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Energy Efficiency Program
Success Through
Innovation

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Market Update

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Approved CPUC
Workpaper (Sept 2015)

e **Work paper on Embertec Tier 2 AV APS approved by the CPUC – September 2015**

e **Tier 2 IT APS work paper approved by CalTF**

e **California Bills Recently Passed**
- AB 802 – Focus on improved tracking and bench marking
- SB 350 – Focus on doubling energy efficiency gains

e **Illinois moving forward with TRM inclusion of Tier 2 APS**

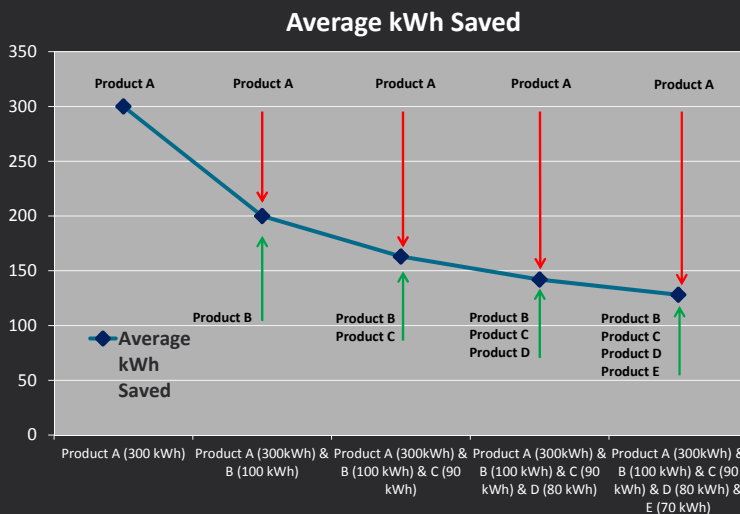2

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Illinois TRM

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- Illinois have utilized the work from California to assist in their assessment of the Tier 2 APS product category

- Extensive debate on the 27th of October around how to assess this new category of Tier 2 APS products given variations in sensing, control and software approaches.

- This is a similar challenge to managing variations in algorithms in controllable thermostats

- Illinois Stakeholder Advisory Group (SAG) determined that the best approach is to assess products based on individual performance to incentivize innovation.

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Averaging Energy Savings Across Products Lowers Program Performance

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Average kWh Saved

Product A (300 kWh)	Product A (300kWh) & B (100 kWh)

Product A (300kWh) & B (100 kWh) & C (90 kWh)

Product A (300kWh) & B (100 kWh) & C (90 kWh) & D (80 kWh)

Product A (300kWh) & B (100 kWh) & C (90 kWh) & D (80 kWh) & E (70 kWh)

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The Effect of Averaging Energy Savings Between Different Tier 2 APS

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e It entrenches free-ridership by product manufacturers into the activity category with the lower performing Tier 2 APS free-riding on the higher performing devices - with numerous additional negative effects…

e Averaging also punishes the higher performing Tier 2 APS and rewards the lower performing Tier 2 APS

e Averaging stifles Tier 2 APS Innovation towards better product design and higher energy savings in the plug load arena

e Averaging rewards the cheapest product not the most cost effective product

e Averaging will lead to ex-post evaluation challenges as the cheapest product is adopted as **actual kWh savings are not considered** – simply an average across all products

e The end result is a new category whose Total Resource Cost (TRC) continually falls due to incentivizing cheap products not cost effective products through averaging kWh savings.

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The Effect of Averaging Energy Savings Between Different Tier 2 APS

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For further clarity on the effects of averaging performance across individual products and the behavior it incentivizes from manufacturers within the industry, please review the links below:

https://www.youtube.com/watch?v=YEa8DpheXkM&sns=em

https://www.youtube.com/watch?v=FOMI0ORGH44 – 3:30 most compelling section.

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The Problem/Opportunity

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Consumer electronics waste power in two distinct ways:

- e **Active Power Waste** where the product is on but not performing its main function (e.g. TV is on but is not being watched)

- e **Passive Standby** where power is used by the product to keep it ready to switch on

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Tier 2 IT APS

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Much like the limitations of Tier 1 AV APS devices where the main energy user (the TV) is not addressed, the same problem is occurring in PC environments also.

Embertec has addressed this through the development of our Tier 2 IT APS solution which eliminates the wasted energy and poor usage patterns of the PC itself, not only the PC peripherals.

