Tier 2 Advance Power Strip (APS)

CALIFORNIA
TECHNICAL FORUM

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Presentation Overview

Objective: Seeking TF approval of draft workpaper

- Measure Description

- Workpaper Methodology

- Results

- Issues and Concerns

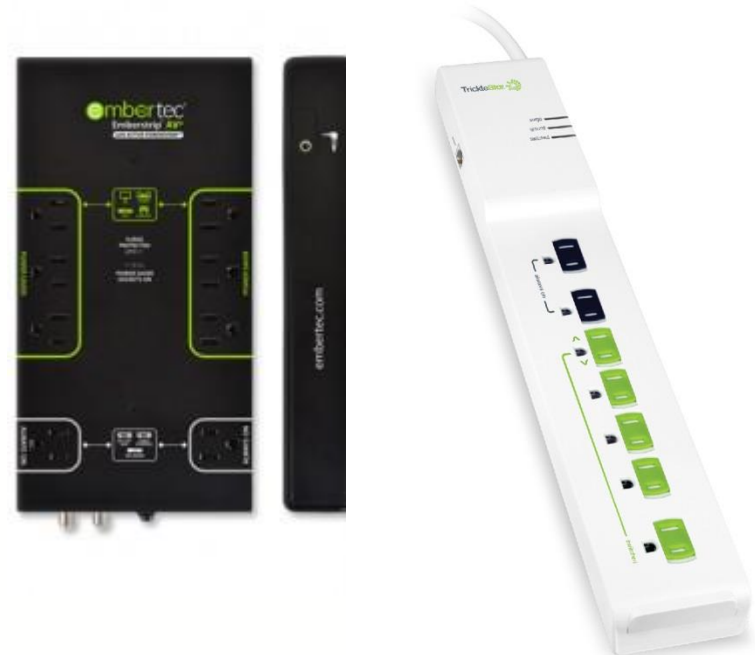- Questions or Comments

Tier 2 Advance Power Strip

Base Case Technology	Measure Case Technology
Standard Power Strip	Tier 2 APS

Capability Differences

Tier 1 master-controlled	Tier 2
Tier 1 Power Strip	**Tier 2 APS**
• *Primarily targets passive standby or vampire energy loads in electronic devices.*	• *Uses intelligent algorithms to monitor the power of all controlled devices.*
• *Determines the master device state through sensing current (or amps) consumption.*	• *Uses infrared (IR) sensing and true Root Mean Squared (RMS) power sensing instead of current sensing.*
• *Disables power to the controlled devices when the master is switched off.*	• *Delivers energy savings to the devices connected to the switched outlets after 1 hour of inactivity.*

Tier 2 Advance Power Strip

- **Units:** per unit

- **Measure Application and Delivery Type**
  - Financial Support / Direct Install (REA) [**Preferred Delivery**]
  - Financial Support / Down-Stream Incentive – Deemed (REA)
  - Midstream Programs / Mid-Stream Incentive (REA)

- **Eligibility**
  - Climate Zones: All
  - Building Types: All Residential

- **Target Market**
  - All residential

- **Market Potential**
  - Market size – CA Households: 12.5 million (http://quickfacts.census.gov/qfd/states/06000.html)
  - Penetration rate – 1% 125,000 households statewide
  - Annual Energy Savings Potential – ~43 million kWh

- **Measure Costs**
  - ❑ Baseline cost (material + labor): $0
  - ❑ Measure cost (material + direct install labor) : $45 + $25 = $65
  - ❑ Incremental cost: $65

- **EUL**
  - ❑ 8 year (DEER EUL ID: Plug-OccSens)

- **NTG**
  - ❑ 0.85 (DEER EUL ID: ET-Default)
  - ❑ 0.85 (DEER EUL ID: Res-Default-HTG-di)

Workpaper Methodology: Baseline

- **CALPLUG Baseline data collection**

  - Studies used: Australia, South Africa, and Santa Cruz, California where all 3 studies used metered data
  - A total of 53 households were field trialed with an average of 15.61 days per home of second by second data retrieved
  - Low, Medium and High AV user types were trailed across this sample set with a 36% / 28% / 36% user type distribution across the sample set respectfully
  - Average annualized energy consumed per AV environment was 880 kWh across these trial homes
  - Outliers were removed from the sample set to reach an adjusted annualized average energy consumption of 679 kWh across all user types

