Do Touch That Dial! How Satisfied Were You With That Tier II Power Strip?

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ABSTRACT

The next generation of load controlling power strips is here and utility efficiency programs are a natural conduit for increasing uptake. But even with the promise of higher energy savings compared to their predecessors, a cost-effective, direct-install approach for Tier 2 power strips presents a high hurdle for programs. Though a retail buy-down delivery model may work in the future, we do not yet have sufficient evidence about Tier 2 installation rates, device persistence, or customer satisfaction to provide utilities with a sense of risk and continued performance.

Building upon a successful direct-install campaign to better understand the energy savings potential of these devices, PG&E explored a retail delivery model in 2017. By offering Tier 2 products at a discount to over 1,000 select PG&E customers and following up with a 2-month post-install survey, we were able to answer critical questions needed to assess the cost-effectiveness and feasibility of a future utility program retail delivery model. This paper will explore the Tier 2 promotion and survey methodology and present findings from the post-install survey to help answer several important program specific questions, such as:

- What was the initial installation rate and persistence over time?
- What reasons were given for removing the device over the 2-month post-install period?
- How easy was the installation using the manufacturer provided instructions?
- How satisfied were customers overall with the power strip?
- Is there a relationship between customer demographics and persistence?

Background

Energy saving Advanced Power Strips (APSs) have been available for almost a decade in a variety of styles and configurations. The first generation of load sensing power strips (Tier 1) sought to reduce energy waste by limiting power to multiple devices through a single control outlet. In the case of an entertainment center, the TV commonly served as the control outlet device (i.e. always receiving power) with peripheral devices such as stereos, DVD players, game consoles, etc. powered down when the TV was turned off. Savings from Tier 1 devices were limited to the reduction of parasitic losses of each unique controlled device. Utility programs promoting the Tier 1 APS devices reported experiencing highly variable savings from site to site based on a variety of factors, including the number of devices connected, the vintage of the devices, the potential for the user to move plugs, and the varying usage patterns of each device.

Initially limited to pilot studies, utility programs conducted increasingly larger pilot programs and subsequent evaluations to better understand the energy savings potential on a larger scale and reduce the site-to-site variability. However, the variability in energy savings due to the mix of devices in the home, the naturally evolving efficiency of electronic devices, and the overall persistence of the APS device resulted in uncertainty about the long-term use of Tier 1 APS devices as a stable resource for utility efficiency programs.

Over the past several years, Tier 2 APS devices began appearing in utility pilot programs and program incentive offerings. The Tier 2 APS saves additional energy and peak demand over

the Tier 1 APS by fully turning off AV systems that have been left on but are not being actively used. Depending on the specific manufacturer, a Tier 2 APS may use a combination of infrared, occupancy, and power sensors to establish when a user is present. Control logic and a countdown timer within the APS are used to determine when it is appropriate to power down the controlled outlets. These devices also provide several uncontrolled outlets that can be used to support equipment that should always remain on. These outlets are commonly reserved for equipment such as DVR boxes that record programming even when an occupant is not present, or cable modems which remain powered on at all times. In this way, the APS provides surge protection for these devices in addition to reducing energy waste of the other devices plugged into the controlled outlets.

Advanced Power Strip Utility Delivery Models

For many utility programs, a direct-install approach has often been the first delivery channel explored for Tier 2 APS devices as it increases the chances of correct device installation as well as ensures enough peripheral devices are plugged in to provide reasonable energy savings. While this approach helps control for installation variables, it comes at a significant cost to the program to deploy. At the time of writing, retail costs for base model Tier 2 APS devices ranged between $70 and $80 each. Though utility programs commonly obtain wholesale pricing at roughly 50% of retail cost, the added cost of a program implementer to install the APS can lead to a less cost-effective resource overall, especially given the variability of savings that can exist from site to site. Though the site-specific variability is difficult to control, utility programs have been eager to use a self-install (i.e. retail) delivery model to remove the implementation-cost burden and realize more cost-effective savings from the Tier 2 APS.

Tier 2 APS Energy Savings & Direct-Install Survey Results

Prior M&V studies indicated that Tier 2 APS devices result in both energy savings and peak demand reduction by reducing standby loads from audio and visual (AV) equipment. Furthermore, a recent field trial (Valmiki and Corradini 2015) conducted on 42 residential homes demonstrated the energy savings from these devices far surpasses the savings experienced by Tier 1 devices, making them a more attractive utility program resource for addressing AV end-use device consumption. A follow-up study (Valmiki and Corradini 2016) explored savings on 98 residential homes and found similar energy and demand reduction potential to the 2015 study. Results from these studies demonstrated that Tier 2 devices can save between 110-125 kWh/yr in the average home depending on the type of APS device installed.

Coupled with the 2016 field study was a field placement survey conducted on over 200 homes in the SDG&E service territory. The study sought to gather feedback from customers on overall satisfaction, likes and dislikes with the Tier 2 APS device, household demographics, persistence, and reactions to unwanted shutdowns. Findings from a follow-up 10-minute email survey indicated that persistence was high (84%) with slightly lower persistence (78%) from customers who experienced unwanted shutdowns. (Unwanted shutdowns were also the primary reason given by respondents for removing the APS.) The survey also indicated that households with retired members tended to have lower persistence rates compared to those without. While overall satisfaction with the APS was high (rating a 5.2 on a 7 point scale), only 67% stated they either have or would recommend the device to a family or friend with a similar correlation between satisfaction and unwanted shutdowns.

