Case Study: Tier 2 Advanced Power Strips and Efficiency Programs

Background

Tier 2 Advanced Power Strips (APS) are activity monitoring power strips that manage both standby and active power consumption. They offer an additional level of savings to traditional or "Tier 1" APS by monitoring a user's engagement with their electronics or presence in a room. After a period of user absence or inactivity, the Tier 2 APS unit will shut off all items plugged into the controlled outlets. By removing power to devices that would otherwise be drawing full power when not actively being used, the savings potential for Tier 2 APS is significant.

Advanced Power Strips are non-traditional energy efficient products. Traditionally in an energy efficient product upgrade, there is a 1-for-1 substitute of a device (such as replacing an incandescent light bulb with an LED light bulb). The energy savings from APS are harder to quantify, as APS are not inherently efficient; rather, they create efficiencies because they control the amount of energy that *other* devices use. However, control devices such as APS serve a very important role in energy efficiency, especially as the devices they connect to (plug loads) are increasing in number and type, even if the electronics themselves are becoming more efficient. Part of the challenge of APS is that their kWh savings is dependent on how many products are plugged into them; this has led to the development of an Energy Reduction Percentage (ERP) metric to demonstrate the effectiveness of controlling plug loads in particular environments. Another issue to consider for Tier 2 APS is their interaction with devices such as game consoles and set-top-boxes which draw considerable load but interruption of which may not be acceptable to users.

Tier 1 APS have been on the market for a number of years and through evaluation and research have been able to achieve deemed savings in the 70-100kWh range[1] for many efficiency programs throughout the US. Tier 2 APS, on the other hand, are an emerging product category and have not had as much opportunity for uptake in the US. This case study will highlight a few examples of efficiency program success in integrating Tier 2 APS into their programs and touch on some of the research and analysis that exists on Tier 2 APS products to date. This case study is designed to help ease the inclusion of this technology into efficiency programs in the Northeast and Mid-Atlantic.

Bonneville Power Authority and the Deemed Savings for Tier 2 APS

In 2013, the Bonneville Power Authority (BPA), as part of their Regional Technical Forum, gained approval for the deemed savings of Tier 2 IR Sensing APS. After reviewing studies and literature on the available savings from independent field trials of Embertec products in the US, Australia, and South Africa, BPA landed on 327 kWh savings at the busbar and 300 kWh savings at the site for these devices. These savings levels are applicable for products sold through retail, direct install, or mailed by request distribution methods. The measure was approved for 5 years and has a sunset date of August 31st, 2015. Currently, Puget Sound Energy is showing the most success for this measure in the Northwest through their multifamily direct distribution efforts. Other efficiency programs may soon be pursuing direct install measures for single and multifamily households.

Massachusetts Tier 2 Technology

In early 2014, the Massachusetts efficiency program administrators, under the heading of the MassSave program, began offering incentives on Tier 2 APS products. These products were being sold through the pop-up retailer TechniArt and online retail channel Energy Federation Inc (EFI)'s online catalog. Massachusetts, similar to BPA, did a literature review of available studies and supporting manufacturer

[1] http://www.neep.org/business-consumer-electronics-strategy-northeast-2013

supplied data to establish savings estimates. They are also undergoing an evaluation of the products, including field monitoring and a focus on the best application. These products will be evaluated for their potential to be incorporated into Direct Install programs.

CalPlug Research

In 2013 and 2014, the California Plug Load Research Center at the University of California Irvine, referred to as CalPlug, completed two studies of Tier 2 APS. In a study focused on the Embertec product, they analyzed over 120 million measurement data points to develop an energy savings performance evaluation. They also developed and validated a field trial methodology to determine energy savings performance of Tier 2 APS, also known as the Energy Reduction Percentage (ERP), which reflects the percentage of energy saved by the Tier 2 device when compared to a system operating the same electronics without an APS. Through a field trial of over 100 households with Embertec products, the CalPlug research found the ERP to be an average annual savings in a residential Audio Visual (AV) environment of 48%-53% from Embertec Tier 2 APS. Regardless of geographic location, demographics, or the amount of AV equipment, the field trials resulted in an average ERP of 50%. The field trial studies demonstrated a range of energy savings from 306 kWh to 385 kWh, with an average of 346 kWh of annual savings. This did not include gaming consoles with hard drives or cable/satellite set top boxes which were not power saved.

In the fall of 2013, CalPlug started an evaluation and testing process for the TrickleStar "Tier 2 APS+" unit featuring an infrared remote signal sensor. CalPlug published their final report from this project in February 2014. In their final report, CalPlug found that, on average, televisions were turned off earlier than they would have been when a Tier 2 APS+ was used. This means that peripherals are turned off earlier, which generates extra savings, assuming peripherals are likely left on by the absent users. Through their testing, CalPlug concluded that in the laboratory test the average annual energy savings of the TrickleStar Tier 2 APS+ was 323 kWh. This average did include controlling an XBOX gaming console.

