# EVALUATION OF THE STANDBY ENERGY SAVINGS POTENTIAL OF POWER CONTROL DEVICES

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# Australian Field Trial Parameters

- Aim to measured energy saving potential for Standby Power Control (SPC) device
- Measured power and energy consumption by mode
  - Audio Visual Environment
    - TV, AV receiver, Set Top Box, Video players, game consoles
    - Minor use of lamps, TV antenna amplifiers, etc
  - PC environment
    - PC (laptop + Desktops), printers, MFD, scanners, routers, etc
    - Some small TVs, desk lamps
- 20 Houses in Adelaide, South Australia
  - 1 to 2 weeks monitoring per household



# Types of Standby Power Control Devices
















# Categories of Power Control Devices

- Master – Slave device
  - Master socket is monitored – turns off slaves when master is detected in low power mode or off mode
- Current averaging sensing device
  - Uses current as the trigger to turn off all slave devices, sometimes need to be “trained”
- USB connection (PCs)
- Software required (PCs)
- Power sensing
  - Device evaluated in the trial



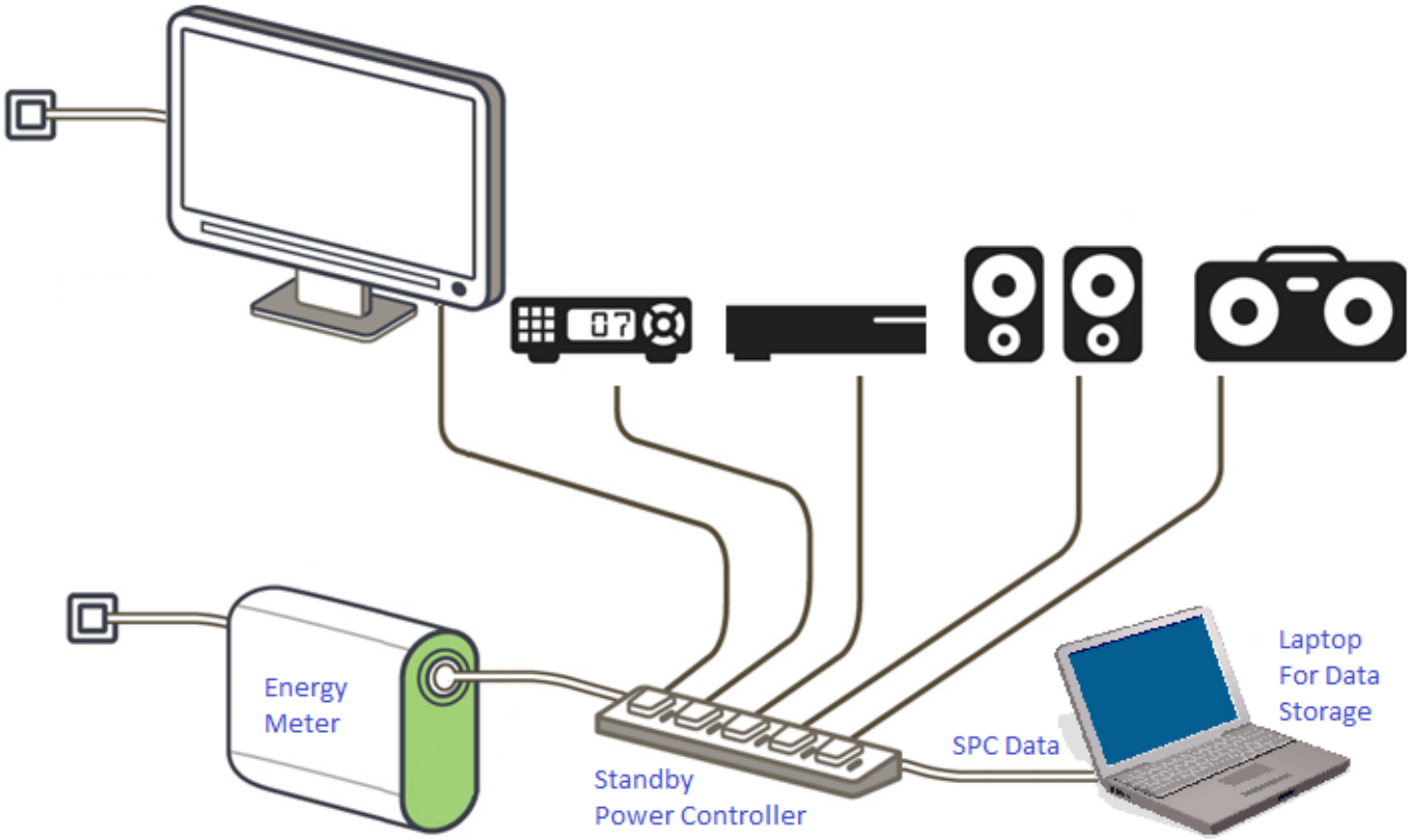
# Measurement Methodology

- Stage 1 Approach – first 5 households
  - Aim to validate the functionality of the energy saving device
  - One week without the device, and one week with the device enabled.
  - Pre/Post test of the impact of the SPC device.
- Stage 2 Approach – next 15 households
  - SPC device was set to log mode
  - SPC device was monitored to record when the energy saving mode was enacted
  - Equipment connected to the energy saving device was again monitored

# Measurement Equipment

- Physical Data
  - Power meter (SparoMeter) on individual products connected to PC and AV power board – Measured power in various modes
  - OmégaWatt data logger for the power board (1 min power data)
  - Data logging from SPC device via PC – 1 second data (power, time, infrared, etc)
    - Measurement of data loggers and meters were correlated with Yokogawa Power Analyser and found to be within 2%
- Survey/interview
  - data on demographics, equipment in household and usage

