Comments

Comment ID	Commenter	Page	Comment/Feedback/Change Requested	Evaluator's Response
1	PG&E		Our first reaction to the report was the low response rates targeted for the household surveys directed to reported recipients of the water-saving measures (see Table 5). The targeted response rates for measures supplied directly to end-user customers supplied fixtures via direct mail are on the order of 0.1%, with general direct install measures (for PG&E) at 2%. We acknowledge that APEX set the targets due to its experience in surveying similar populations in "low involvement" topics, and that your completion rate forecasts were accurate (also shown in Table 5). That said, as your report indicates, the low completion rates hamstring your ability to draw the types of insights for which your surveys were designed, and, with higher response rates, would have provided valuable insights for future program cycles and to future program implementers.	We set the targeted survey sample sizes to obtain a sample that would provide a reasonable degree of statistical confidence and precision within each program delivery approach. In a large population, like the population of households receiving water fixtures by direct mail, even a sample that is relatively small in proportion to the population can provide statistical confidence and precision. Our sample of 95 direct mail respondents from a population of 522,021 (from Table 5/Table 9 in the updated version) is sufficient for greater than 90% confidence with 10% precision, meaning that, in more than 90% of equivalently-sized samples from the same population, an estimate for a given value derived from the sample will be within 10% of the true value in the population. A 90%/10% confidence/precision level is an accepted standard for justifiable results and the achieved sample size in no way hindered our results or our confidence in them. These confidence and precision estimates assume a random sample that is not systematically different in some relevant way from the population as a whole. We sought a sample that represented all PAs to ensure geographical representation and that adequately represented each measure type. In addition, our analysis of household and demographic factors in Section 5 shows that both our overall sample and the direct mail respondents in particular, closely parallel California's population in household and demographic factors including tenure (own/rent), distribution of dwelling types, water heater fuel, and household size. These findings do not indicate a systematic bias in our sample.

				Table 13 in the updated version lists household survey response rates. The response rate for direct mail programs in particular (2%) is considerably larger than the proportion of survey respondents to all direct mail participants because we sent survey invitations to a random sample of direct mail participants. As the report notes, the response rates in Table 13 are consistent with our experience with general population web surveys and web surveys focused on relatively low-engagement measures.

2	PG&E		First, in light of California investor-owned utilities movement to a third party implementation model, could you suggest ways that program designs incorporating "embedded evaluation" could bolster household survey completion rates in the future?	As part of their "embedded evaluation" efforts, third party program designs could include "fast feedback" surveys, which reach out to participants with basic satisfaction, installation, and free-ridership questions shortly after their participation. In our experience, this type of early and often feedback can enable programs to adjust implementation strategies in real time. These types of more immediate survey efforts could also help increase respondents' awareness of recieving the measures due to the shorter-term recollection required. Some follow-up surveys would still be necessary to assess installation rates over a longer timeframe. We recommend aligning fast feedback survey batteries with those used in this evaluation to ensure replicable results.
3	PG&E		Second, given your perspective gained as experienced evaluators, can you suggest ways to leverage or "bundle" direct-install program delivery to engage end-user participants so that household and/or demographic factors that may impact a) hot water usage, b) installation rates, and c) fixture removal can be understood and leveraged to improved program targeting and design more quickly than is possible today given the evaluation model in place?	An analysis of the relationship between household or demographic factors and hot water usage, installation rates, or fixture removal was beyond the scope of this evaluation. However, going forward under a third-party implementation model that incorporates embedded evaluation, it may be worthwhile to consider implementing a brief follow-up survey one year after measure delivery to assess installation rates in addition to a more immediate fast feedback survey to gather satisfaction and free ridership data. These surveys could also gather household and demographic data, or findings could be linked to household and demographic data gathered through the implementation process, to allow for analysis to support more effective household targeting.

4	PG&E		Our second reaction was that none of the 56 property managers and owners participating in PG&E's Manufactured Home Direct Install Program responded to the Apex survey (see Table 10). This lack of response, in spite of multiple attempts by email, additional attempts to a subset by telephone (presumably to most if not all of the ones participating in PG&E's program), and the offering of a $20 gift card is a concern and leads us to our second and final set of questions.	Four Property Owners and Managers from PG&E's Manufactured Home Direct Install program responded to the Property Manager and Owner survey invitation. Three of those screened out (one was not aware of the improvements to their property, and two reported the residents had been the primary decision-makers). The fourth dropped out early in the survey. Property owners and managers from PG&E's Manufactured Home Direct Install program were not included in the phone follow-up because the phone numbers provided in PG&E's response to our data request appeared to correspond to the residents, rather than the property owners and managers. We will add a footnote clarifying this.
5	PG&E		Third, what suggestions do you have to increase the response rates to the Property Manager and Owner Survey Sample generally?	In our experience, property owners and managers have been a difficult population to reach in multiple evaluation efforts. As a result, it is important that evaluators plan for these challenges and follow best practices for survey outreach, as we attempted to do with this survey, using incentives appropriately, making multiple attempts to contact respondents, and using best practices in invitation language. Better contact information might improve response rates to future survey efforts relative to this one: The program datasets Apex received in response to our data requests did not consistently identify property owners and managers and distinguish them from individual household participants. Apex identified property owners and managers based on factors like the number of site contacts associated with each entity and the number of measures received, but there was some uncertainty in this assessment. If program implementers could track and report contact information for the property owner and manager individuals that were most closely involved in measure delivery, evaluators could better target outreach efforts.

6	PG&E		Fourth, what suggestions do you have to increase the response rates of the participants of the Manufactured Home Direct Install Program, if any?	Household participants in the Manufactured Home Direct Install program had a 5% response rate to the household survey. A variety of strategies, including offering incentives and conducting phone follow-up could increase this response rate, although they would increase the cost of the survey effort. As noted above, "fast feedback" type survey efforts conducted in an embedded evaluation framework have also achieved higher response rates.
7	PG&E		Fifth, are you aware of any water-saving measure or similar utility programs that require completion of similar surveys as a requirement of program participation, and if so, what is the effect on both the rate of, and quality of, survey participation?	We are not aware of similar programs that require survey participation. Even if survey completion were a participation requirement, it is unlikely that all participants would respond to a survey invitation. Nonetheless, two elements may help to improve survey response, regardless of whether the survey is required: 1) The program clearly informing participants at the time of participation to expect a survey invitation and encouraging them to participate, and 2) conducting surveys close to the time of participation.