Self-Install Promotional Offering & Post-Install Survey

Based on the survey and field trial findings from the direct-install field study, the utility was interested to know if a self-install Tier 2 APS program would be successful at obtaining savings at a reduced cost to the program. Our team worked with the utility to develop a promotional offering coupled with a post-installation survey. Our agreed-upon metric for a successful direct-install program design would be a high initial install rate, a high persistence rate, and customers who were highly satisfied with the device. We would use findings from the post-installation survey to provide recommendations to the program for possible future incentive programs and target demographics, as well as to troubleshoot any common installation issues.

To better understand customer satisfaction and purchase patterns related to the APS through a self-install delivery model, we worked with the program to develop the promotional offering. The goal of the promotion was to sell approximately 1,000 heavily discounted Tier 2 APS devices to targeted customers via an online sales platform. Through this pilot, the utility program sought to accomplish three important advances:

- Identify new savings opportunities and delivery channels for the program portfolio
- Demonstrate the value of an online sales platform in selling the APS
- Gauge customer satisfaction associated with the APS through a post-installation survey

The materials developed for the promotion were aimed to support sales, product installation, and provide installation reminders. The key messaging platforms highlighted were:

- The Tier 2 APS devices are simple to install and use
- The utility is bringing their customers a valuable limited time offer of $10 ($80 value)
- Using the Tier 2 APS can help you manage energy waste, automatically turn off unused devices, and provide premium surge protection

The program targeted this promotion to “Gadget Family” and “Way Wired Persona” demographic groups within the utility’s customer segments. Previous demographic studies indicated these groups were likely receptive to purchasing an APS and would likely utilize the device once installed. The characteristics of both target audiences include:

Table 1. Target Audience Characteristics

Gadget Family Characteristics	**Way-Wired Characteristics**
Most interested in purchasing a Tier 2 APS	Savvy about energy use and utility offers
Have a high interest in electronics	Affluent, established households
Are financially secure	Have higher utility bills
Are digitally fluent	Have used utility rebates in the past
Tend to have children in the home	Tend to be enrolled in bill e-payment methods
Homes are energy inefficient	
Tend to be homeowners	

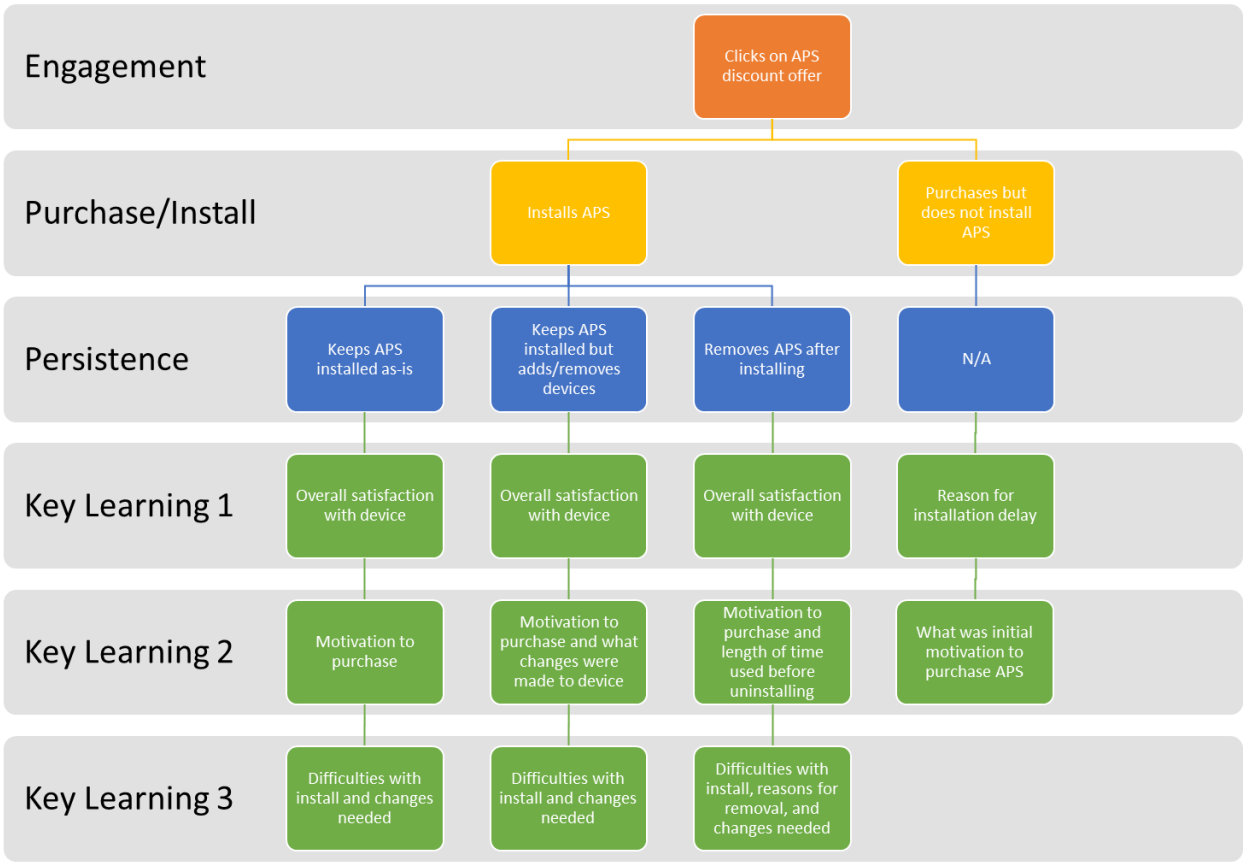
We collected contact information for each customer who purchased a Tier 2 APS through the online sales platform and utilized the email address associated with the APS purchase to create a distribution list for the post-installation survey.

