Agenda

• BBA PPL Team Updates
  • Publications
  • New Research
  • Upcoming Events

• Technical Presentations
  • Energy Savings and Usability of Zero-Client Computing in Office Settings
    Amanda Farthing, University of Michigan
  • Driving Down Consumer Electronics Energy Use: Lessons from Residential
    Jennifer Amann, American Council for an Energy-Efficient Economy

• Discussion and Q&A
• Member Updates
Team Players

Technical Team Lead:
Dr. Kim Trenbath
National Renewable Energy Laboratory (NREL)
Kim.Trenbath@nrel.gov
Phone (office): (303) 275-3710

Bennett Doherty
NREL

Katie Vrabel
Waypoint Energy

Carly Burke
Waypoint Energy
Device-level plug load disaggregation in a zero energy office building and opportunities for energy savings

- *Energy and Buildings*
- Bennett Doherty & Kim Trenbath
- October 2019
Integrating Smart PPL Controls into EMIS Platforms – A Landscaping Study

• Technical Report
• Rois Langner & Kim Trenbath
• June 2019
Emerging Technologies for Improved Plug Load Management Systems: Learning Behavior Algorithms and Automatic and Dynamic Load Detection

- In progress technical report
- Bennett Doherty, Kim Trenbath, Katie Vrabel, & Carly Burke
New Research

Automatic and dynamic load detection laboratory study

Interoperability of plug load controls with other building systems and EMIS platforms
Collaborations

Share your experiences, express your interest, or request technical assistance by contacting:

integratedlighting@pnnl.gov
2019-2020 Better Buildings Webinar Series

**BACK BY POPULAR DEMAND:**
The Best of the 2019 Better Buildings Summit
Tue, Sep 17, 2019 | 3:00 - 4:00 PM ET

**GETTING TO 100%:**
Overcoming Barriers to Tenant Data Collection
Tue, Oct 1, 2019 | 3:00 - 4:00 PM ET

**ENERGY EFFICIENCY AND RENEWABLE ENERGY IN SMALL AND RURAL K-12 SCHOOLS**
Tue, Oct 22, 2019 | 3:00 - 4:00 PM ET

**RETHINKING LEASING:**
Spotlight on the 2019 Green Lease Leaders
Tue, Nov 12, 2019 | 3:00 - 4:00 PM ET

**HOW BUILDINGS OF ALL SHAPES AND SIZES ARE BECOMING ZERO ENERGY USERS**
Tue, Dec 3, 2019 | 3:00 - 4:00 PM ET

**BEST OF THE BETTERS:**
The 2019 Better Project and Better Practice Presentations
Tue, Jan 7, 2020 | 3:00 - 4:00 PM ET

**BUILDING VALUE:**
Energy Efficiency’s Impact on Financial Performance
Tue, Mar 3, 2020 | 3:00 - 4:00 PM ET

**FINANCE + RESILIENCE:**
Insights from Industry Leaders
Tue, Apr 1, 2020 | 3:00 - 4:00 PM ET

**GET SMART (LABS):**
Results from the Smart Labs Accelerator
Tue, May 5, 2020 | 3:00 - 4:00 PM ET

**SAVE MONEY AND BUILD RESILIENCE WITH DISTRIBUTED ENERGY TECHNOLOGIES**
Tue, Feb 4, 2020 | 3:00 - 4:00 PM ET
Upcoming Events

2020 GSA / DOE Request for Information on Grid-Interactive Efficient Buildings

- View the [recorded webinar](#)
- View RFI posting details [here](#)
- Closes December 9, 2019
Upcoming Events

Smart Energy Analytics Campaign Webinar
• Presenting the 2019 New Installation Recognition awards
• November 20th, 11am-12pm PST
• Register here

http://smart-energy-analytics.org
• Hyatt Regency Crystal City (Arlington, VA)
• Registration opens in January; early-bird discounts available
• More information here
Guest Presentation

Amanda Farthing
University of Michigan
adfarth@umich.edu
Energy Savings and Usability of Zero-Client Computing in Office Settings

Amanda Farthing
Study Co-Authors: Rois Langner, Kim Trenbath

U.S. Department of Energy, Better Buildings Alliance
Technical Research Team Call
November 13, 2019
Computing in the commercial sector is a large energy consumer