# Diagram of Measurement Setup (AV)



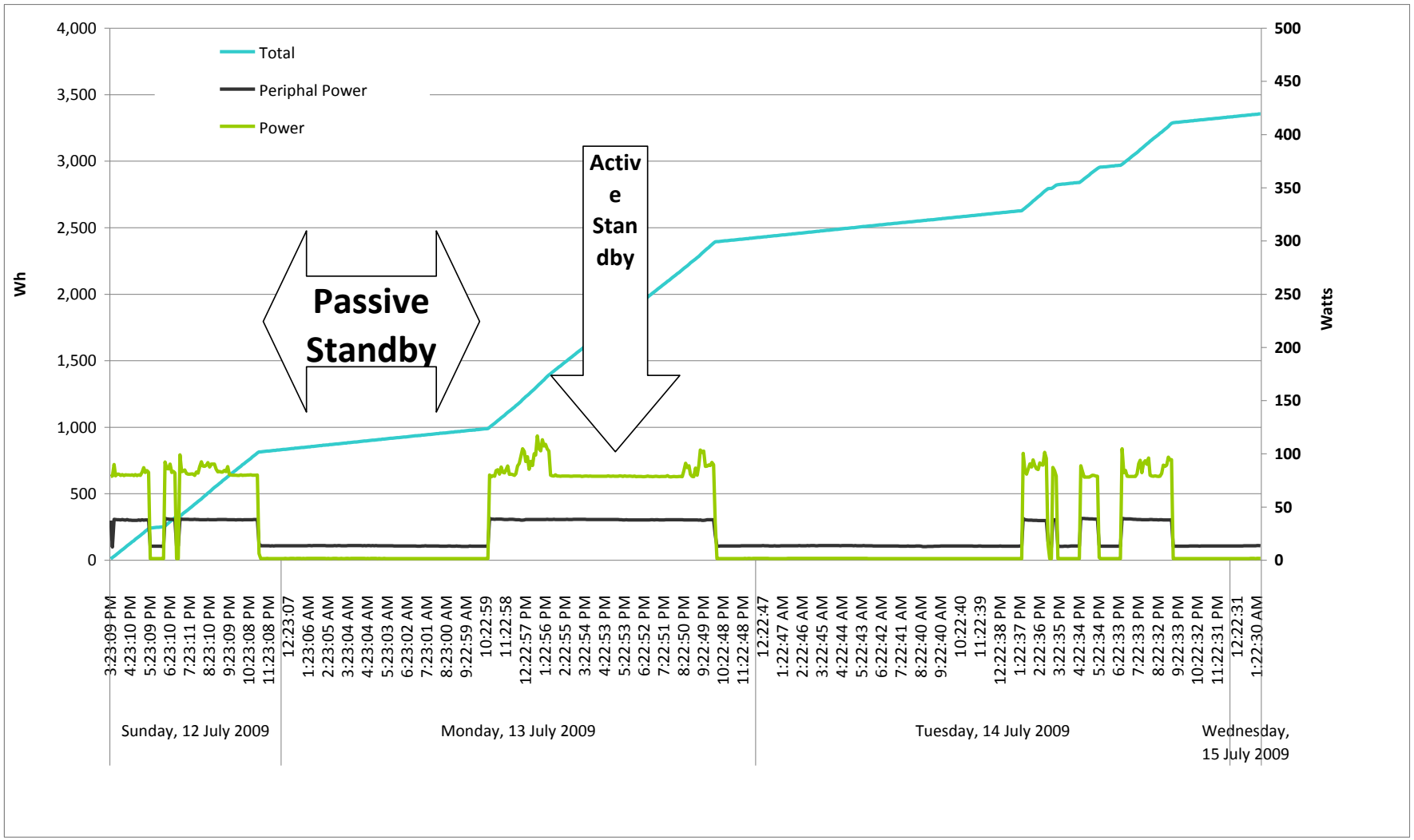
# Sample Characteristics

- Aim was to sample a range of typical Australian households, however:
  - slightly biased with higher income groups.
  - a slightly higher appliance ownership
    - televisions, laptops and laser printers.
  - Found multiple AV and PC systems
    - But this did not affected the results of this study as measurements were only made of the power use of the central AV or PC systems in each household