Survey Design

We designed the email survey with the primary goals of obtaining install, persistence, and satisfaction rates while keeping the overall length to a minimum. We viewed this as a principal focus to optimizing participation and customer experience. Once finalized, we programmed the survey questions into a survey software platform and began testing the survey flow and content internally and with key stakeholders. Questions with pre-populated answer choices were randomized to reduce order bias, and we minimized both the length and depth of the final survey to keep response times below 5 minutes in order to increase the response rate.

Though we expected a subset of customers would not have installed the APS by the time the survey was distributed, we still wanted to probe for purchase motivation and reasons for not installing. Similarly, we were interested in reasons for removing the device and initial purchase motivation for the subset of customers who had removed the APS at the time of the survey. Working with the utility, we programmed a series of skip functions into the survey to prompt targeted questions depending on the installation status. The decision tree shown in Figure 1 below outlines the various paths a survey respondent could take depending on whether they initially installed the APS, as well as whether it was still installed at the time of the survey.

Figure 1. APS Decision Tree



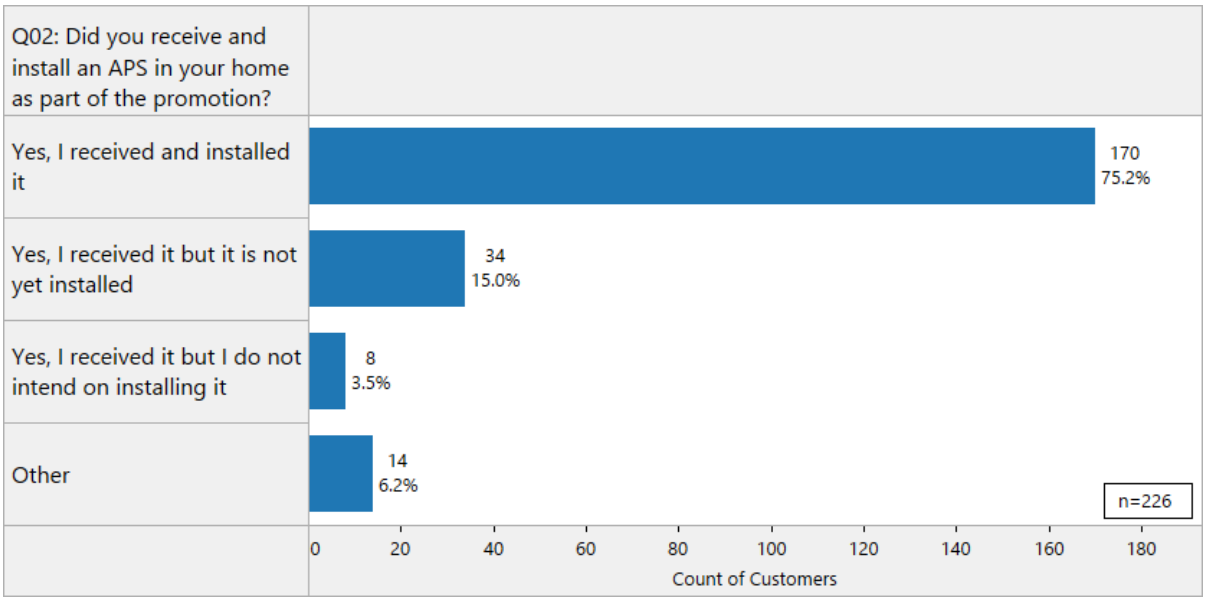
Once we obtained the list of APS recipients, we compiled a distribution list which was sorted by the two types of Tier 2 APS devices that were promoted. We then ran an initial test survey with 100 recipients from each group (targeting emails with large mailbox provider

domains such as Google.com, Yahoo.com, etc.) with the intent of uncovering possible survey deployment issues, significant email bounce-backs, or unrealistically low response rates. Though no significant survey issues were discovered, response rates were initially low (~10%) and so a reminder email was sent one week later to customers who did not yet complete the survey. Results from the reminder email doubled the overall response rate to 20%, and we proceeded to deploy the survey to the remaining population of 876 customers who purchased the APS. Similar to the test survey of 200 recipients, we sent a reminder email to all customers who did not complete the survey one week after the initial deployment. In the end the final response rate of the survey, including the test group, was 22% overall.

Findings – Installation Rates

Installation rates for Tier 2 APS devices had not been evaluated as previous campaigns explored a utility direct-install approach. For the self-install campaign, we sought to evaluate how many recipients successfully installed the device on their own and probe further into reasons why some recipients chose not to install the device even after purchasing the product. Figure 2 below shows the results from the survey indicating a 75.2% installation rate, with another 15.0% responding that they still intended on installing the device. A much smaller percentage (3.5%) indicated they received the APS but do not plan on installing it.

Figure 2. Overall Installation Rate



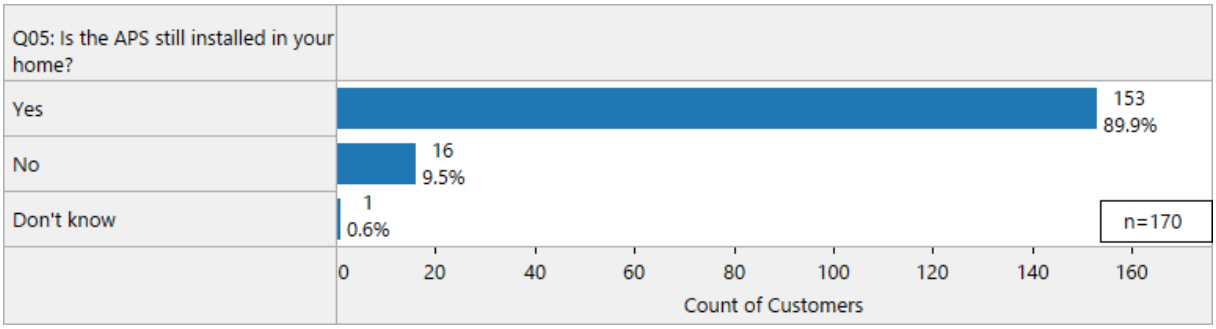
The subset of 34 customers who had not yet installed the device but plan to do so, along with the 14 customers who selected 'Other,' provided a range of answers explaining why the device was not installed. Though answers varied among respondents, we were able to group them into common themes to gain a better sense of installation barriers. The greatest number of responses in this subset (n=10) stated they had been too busy to install it. The second biggest response (n=9) was from recipients who had a misunderstanding of the product and indicated they didn't know where to use the device, or were anticipating using it for a different location or purpose than originally intended. The remaining subset of respondents who indicated they will