Silicon Valley Power Authority Study

In early 2014, the Silicon Valley Power Authority (SVP) did a field study in their service territory of Tier 2 APS looking at savings achieved as well as consumer acceptance of the products. They used the Embertec Tier 2 APS and installed devices in 34 households. In the first 4-week phase, SVP utilized the CalPlug field trial methodology and monitored the entertainment systems of participants. They used the CalPlug field trial approach to assess the ERP. The second 4-week phase focused on user satisfaction by installing the Tier 2 devices into entertainment systems and asking participants to complete a survey at the end of the trial. The results that SVP reached were an ERP value of 49.5% of energy consumed by entertainment system. When calculated on an annual basis, SVP calculated an average potential energy savings of 163.9 kWh. While the ERP value, approximately 50%, is consistent with other studies on the same technology, the energy consumption levels overall were much lower than have been otherwise observed in AV environments. The cause of this inconsistency is unclear; demographics of this territory or the small sample size could have contributed to this outcome.

UL Environment Environmental Claim Verification

In the fall of 2014, TrickleStar engaged the services of UL Environment (ULE) to conduct an Environmental Claims Verification on the energy savings capability of the TrickleStar Tier 2 APS unit. ULE completed their laboratory testing, auditing, and analysis in accordance to their "ULE ECVP 108 Version 3 - Estimating Energy Savings for Energy Saving Power Strips" methodology in December of 2014 and later issued a certification letter in January of 2015. The ULE report validated energy savings between 20%-47% a year (estimated a range of 79.2kWh/yr to 333.48 kWh/yr. savings) in reference to the TrickleStar Tier 2 APS unit.

Summary chart of Tier 2 APS Studies:

Study/Program	Products	Savings established (kWh)	% savings
BPA	Embertec and TrickleStar	300 – 327	Not specified
MA	Embertec and TrickleStar	242	Not specified
CalPlug	Embertec	306 – 386	48-53%
CalPlug	TrickleStar	323	Not specified
Silicon Valley Power	Embertec	164	49.5%
UL Environment	TrickleStar	79 – 333	22-47%

Note: Some of the above reports include savings from gaming consoles and some do not which can impact the energy savings.

Tier 2 Products incorporated into Efficiency Programs

Currently, the only Tier 2 products being incorporated into efficiency programs in the US are the Embertec Emberplug AV+ plug version and strip version and TrickleStar 7 Outlet Advanced PowerStrip Plus 188LV-US-7XX. Soon to be released by Bits Limited are a 10 and 7-outlet Tier 2 APS. Overall, the Tier 2 product availability is expected to increase.

Pricing

Pricing for Tier 2 APS varies greatly depending on market segment, distribution channel, incentives, and volumes. General MSRP to consumers in traditional retail is about $75-$100 and online pricing around $60-$90. Direct pricing to utilities and installers is likely to be more cost effective for energy efficiency programs looking to procure Tier 2 APS.

Product and Adoption Barriers

Nomenclature: While "Tier 2" has been adopted as the terminology for internal industry uses, it is not intuitive. As put forward by the NEEP APS Working Group in their Common Terminology document, for customer-facing communications, Tier 2 devices should be referred to as Activity Monitor Power Strips with active power down capabilities. The phrase "Advanced Power Strip" is acceptable to refer to either Tier 1 or Tier 2 products.

User Acceptance: User acceptance and opinions on Tier 2 APS were observed in the SVP study as well as in a Cadmus trial and in Puget Sound Energy surveys. From the SVP study, participants had mixed feelings about the APS. In a follow up survey, SVP found that 66.7% of respondents picked a rating between 6-10 (on a 0-10 scale) of how likely they were to continue to use the APS. 71.4% of respondents picked a rating within 6-10 of how satisfied they were with the APS. Anecdotally, in 2014 the Cadmus Group looked at Tier 2 APS and user experiences with a small qualitative study of employees. They found that user understanding and acceptance of this technology was mixed. 38% of participants who simulated purchasing an APS through a retail channel said that it took "some time" to figure out proper set up, and 25% of participants had issues using their electronics as they normally would once the APS was installed. Furthermore, 43% of participants stated they would not pay more than $20 for a Tier 2 APS Product. On the other hand, follow up surveys from Puget Sound Energy installing Embertec APS reflect more positive experiences and high retention rates of units.

Conclusion and Opportunities

Overall, efficiency programs in the Northeast and Mid-Atlantic have the opportunity to incorporate Tier 2 APS into their program portfolios. The measure has gained approval in several territories and is claiming much greater savings than Tier 1 APS based on existing research and available reports. There is an great opportunity to incorporate Tier 2 APS into direct install programs to help increase consumer acceptance of the products and ensure a proper installation. In California, under the advisement of

CalPlug and with the support of the California Technical Forum (CalTF) Californian IOU's have an approved state-wide Tier 2 APS product specification. This could have a significant impact on the Tier 2 APS industry and should be watched closely. Additionally, there are field trials, including one completed on Embertec Tier 2 APS in early 2015 by San Diego Gas and Electric and another expected to be completed in early summer of 2015 by PG&E and SDG&E, which are forthcoming and should provide further and deeper insight into this energy saving measure. Overall, the evidence is mounting that savings opportunities exist with efficiency program support of Tier 2 APS.

Resources

http://static1.squarespace.com/static/53c96e16e4b003bdba4f4fee/t/54ee10e6e4b0c42059d56bf8/1424888038966/2015-02-25+Tier+2+APS+Follow+Up+Cal+TF+WP+Presentation.pdf
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