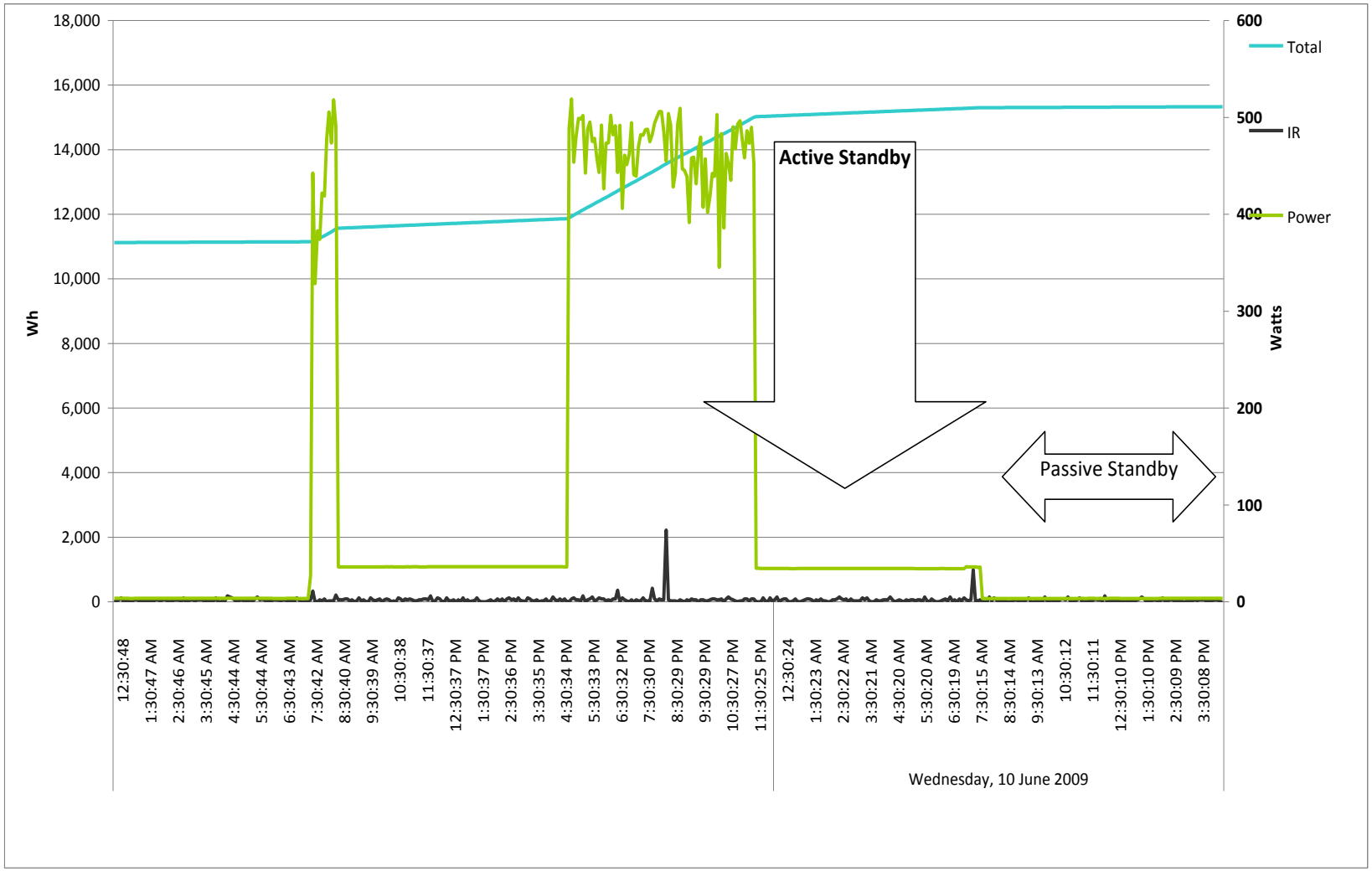
# Analysis Approach

- Detailed assessment of power use over time
  - power use of the individual equipment
  - equipment ‘signature’ energy and time of use, and;
  - survey information
- Used standard definitions of power modes, and **active (or idle) standby mode** further defined as:
  - For AV Equipment, after no user (IR) activity was detected for a period of 1.5 hours
  - For PC equipment, after the power use of the PC box was stable for a period of 30 mins.