no longer install the device was small (n=8) and provided a variety of responses, though no single reason was found to be an overarching barrier to installation. Overall, we concluded that installation rates were sufficiently high with no significant installation issues experienced.

Findings – Overall Persistence

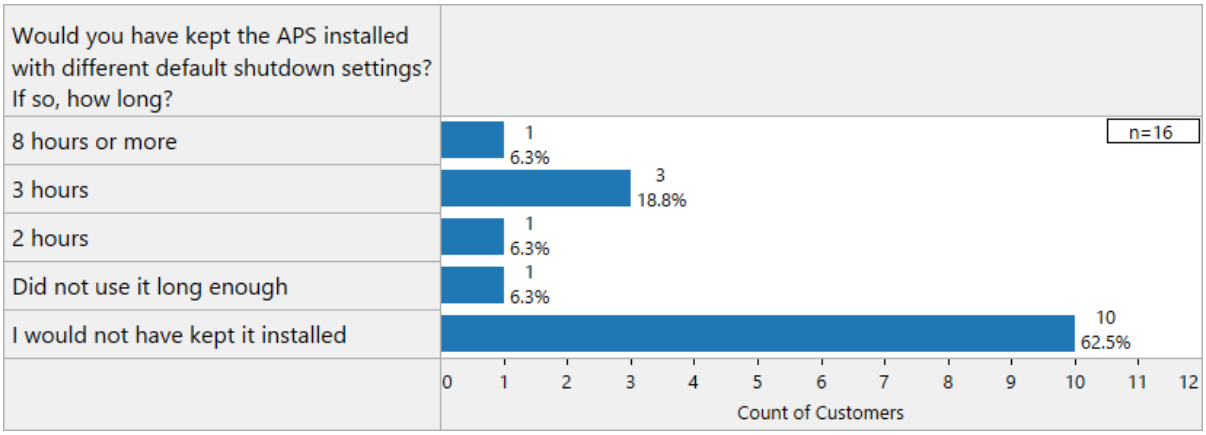
The survey sought to evaluate how many APS devices remained installed at the time the survey data were collected (~3 months after receipt of the devices). Figure 3 below shows the survey results indicating how many Tier 2 APS devices were still installed when the survey was completed based on the subset of customers who responded that they installed the device.

Figure 3. Persistence Rate of Installed Devices



The key takeaway from analyzing persistence at a gross level is that a significant number (89.9%) of the Tier 2 APS devices which were initially installed were still installed after approximately 3 months. The 16 customers who indicated the APS was no longer installed were asked one follow-up question regarding whether they would have kept the device installed if it were shipped with different default power-off settings and if so, what that setting would need to be (default settings are generally 1-hour.) This question was asked due to previous studies indicating that a primary reason for removal was turning off the TV prematurely. As seen in Figure 4, the majority of responses (62.5%) said they would not have kept the device installed regardless of different default power-off settings, and a smaller non-significant percentage (18.8%) stated that a default setting of 3 hours would be needed to have kept the device installed.

Figure 4. Would Device Remain Installed if Default Settings were Different? If so, How Long?

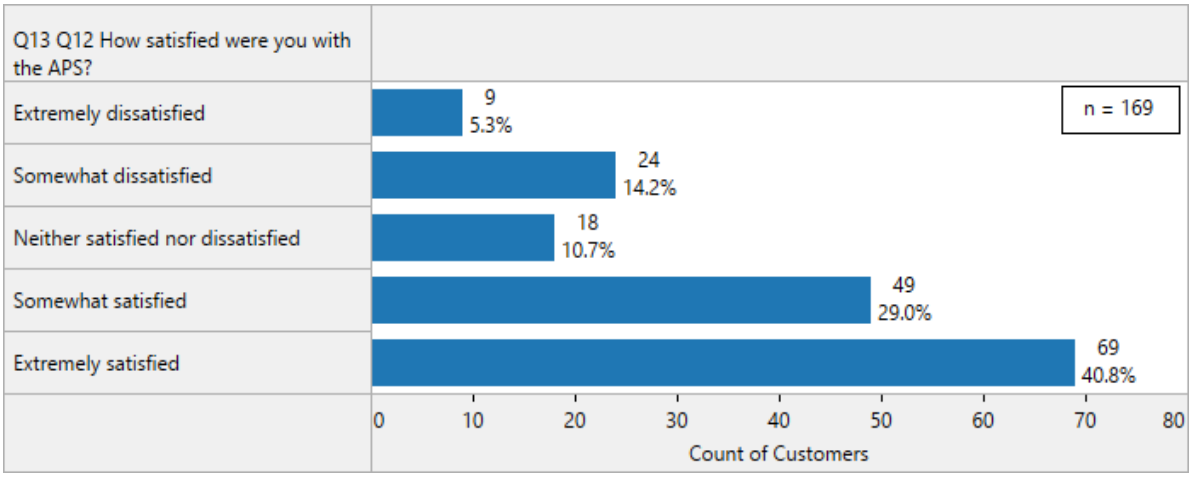


A key finding from this group is that while, overall, a small percent of customers uninstalled the device after a short period of time, the default TV shutdown settings on the APS were not linked to the persistence of the device for this group of customers.