Computing loads
~ 1 quad / year
5% total energy consumption

U.S. Commercial Buildings
2017

2017 percentage of total energy consumption by end use attributed to computing loads in all commercial buildings. Data from EIA Annual Energy Outlook 2019.
We compared virtual and traditional computing methods
Computing takes place on data center servers
Research Questions:
➢ Can virtual computing using zero clients save energy?
➢ When are virtual machines and zero clients appropriate?
Four workstations were submetered over 2 weeks
21 Watts: average power draw of one virtual machine on data center servers
Average plug load power draw is similar between computing types.
Total average power including the VM servers is 119% higher for zero clients

<table>
<thead>
<tr>
<th>Workstation Number and Computing Type</th>
<th>Workstation Power (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero Client 1</td>
<td>22.9</td>
</tr>
<tr>
<td>Laptop 1</td>
<td></td>
</tr>
<tr>
<td>Zero Client 2</td>
<td>42.0</td>
</tr>
<tr>
<td>Laptop 2</td>
<td></td>
</tr>
<tr>
<td>Zero Client 3</td>
<td>37.3</td>
</tr>
<tr>
<td>Laptop 3</td>
<td></td>
</tr>
<tr>
<td>Zero Client 4</td>
<td>36.5</td>
</tr>
<tr>
<td>Laptop 4</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- **VM Server**
- **Zero Client**
- **Laptop**
We analyzed whole-building plug loads in NREL’s Research Support Facility
We analyzed whole-building plug loads in NREL’s Research Support Facility

Sept 2013: Switch to zero clients
C Wing plug loads decreased after switch to zero clients

![Bar graph showing plug loads per occupant (W) for C Wing in 2013 and 2014.

- C Wing 2013: 86.20 W (±), 34.50 W, 31.47 W
- C Wing 2014: 59.02 W (±)

Legend:
- Zero client (occupied)
- Zero client (unoccupied)
- Laptop (occupied)
- Laptop (unoccupied)
2016 plug loads were lower in office using zero clients during occupied hours only.
Average plug load power per occupant is lower for the office space using zero clients.
But not when VM power consumption is considered
Research Questions:

➢ Can virtual computing using zero clients save energy?

➢ When are virtual machines and zero clients appropriate?
Questionnaire results indicate varied preferences

• Current VM technology is more appropriate for light and medium power users
• Nearly 50% of VM users felt that the processing speeds were too slow
• VM users worry less about cyber security or theft of their computing systems while traveling
• More VM users (82%) versus laptop users (55%) found it easy to access their files and applications from multiple locations
Questionnaire results indicate varied preferences

“My VM has changed my life. It allows me to do tasks from home that were impossible before.”

“I hate them, it is like torture trying to use a browser or Excel.”

“I LOVE my zero client and would only give it up with loud vocal disagreement. (I hate having to lug things around like a tablet.)”
Key Takeaways

• Although zero clients offer **plug load savings** (particularly during occupied hours),...

• Power consumption of virtual machines can make zero-client computing **more energy intensive**

• **Virtual Desktop Infrastructure** and **Data Center** efficiency heavily influence total energy consumption

• Zero clients can **help improve cyber security** and **remote file access**

• More work is needed to **improve the usability/performance** of zero-client computing
More Key Takeaways

• Benefits of submetering building loads

• Role of user behavior in energy use

• Opportunities for Advanced Power Strips and Smart Outlets
Full Report:
Thank you!

Questions?

Amanda Farthing
adfarth@umich.edu
Guest Presentation

Jennifer Amann
American Council for an Energy-Efficient Economy
jamann@aceee.org
Driving Down Consumer Electronics Energy Use: Lessons from Residential

Jennifer Amann, Buildings Program Director, ACEEE

Better Buildings Alliance
Plug and Process Loads Technical Research Team Webinar
November 13, 2019
The American Council for an Energy-Efficient Economy is a nonprofit 501(c)(3) founded in 1980. We act as a catalyst to advance energy efficiency policies, programs, technologies, investments, & behaviors.

Our research explores economic impacts, financing options, behavior changes, program design, and utility planning, as well as US national, state, & local policy.