- **SDG&E Baseline data collection**

  - Metered data (seconds) – power, voltage, current, IR signals, instantaneous energy, and cumulative energy used
  - Total of 47 households were field trialed with an average of 15.86 days per home of second by second metered data retrieved
  - Average annualized energy consumed was 458.4 kWh across these trial homes
    - It is worth noting that many of these homes were SDG&E employee homes, so their energy usage was expected to be lower than the Californian annual average of 600 kWh because of their awareness of energy efficiency and energy conservation

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Figure 1.1: Field Trial Data Assessment & Utilization
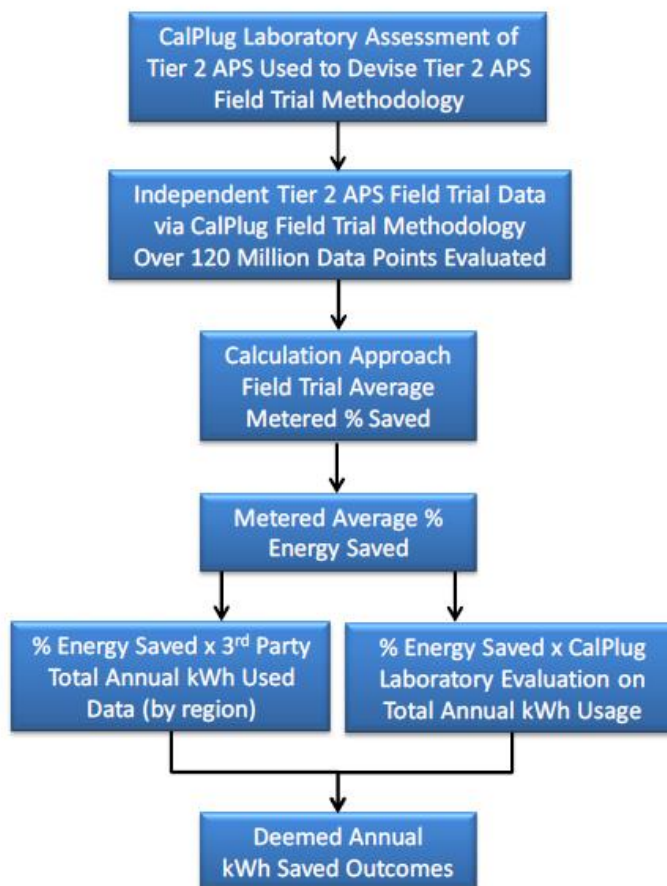
Workpaper Methodology: Measure

- The data measured and logged by the Tier 2 APS device throughout each trial included second by second metered data of:

  - ❑ Date & Time (local)
  - ❑ Mains power level (voltage)
  - ❑ Connected equipment current consumption
  - ❑ Connected equipment power use (W)
  - ❑ IR signals determined by the IR sensor on the Tier 2 APS (if an IR sensing Tier 2 APS)
  - ❑ Count down timer settings of the Tier 2 APS device
  - ❑ Mechanical relay logged state of the Tier 2 APS
  - ❑ Energy saved - cumulative watt hours
  - ❑ Energy saved - instantaneous watt seconds
  - ❑ Energy used - cumulative watt hours
  - ❑ Energy used - instantaneous watt seconds

- Using CalPlug's field trial methodology, Figure 2 highlights certain data to provide a clear illustration as to the events in the monitored AV environment. Observations included:

  - Real time power fluctuations of the connected equipment (shown in blue);

  - IR activity (shown in red);

  - Device switch off points (depicted where there is a clear prolonged power change in power level);