Findings – Overall Satisfaction

Of the 170 survey respondents who indicated that they had installed the Tier 2 APS, we received 169 responses to our question regarding overall satisfaction with the product. Figure 5 below shows that the majority of respondents in this subset (69.8%) were either 'somewhat' or 'extremely' satisfied, 10.7% were ambivalent, and the remaining 19.5% were either 'somewhat' or 'extremely' dissatisfied.

Figure 5. Satisfaction with Installed APS Device

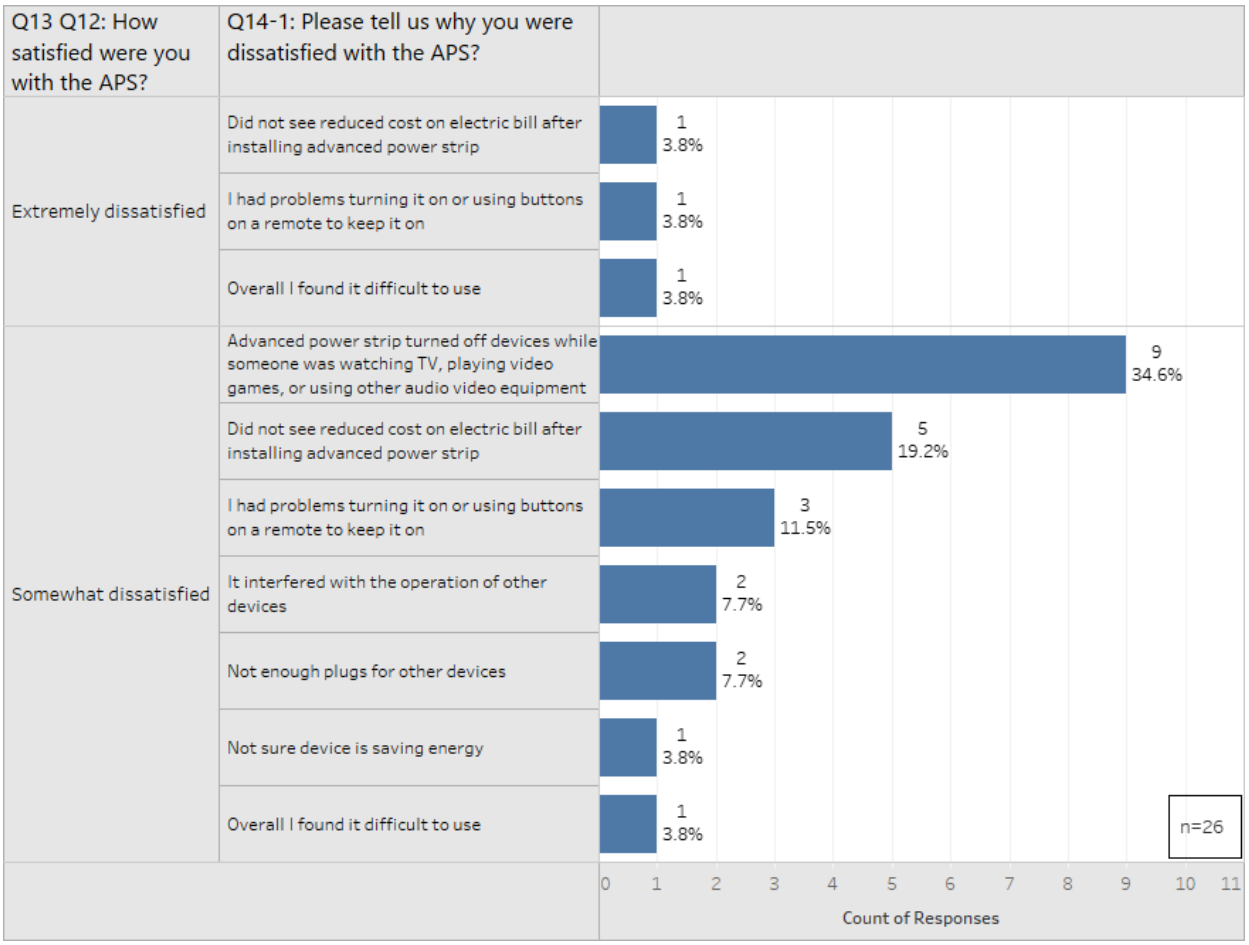


To gain a better understanding of the reasons for satisfaction, we segmented satisfaction results based the number of respondents who made changes to their APS during the course of the study. Segmenting the data in this manner reduced the sample size from 169 to 152 because it only considered those who still had the APS installed at the time of the survey and provided answers to the questions regarding satisfaction and changes made. Of these 152 respondents, 102 (67.1%) made changes to their APS and respondents who were 'extremely' or 'somewhat' satisfied were also 1.5 times more likely to have made changes to settings than to have accepted the defaults. While a question was asked about the general category of change, customers were not asked to provide specific details on what changes were made, and therefore, we unfortunately do not know if satisfaction is correlated to a single common change made throughout the population of respondents. Though satisfaction appears correlated to making changes, it should be noted that 19.6% of the respondents who made changes were still 'somewhat' or 'extremely' dissatisfied, whereas only 6.0% of those who didn't make changes describes themselves as such.

Customers who responded that they were 'somewhat' or 'extremely' dissatisfied were also asked to state any specific reasons for being dissatisfied (more than one answer was permitted). When asked this question, 22 out of the 23 respondents who expressed dissatisfaction and still had the APS installed at the time of the survey provided a reason, with three respondents providing more than one answer (for a total of 26 responses). Although the sample of responses is small¸ as shown below in Figure 6 below, the predominant reason given for dissatisfaction was

due to unwanted shutdowns of the device. This finding confirmed previous survey results that indicated unwanted shutdowns were a primary reason for dissatisfaction with the device.