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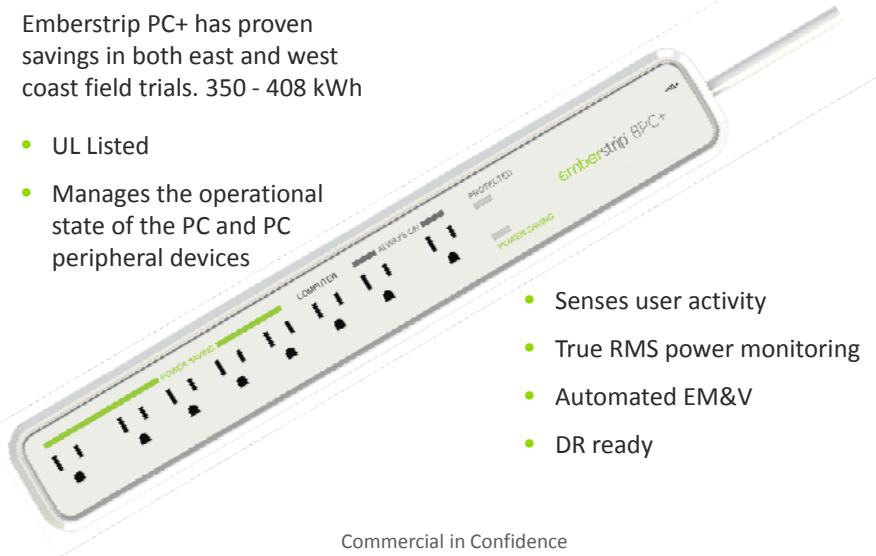
Emberstrip 8PC+

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Emberstrip PC+ has proven savings in both east and west coast field trials. 350 - 408 kWh

- UL Listed
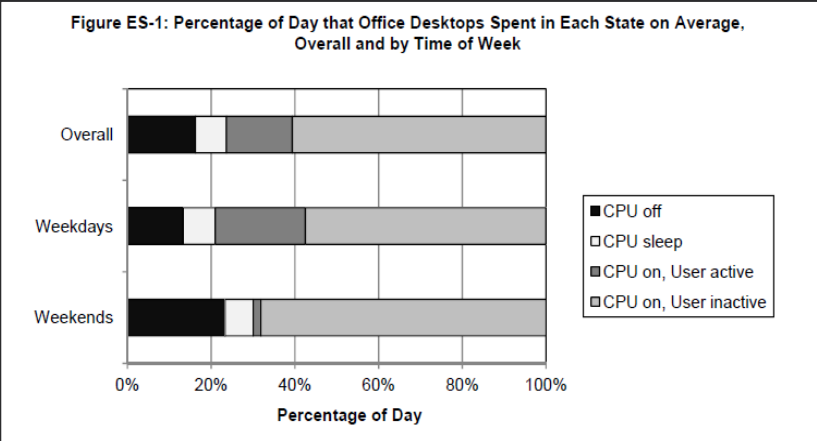- Manages the operational state of the PC and PC peripheral devices

- Senses user activity
- True RMS power monitoring
- Automated EM&V
- DR ready

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CalPlug Research

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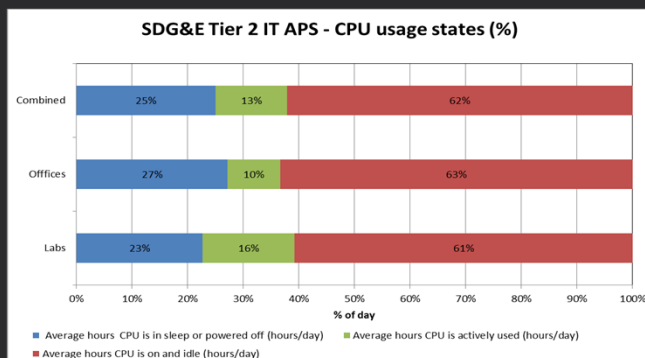Figure ES-1: Percentage of Day that Office Desktops Spent in Each State on Average, Overall and by Time of Week

Legend:
- CPU off
- CPU sleep
- CPU on, User active
- CPU on, User inactive

X-axis: Percentage of Day (0% to 100%)
Categories: Overall, Weekdays, Weekends

Source: Pixley, Joy E.; Stuart A. Ross. (University of California, Irvine). 2014. *Monitoring Computer Power Modes Usage in a University Population*. California Energy Commission. Publication number: CEC-500-2014-092.