  - Energy saving power down timer (shown in orange); and

  - Accumulated energy saved (shown in green) Rate of incline denotes rate of energy being saved which is a factor of the instantaneous power level (Watt seconds) being monitored.
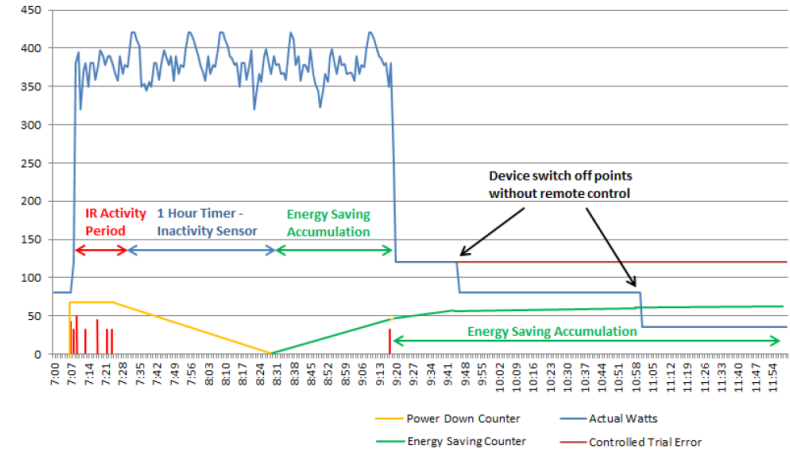

Figure 2. Data Plot Using CalPlug Tier 2 AV APS Field Trial Methodology

Energy Savings Results

- Based on this field trial methodology, CalPlug's assessment on Tier 2 AV APS found an average ERP across all installations was 51% resulting in an average annual energy saving of 346 kWh.

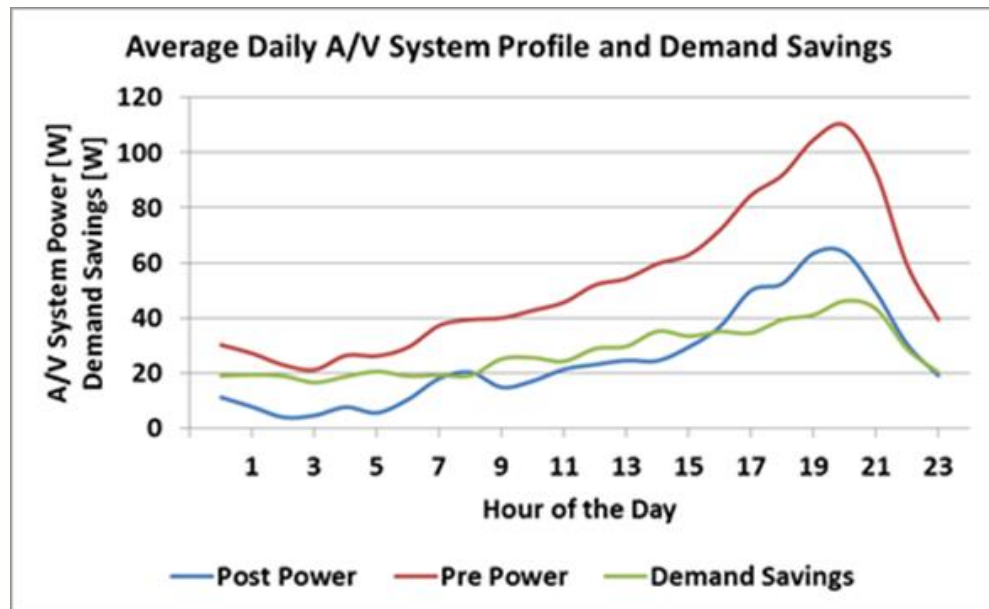|	Tier 2 AV APS Field Trial Data Assessment					
	Australia	**South Africa**	**USA - Santa Cruz**	**USA SDG&E**	**CalPlug Report**	**Average**
AV User Type/s	High	Medium	Low	Low	Low-High	N/A
% Reduction	__54__	__53__	__48__	__56__	__51__	__52__
kWh Used	1310	792	537	468	678	757
Raw kWh Reduction	707	420	258	262	346	399
Sample Sites	19	15	19	47	53	31
Data Points (Millions)	161	127	161	398	449	259

Demand Reduction Results

Based on SDG&E's field trial study, peak demand reduction results were averaged across all sites as shown in the table below.