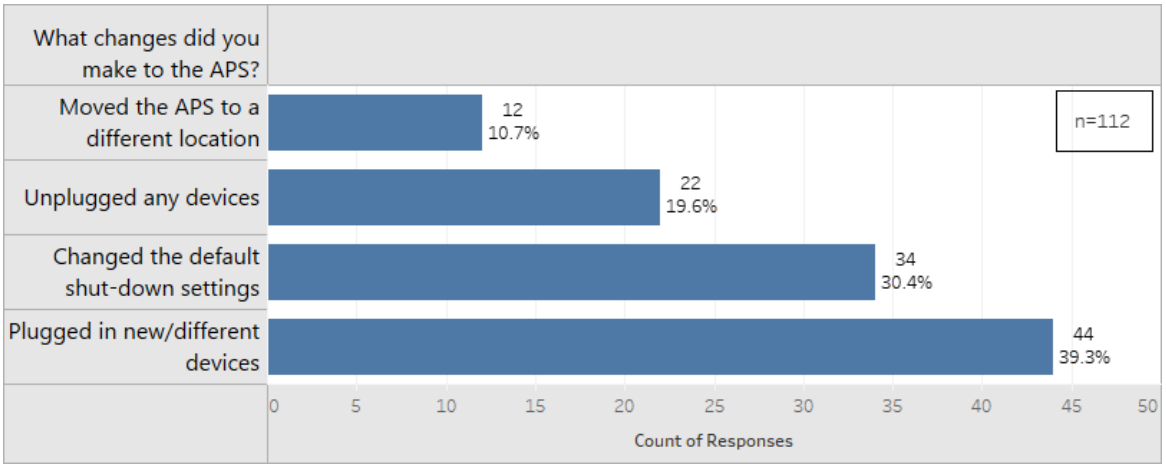
Figure 6. Reasons for Dissatisfaction Amongst Respondents Who Still Had the APS Installed at the Time of the Survey (Multiple Responses Allowed)



Satisfaction Based on Changes Made

Looking at specific changes made in more detail, 102 out of the 153 customers who still had their APS installed at the time of the survey provided answers to what specific changes they made. Similar to the questions around satisfaction, customers were allowed to choose multiple responses (including an open-ended 'Other' response) regarding what changes they made. Based on their responses from the choices given we found that the majority of respondents either plugged or unplugged a device from the APS. Figure 7 below illustrates the specific types of changes made with plugging and unplugging a device accounting for a significant 58.9% (n=66) of all responses given.

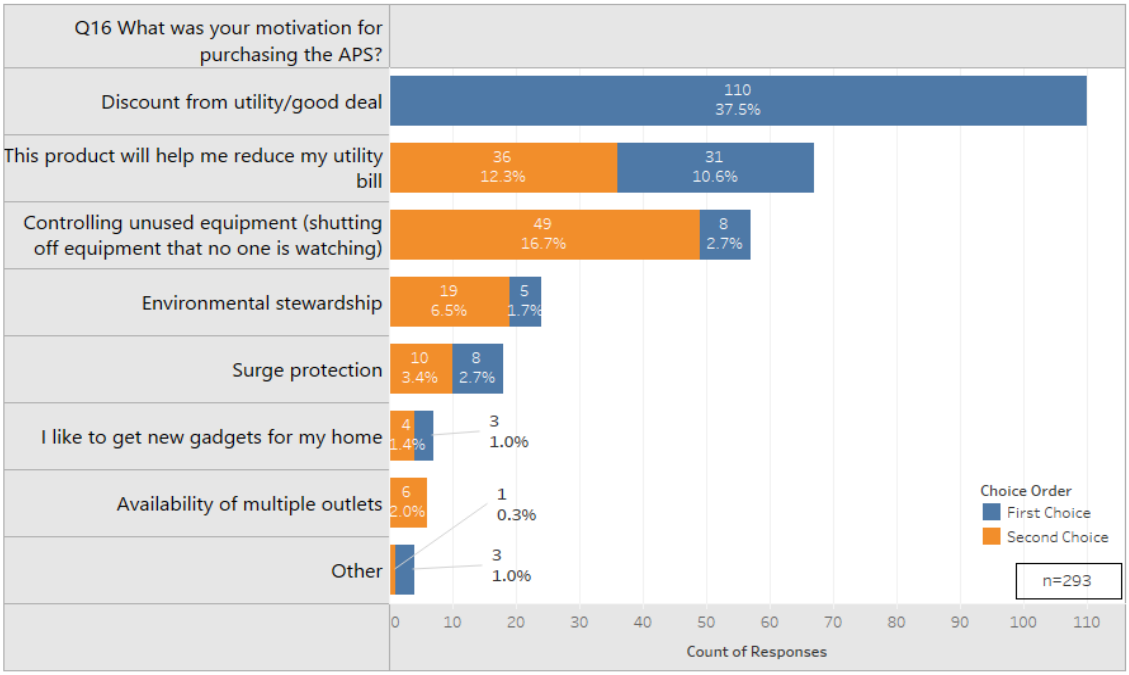
Figure 7. Specific Changes Made to APS Amongst Respondents Who Still Had the Device Installed at the Time of the Survey (Multiple Responses Allowed)



Purchase Motivation

Of secondary importance to the study was the motivation to purchase the APS among those respondents who installed the device. Six pre-populated choices were provided (along with a write-in option) for respondents to choose from, and the display order was randomized among participants to eliminate order bias. Results indicated that the primary motivation to purchase the APS in the first place was due to the discount from the utility with this answer choice receiving 37.5% of all responses. Additionally, this subset of customers who were motivated by a discount from the utility showed a strong correlation to device satisfaction, with an average satisfaction level of 4 out of 5.