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SDG&E Field Trial

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SDG&E Tier 2 IT APS - CPU usage states (%)

	Average hours CPU is in sleep or powered off	Average hours CPU is actively used	Average hours CPU is on and idle
Combined	25%	13%	62%
Offfices	27%	10%	63%
Labs	23%	16%	61%

% of day

- Average hours CPU is in sleep or powered off (hours/day)
- Average hours CPU is actively used (hours/day)
- Average hours CPU is on and idle (hours/day)

- Less than 3% variation in CPU usage state across CalPlug office evaluation and SDG&E field trial.
- This highlights a significant plug load management opportunity in commercial offices

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Emberstrip PC +

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- Desktop and Laptop compatible

- Real world field trials

- NEEP/ERS Field Trial 408 kWh

- SDG&E 371 kWh

- CalPlug 350 kWh savings

- Addresses both peripheral and PC energy wastage as opposed to only addressing peripheral energy waste and standby power

SDG&E Commercial Field Trial

③

DATASET	Monitored Time [Days]	Weekly Active Usetime [Hours]	Baseline Annual Usage [kWh]	Annual Energy Savings [kWh]	% Savings
Office Settings	12	19.6	621.5	494.0	79.5%
Computer Lab Settings	13	28.3	342.9	253.5	73.9%
Combined	13	24.0	479.5	371.4	77.5%

Tier 2 APS Follow Up   3/5/2015

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IT APS Product Comparison

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The SDG&E field trial enabled a comparison between 3 types of APS device:

- Tier 1 APS – Requires the PC to be placed into a lower energy state to **save power to the peripheral devices only**
- Motion Sensing APS – Requires there to be no user activity to **save power to the peripheral devices only**
- Tier 2 APS – Adjusts to user activity automatically to **save power to the PC and the PC peripheral devices**

	Energy Reduction Percentage	kWh Saved
Tier 1	0.40%	2.1
Motion Sensing	14.70%	78.5
Embertec Tier 2	**77.50%**	**371.4**

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Understanding the Barriers of Energy Efficiency Program Success

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- The Tier 2 APS product category will need to address market barriers to prove program performance to ensure their mainstream adoption.

1. Utility Field Trial Validated Energy Savings

2. Proof of T2 APS Installation

4. Proof of T2 APS Retention

Successful T2 APS Program

3. Proof of T2 APS Energy Savings
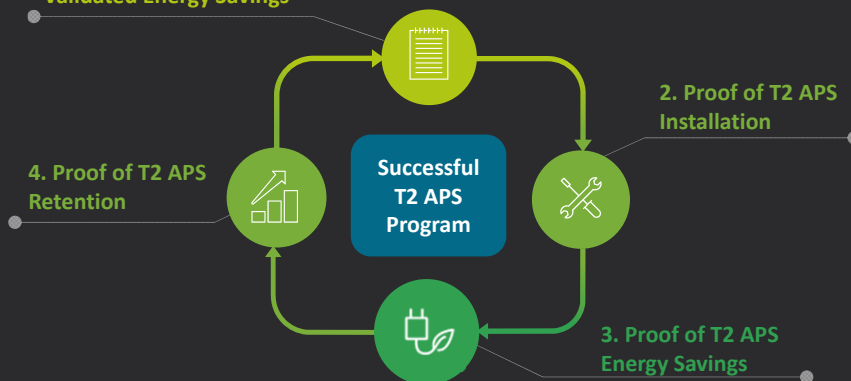
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Understanding the Barriers …

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- Gathering this level of data to prove program performance has previously been very laborious, time intensive and expensive.

- If this data could be attained quickly and efficiently to prove program performance, we could de-risk this new activity for utilities and their implementers.

- De-risking programs accelerates their adoption and drives greater energy efficiency faster and more cost effectively.

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Wireless Communication Features

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- Installation & retention verification, with energy saving performance tracking by program.

- Utility auditing, regulatory reporting & customer communications
- **Meeting EM&V 2.0 Roadmap**
- Tier 2 APS control & adjustability for additional user convenience

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Communications Enabled - 2016

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- Q1 2016 - Bluetooth enabled Tier 2 APS will be available
- They will have the same Energy Saving Firmware and Hardware
- All new design for the strip, wall-tap and sensor
- The ability to validate **proper** installation
- Monitor retention rates
- Monitor base-loads across all products deployed in territory to validate energy savings
- Field trial capable
- A portal to communicate with customers additional utility energy efficiency offers
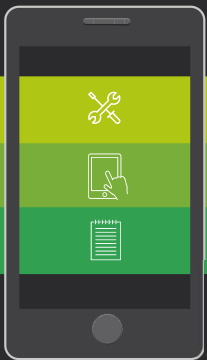
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Wireless Communication

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e Embertec Tier 2 AV APS are proven to save 8-10 times more energy than a Tier 1 AV APS

01 — Installation & retention verification, with program tracking.