Group	Average On-Peak Savings [W]	Min [W]	Max [W]	Standard Deviation [W]
All corrected sites	25.2	0.7	124.6	27.6

Demand Reduction Results

Figure below plots the average daily profile averaged across all sites. Patterns show increasing usage and demand savings as the day progresses starting at 7 AM, with sharp drop-off around 9 PM.

Average Daily A/V System Profile and Demand Savings

# Issues and Concerns

Abstract Review Comments – Energy Savings

X Cal TF comment 1 - Methodology: Using existing data vs. using the logging mode of some smart strips to conduct a field survey of energy usage and load profiles; consider weighting savings based on variations in number/type of plugged in devices and primary/secondary usage of plug location

- ❑ Second by second metered data is a more robust approach compared to weighting savings based on variation because the savings consistently from the metered data exhibited 50% savings from any AV environment per power strip.

✓ Cal TF comment 2 - Simplifying assumptions vs. collecting more data

- ❑ Based on all field trial studies, the metered data consistently showed that the average energy reduction percentage per strip was ~50% from any residential AV environment.

- ❑ AV Annual Baseline Energy Usage * 50% Energy Reduction = AV Annual Energy Savings

Issues and Concerns

Abstract Review Comments – Energy Savings

- ✓ Cal TF comment 3 - Baseline expiration due to technology evolution of devices assumed to be plugged into power strip and behavioral impacts on persistence of savings and baseline assumptions

  - ○ Figure to the right is an extract extropolating the change in baseline TV environment energy use across 5 varying scenarios for the next 5 years.

2009/10 primary TV room energy consumption comparison to five future scenarios for 2019/20
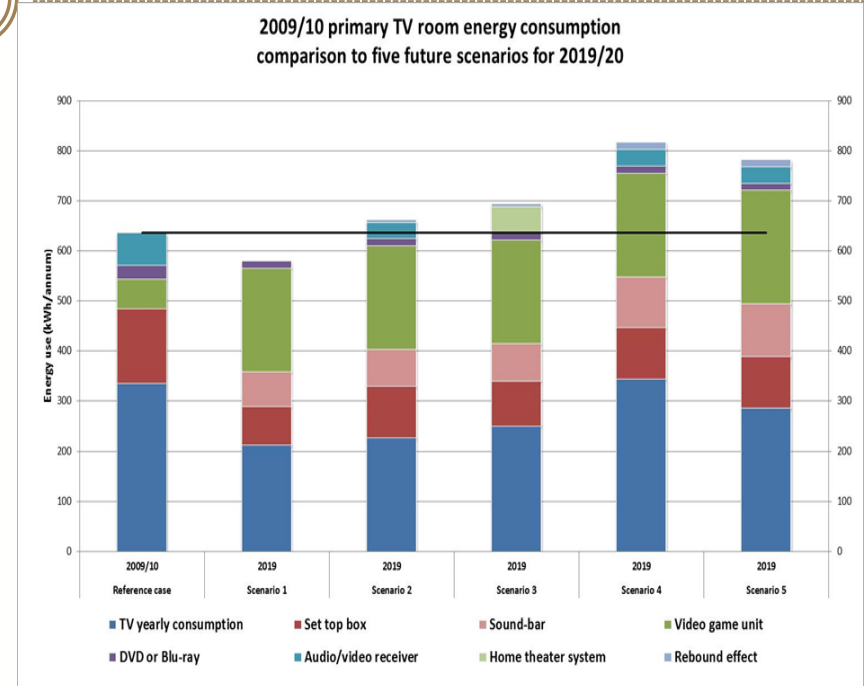
Abstract Review Comments from CALTF

✓ Stakeholder comment 4: Measure cost for direct install application

❑ Material and labor costs for Direct Install addressed in WP

X Stakeholder comment 5: Effective useful life (EUL) considering baseline expiration

❑ Unclear at the moment based on how to achieve

❑ Perhaps commissioning an EM&V study to survey customers for persistence?

Issues and Concerns – Future Updates

- Future update topic 1: Commercial Tier 2 APS WP

  - ❑ SDG&E ET Scaled Field Placement trial completed in November 2014 and final normalized results will be available later this month

  - ❑ Current coordination with statewide PAs

  - ❑ Need to understand timing of when PAs want to offer this measure

Questions or Comments?