Figure 8. Motivation to Purchase APS (Multiple Responses Allowed)



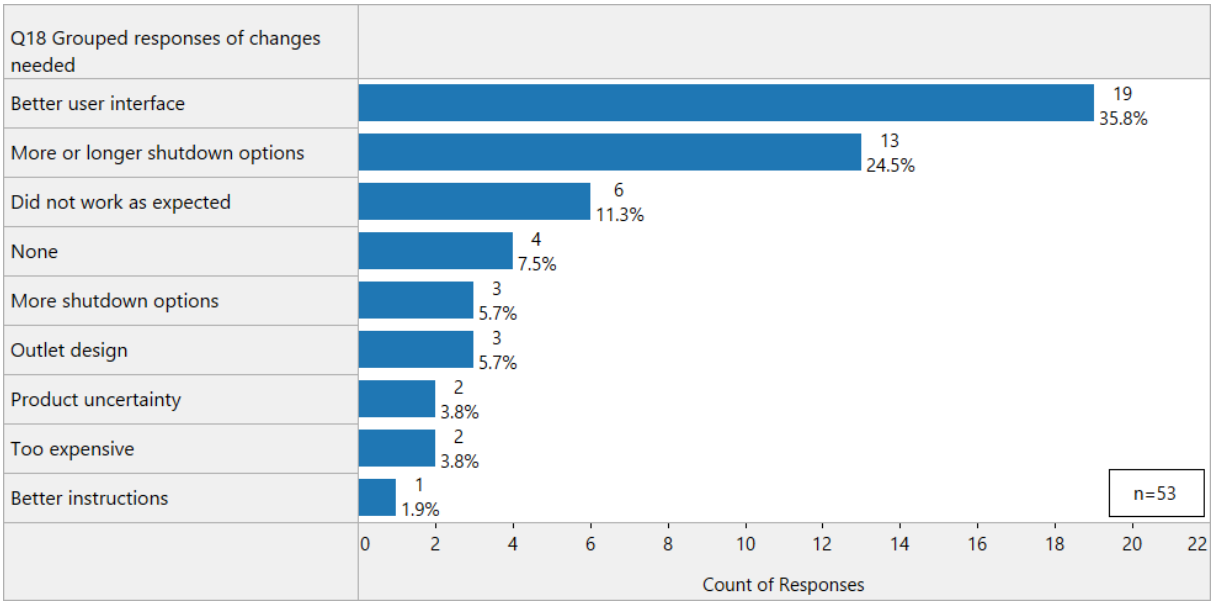
The subset of customers who indicated they either have not yet installed the APS or do not plan to in the future (n=34) were also asked about initial motivation to purchase. When examining the reasons from this group, most responses indicated a motivation to purchase the APS to control unused equipment. However, when parsed between first and second choice answers, most respondents who provided two answers indicated the utility discount as their first choice for motivation to initially purchase the APS even if it was not installed, suggesting that this was the primary motivation among this group as well.

Suggested Modifications

Another goal of the survey was to discover what, if any, modifications needed to be made to the APS device in order to receive a recommendation to a family member or friend. Therefore, regardless of whether the APS was still installed at the time of the survey, all respondents who answered 'not at all likely' or 'somewhat likely' to recommend the product were also asked a follow-up question about what needed to change in order to receive a recommendation. Of this group of 63 total respondents, 53 provided write-in comments on desired changes to the device.

As with other write-in responses, the suggestions varied greatly but could be grouped into common themes regarding user interface, longer shutdown settings, etc. Though several respondents provided more than one suggestion, we included only their first response as a proxy for the primary change suggested in order to recommend the device. As was found in previous satisfaction surveys, the overarching theme for changes needed to the APS are related to user interface issues such as 3rd party remote recognition and Bluetooth control, as well as needing longer periods of time (or more options) before the TV powers off. Figure 9 below shows the count of all responses received regarding recommended device modifications.

Figure 9. Grouped Recommendations for Device Modifications (First Responses Only)