# PC Power Use Example from Field Trial



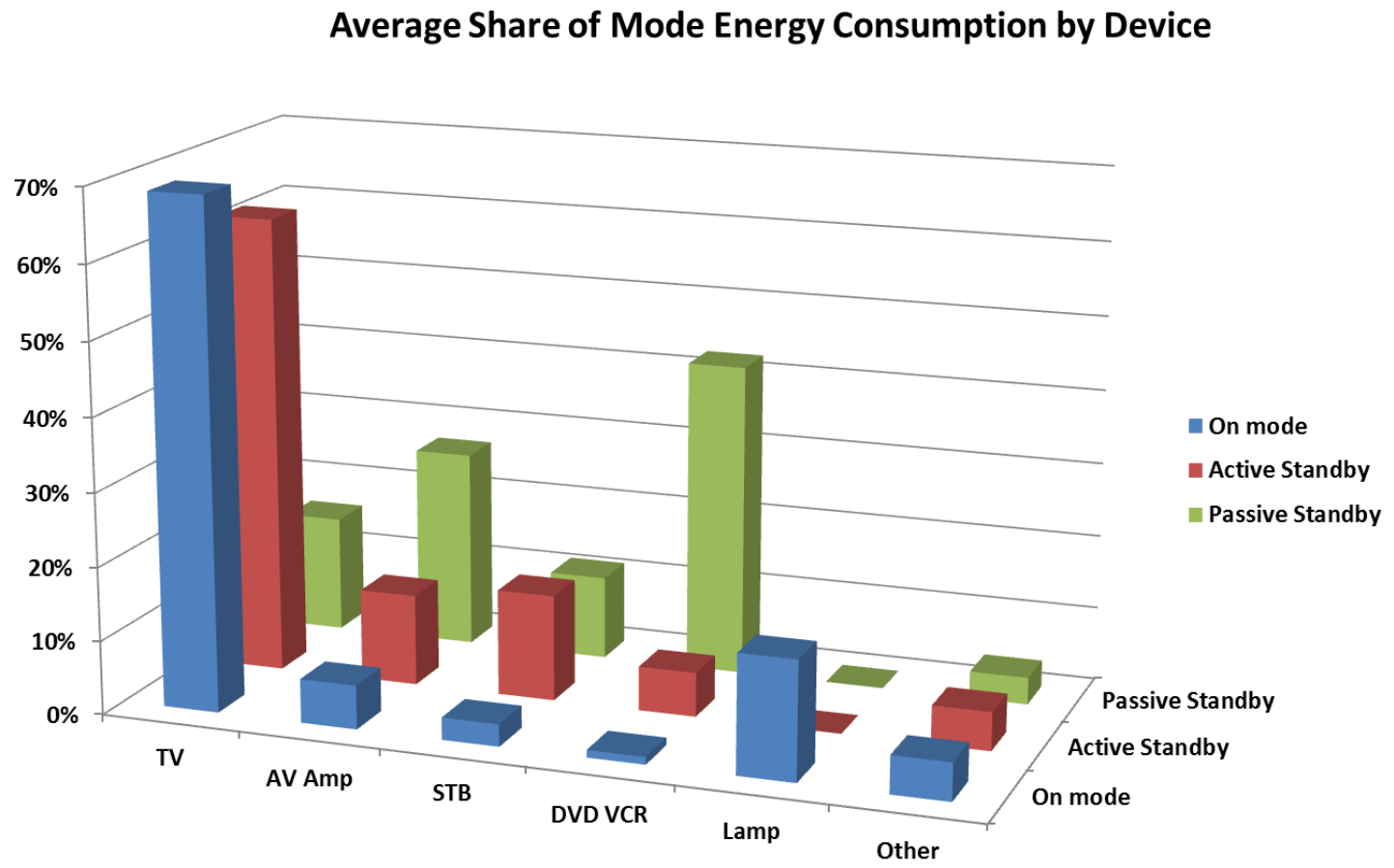
# AV Power Use Example from Field Trial



# AV Results - Average Use and Power

| | In-use | Active Standby | Passive Standby | Off |
|---|---|---|---|---|
| **Time by Mode (hrs/day)** | 5.5 | 7 | 9.5 | 2 |
| **Average Power (W)** | 382 | 214 | 16 | 0 |

# Average Share of Mode Energy Consumption by Device Type



# PC Results – Average Use and Power

| | In-use | Active Standby | Passive Standby | Off |
|---|---|---|---|---|
| **Time by Mode (hrs/day)** | 2.9 | 10.0 | 11.1 | 0 |
| **Average Power (W)** | 158 | 158 | 28 | 0 |

# Total Average Energy Consumption by Mode and Environment

| Environment | Energy Use by Mode | All Modes | In-Use | Active Standby | Passive Standby |
|---|---|---|---|---|---|
| **PC** | kWh pa | 859 | 448 | 581 | 111 |
| | Percent Energy Use | | 19% | 68% | 13% |
| **AV** | kWh pa | 1,370 | 767 | 548 | 55 |
| | Percent Energy Use | | 56% | 40% | 4% |