02 — Customer control, adjustability for user convenience

03 — Utility auditing, regulatory reporting & customer communications via Ember Exchange

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New Bluetooth Models for 2016   embertec®

- A **Tier 2 APS App** <u>for consumers</u> to control their Tier 2 APS, change the settings of their Embertec Tier 2 APS, receive messages from their utility, and see how much energy their audio visual equipment uses and has saved are just some of the features.

- The **Tier 2 APS App** <u>for installers</u>, will allow the installer to validate installation, add notables regarding the install, monitor their daily installation activity, map where they have already been, determine power levels, etc.

- For program administrators, at a click of a button instant M&V, validate installation, see aggregate base load, verify retention rates, and even push messages to users, plus many additional features.

- **M&V requirements from regulators will be delivered cost effectively through Bluetooth enabled Embertec Tier 2 APS products.**
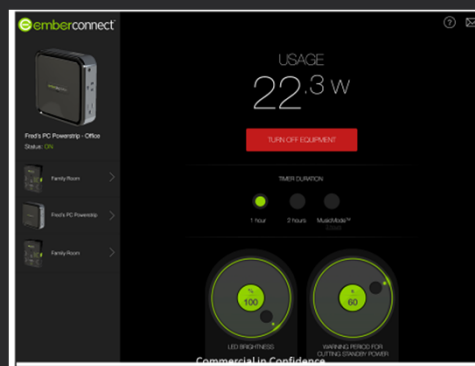
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Customer App Overview   embertec®

- e Tier 2 APS installation and user guide
- e Smart device application interface across important Tier 2 APS settings:
  – LED brightness setting
  – Active power-down settings
  – Time-out settings
  – Manual Over-ride
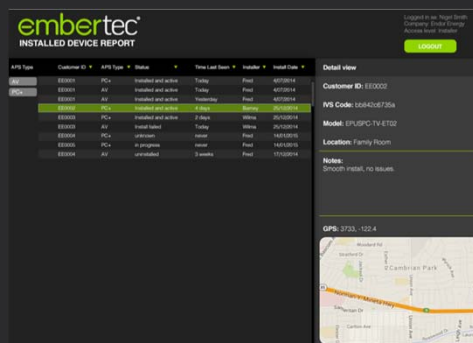 – Community Savings
  – Instant Messaging Support

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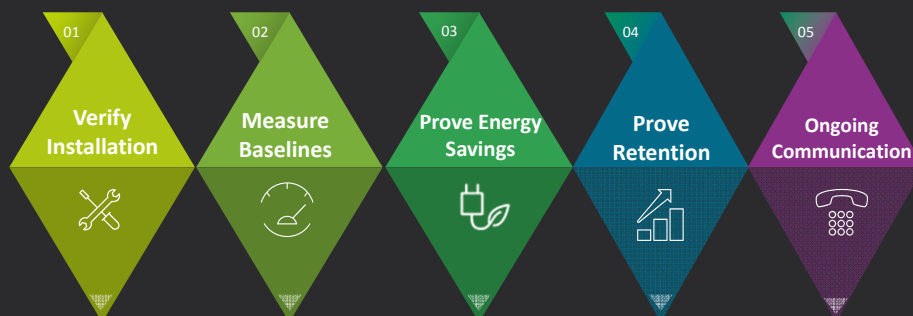## Installer App Overview

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- Verifies installation and other metering parameters to an actual AV/PC environment
- Links installation to individual installers
  - Critical for program performance improvement
- Provides Tier 2 APS how to install/use videos
  - Ensures the appropriate messaging is presented to the householder
  - Fast tracks installation process lowering installation time and cost

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Benefits of Tier 2 APS + Wireless Communications

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01	02	03	04	05
Verify Installation	Measure Baselines	Prove Energy Savings	Prove Retention	Ongoing Communication

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Additional Information on PC+

Emberstrip PC +

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- Cutting wasted plug load energy

- Savings are delivered to each office environment individually, avoiding the "hit or miss" of broader IT effort control.