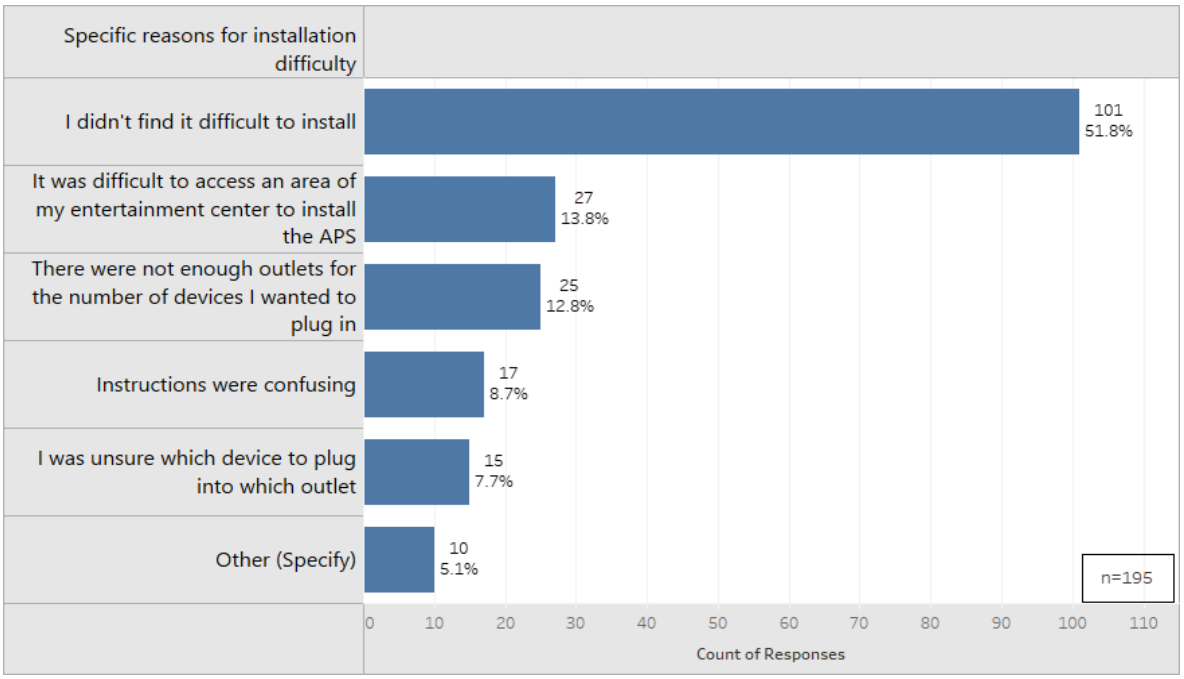


Findings – Installation Difficulty

All customers who indicated they installed the APS were also asked how difficult they found the installation. From this group of 170 customers, 168 provided answers regarding install difficulty with 80.9% (n=136) finding the installation either ‘somewhat’ or ‘extremely’ easy. Though 11.3% (n=19) were ambivalent in their response, 7.1% (n=12) found the installation somewhat difficult, and only 1 respondent found it ‘extremely’ difficult.

The group of 170 respondents was also asked to specify what, if anything, they found difficult about the install. The same number of customers (n=168) who responded to the question regarding difficulty of install also responded to the question about what specific difficulties they experienced. However, since multiple reasons were allowed for each respondent, the total count of reasons given in Figure 10 below are greater (n=195) than the total number of respondents. A significant finding of the self-install approach was that the majority of responses (51.8%) indicated that they did not find anything specifically difficult with the APS installation, providing encouragement that a self-install program could result in successful APS installations.

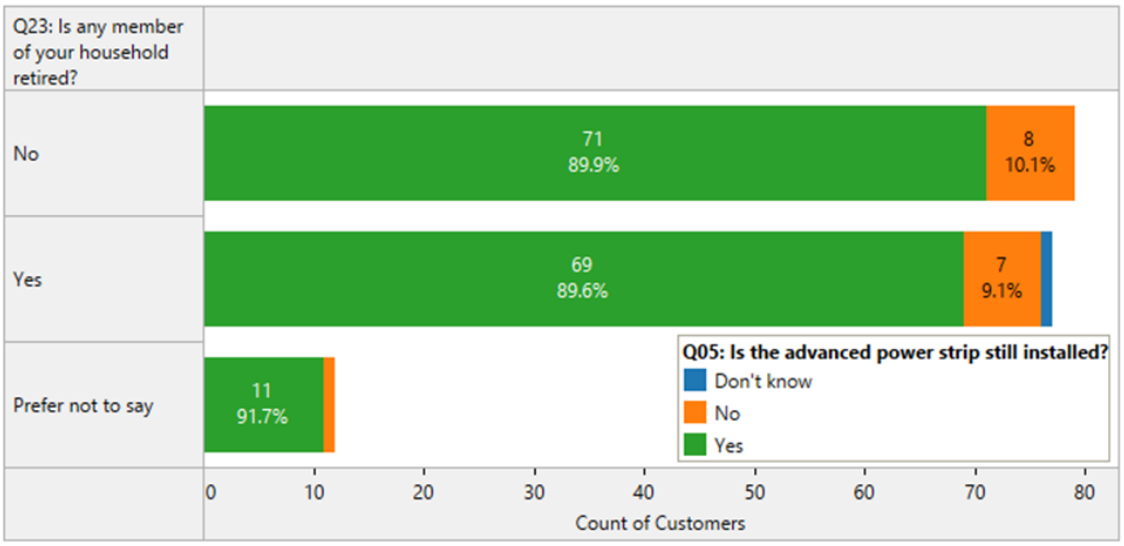
Figure 10. Reasons for Difficulty of Installation for All Respondents Who Installed the APS



Findings – Demographics

Since previous Tier 2 APS survey campaigns found significant persistence bias based on the presence of a retiree living in the household, we collected demographic information from survey respondents to tease out whether a similar bias exists in the self-install approach. Our results suggest that the investigated demographic biases are not significant. We found that 90% of survey respondents still had the Tier 2 APS installed in their home at the time of the survey, regardless of the presence of a retiree as shown in Figure 11 below.

Figure 11. Persistence Based on Presence of a Retiree (Percentages Reflect Totals of Each Row)



This finding is significant because it contradicts the direct-install survey findings that noted older age demographics could have an impact on APS persistence. However, this result is not unexpected since the design of the self-install Tier 2 APS campaign included a profiling exercise, targeting gadget-friendly households. This was conducted based on a hypothesis that the reduced persistence and satisfaction amongst households with a retiree may be correlated with age, but is not attributed to age. The attribution instead stems from a reduced appetite or aptitude for gadgets which happens to be correlated with the presence of a retiree in the household. Therefore, by targeting gadget-friendly households, the program design successfully controlled for the age bias that was present in the previous study.

Conclusion & Recommendations

The results from the promotional campaign and satisfaction survey point to no significant barriers among the targeted customer population. Installation rates were sufficiently high, though we recommend a support hotline for programs who intend to deploy a self-install campaign to alleviate any customer concerns regarding installation. Additionally, although both persistence and satisfaction were high among respondents who continued to use the APS during the survey period, a longer-term follow-up with customers is suggested to more accurately assess the continual use of the device.

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