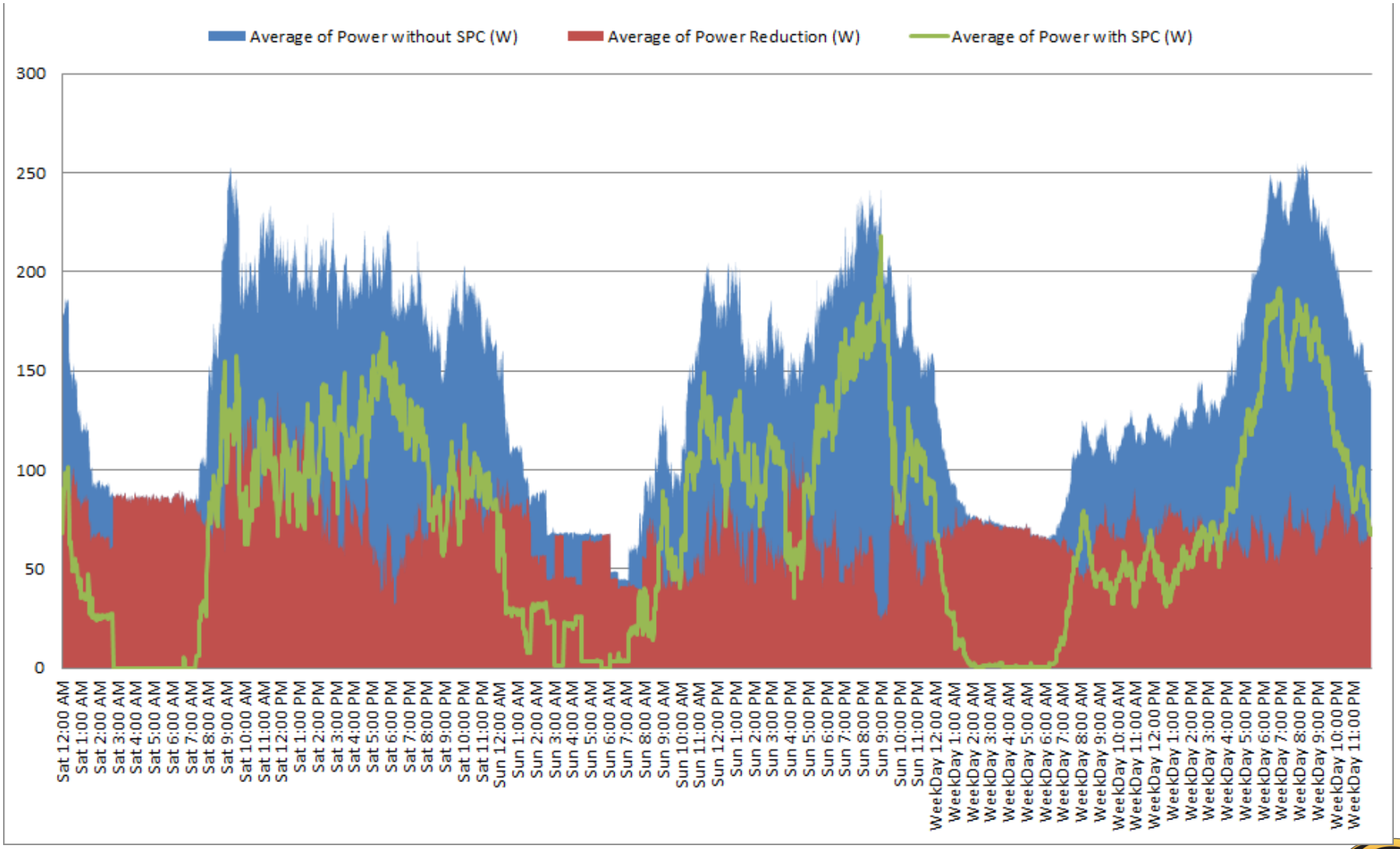
# Energy Savings by Mode - AV

| | Total AV Energy (kWh pa) | Average In-use Energy (kWh pa) | Average Active Standby mode Energy (kWh pa) | Average Passive Standby Energy (kWh pa) |
|---|---|---|---|---|
| **Energy Use by Mode** | 1,370 | 767 | 548 | 55 |
| **Energy Savings** | 736 | 164 | 525 | 48 |
| **Percent savings: Total and by mode** | **54%** | **21%** | **96%** | **87%** |

# Energy Savings by Mode – PC

| | Total PC Energy (kWh pa) | PC Peripheral Energy (kWh pa) | PC Peripheral Average Active Standby mode Energy (kWh pa) | PC Peripheral Average Passive Standby Energy (kWh pa) |
|---|---|---|---|---|
| **Energy Use by Mode** | 859 | 448 | 290 | 77 |
| **Energy Savings** | 352 | 352 | 290 | 62 |
| **Percent savings: Total and by mode** | **41%** | **79%** | **100%** | **87%** |

# Average Power Reduction by Time of Day – AV Environment



# Conclusions

- **Active standby power consumption is a major contributor** to energy consumption for both PC and AV equipment,
  - yet the main focus of standby power savings programs have been on reducing passive standby power consumption; and
- **Intrusive household surveys** which undertake detailed metering and data-logging of appliance energy usage, can provide **unprecedented insight into residential energy usage** and potential for standby energy savings.
- **Standby Power Controller** has the **potential to save 1,000 kWh pa**, or AU$200 (150 Euro)



# Further Information

Thank You

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