- Computers and peripherals waste power in two distinct ways:
  - **Active Power Waste** where the device is on but not performing its main function (e.g. Computer and peripherals are on but not being used)
  - Passive Standby where power is used by peripheral products to keep it ready to switch on.

- An ideal energy saving device would reduce both types of wastage through advanced activity sensing.

Left on during lunch, meetings, breaks, and overnight/weekends

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Emberstrip PC +

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- Emberplug PC+ is a software/hardware solution

- Using Automatic Power Down™ it senses when the PC is not being used by monitoring multiple parameters and warns you of imminent energy control.

- If no user activity it then places your PC into sleep mode and shuts power off to all peripherals in the Energy Saver sockets.

- If the user is at their work station they simply move the mouse or hit a key on the keyboard and the sleep mode is avoided.

Embertec PC+ Software

embertec™
ENERGY EFFICIENCY TECHNOLOGIES

Power saving is about to start!

You don't seem to be using your computer at the moment.

Your computer will go to sleep in 01:58 minutes

To continue using your computer,

Move the mouse or Press any key

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Enterprise Solution

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Overview

PC+ Enterprise Solution creates the perfect marriage between *hardware* and *software*.

A cloud based service is then used to configure and manage all enterprise PCs, coupled with software installed directly on to the PCs connected to the Embertec PC+ unit.

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Enterprise Solution

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Key Features

- Allows IT administration to centrally install, update and manage Embertec PC+ software and hardware.
- Enables PCs connected to the corporate intranet to be individually identified and optionally grouped together
  - *All PCs in a lab/office can be identified & managed together*
- Enables creation of multiple configurations (wake up sessions) to be created and then assigned to individual or groups of PCs
  - *PCs will then wake up when required for essential system maintenance and security*
- Provides a report on power usage both by individual PCs and collectively as a group such as in a lab, room, building or campus
- Enables PCs to be remotely put to sleep on demand – if the PC is not being used, thus saving additional power.

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Additional Information on Wireless Connectivity

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New Bluetooth Models for 2016   **embertec**

e Linking communication to Tier 2 APS will unlock program success and certainty.

e During Q1 2016 our optional **Bluetooth** connected smart sensor with be available.

e This option will offer benefits for consumers, installers and program administrators given the EM&V requirements through the deployment of Tier 2 APS.

e The new 2016 **Bluetooth** models will also be a new chassis design, a sleeker strip and an 8 outlet wall-tap all with the same proven energy saving design, but with added communication.

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After sales support challenges

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By ensuring appropriate product introduction with dedicated sales personnel you reduce the burden on after sales support requirements

Dedicated customer support services provided by Embertec

We can leverage technology (smart-phone app) to address FAQ's for the customer and assist in installation and initial usage barriers where they exist.

The smart-phone application will also address other customer requirements which we have learned over time through the deployment of Tier 2 APS, including adjustment of:

- LED light brightness
- Active power-down timer
- Power-down delay accessibility

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Knocking Down Market Barriers

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- Embertec delivers another first for the Tier 2 APS category we created.

- Ongoing Tier 2 APS program assessment at the push of a button from the comfort of your office

- Many more program benefits for utilities, implementers and their customers only possible through this latest Embertec innovation.

Contact us to learn more
www.embertec.com

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CPUC & "Direct Install Only" Status embertec®

- Only Direct Install measures have been approved at present due to uncertainty around installation rates of upstream, mid stream and down stream approaches.

- Detailed ongoing field metering will be required to validate and update ex-ante EUL and energy savings data whilst also enabling a strong IOU position on ex-post evaluations.

- This data can be easily and inexpensively attained via Embertec's innovative communications solutions within Embertec our Tier 2 APS product range

- Communications can also be leveraged to open up delivery channels outside of Direct Install and meet CPUC rigor to prove installation at the outset

- **Embertec provides our partners with program flexibility through opening up new delivery channels for tier 2 APS due to automated EM&V solutions.**

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Why Embertec? - Recap embertec®

- Invented the Tier 2 Advanced Power Strip

- Deployed millions via direct install, multi family, single family and low income programs.

- Tried and tested firmware and hardware solutions through customer feedback from millions of units deployed

- Excellent customer service

- Full and on-going training to installers and or customer service reps

- Is the only product with proven savings from independent field trials and evaluation from utilities in US and Canada

- Embertec Tier 2 APS ensures program performance is automatically measured and field issues resolved before detailed ex-post evaluation occurs

- Embertec Tier 2 APS is a gateway to a connected home platform for the energy utility

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