Our work is made possible by foundation funding, contracts, government grants, and conference revenue.
## Set-Top Boxes: 2012 Estimated Energy Consumption

<table>
<thead>
<tr>
<th>Segment</th>
<th>Category</th>
<th>UEC kWh/yr</th>
<th>Units Millions</th>
<th>TEC TWh/yr</th>
<th>Power Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cable</strong></td>
<td>DVR</td>
<td>282</td>
<td>27</td>
<td>7.5</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>Non-DVR</td>
<td>139</td>
<td>57</td>
<td>7.9</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>Client</td>
<td>90</td>
<td>2</td>
<td>0.1</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>DTA*</td>
<td>39</td>
<td>33</td>
<td>1.3</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>Satellite</strong></td>
<td>DVR</td>
<td>283</td>
<td>21</td>
<td>5.9</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>Non-DVR</td>
<td>110</td>
<td>58</td>
<td>6.4</td>
<td>2.1</td>
</tr>
<tr>
<td><strong>Telco</strong></td>
<td>DVR</td>
<td>140</td>
<td>6</td>
<td>0.8</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>Non-DVR</td>
<td>90</td>
<td>21</td>
<td>1.9</td>
<td>0.6</td>
</tr>
<tr>
<td><strong>U.S. Total</strong></td>
<td></td>
<td>-</td>
<td><strong>225</strong></td>
<td><strong>32</strong></td>
<td><strong>10.6</strong></td>
</tr>
</tbody>
</table>

* DTA stands for digital transport adapter

Further rapid growth projected with increasing prevalence of digital video recorders!
STB Voluntary Agreement

- Limited options for standards; regulatory alternative needed
- Service provider signatories account for at least 85% of all pay-TV subscribers
- 90% of each service provider’s new STBs must meet required energy levels
- Additional requirements for each provider type (cable, satellite, telco)
- ANSI/CTA 2043: Set Top Box Power Measurement standard required
- Independent administrator publicly reports the results the following year
- Field verification, audit, and remediation provisions
- All reports and energy information on all STB models purchased since 2014 at http://www.energy-efficiency.us/
Significant Savings over Six Years

- First six years: national STB energy consumption decreased 39% even as functionality increased
- Consumer savings of $5.14 billion ($1.6 billion in 2018)
- CO₂ reduction of 28.6 million metric tons over 6 years
- Annual savings now exceed output of four 500 MW coal-run power plants

![Bar chart showing energy savings from 2013 to 2018](chart.png)
<table>
<thead>
<tr>
<th>Category</th>
<th>TEC (kWh/y)</th>
<th>Percent Change in Weighted Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-VA (Existing Stock)</td>
<td>2018 Stock</td>
</tr>
<tr>
<td>Weighted Average</td>
<td>267</td>
<td>138.71</td>
</tr>
<tr>
<td>DVR</td>
<td>119</td>
<td>91.76</td>
</tr>
<tr>
<td>Thin Client</td>
<td>90</td>
<td>45.39</td>
</tr>
</tbody>
</table>

DVR: 10.63” x 6.34” x 1.18”

Thin client: 5.12” x 5.12” x 0.86”
Base Allowances + Adders

Table 1: Base Type TEC Allowances

<table>
<thead>
<tr>
<th>Base Type (use Topmost if Multiple Apply)</th>
<th>Tier 2 Allowance (kWh/yr)</th>
<th>Tier 3 Allowance (kWh/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable DTA (DTA)</td>
<td>25</td>
<td>40</td>
</tr>
<tr>
<td>Cable (CBL)</td>
<td>45</td>
<td>50</td>
</tr>
<tr>
<td>Satellite (SAT)</td>
<td>50</td>
<td>55</td>
</tr>
<tr>
<td>Internet Protocol (IP)</td>
<td>45</td>
<td>40</td>
</tr>
<tr>
<td>Thin Client (TC)</td>
<td>12</td>
<td>25</td>
</tr>
</tbody>
</table>

20 kWh/yr in Tier 2 adders for on Advanced Video Processing decoder and High Definition moved to the base allowance in Tier 3

Adders
+ DVR/Shared DVR
+ Hard drives
+ Transcoding
+ CableCard
+ Multiple streams
+ Cable interface: DOCSIS
+ Home Network Interface: WiFi, MIMO, MoCA
+ Access point
+ 4K – Ultra HD
+ High Efficiency Video Processing (HEVP)
+ Telephony
Progress to date from:

• Component improvements
• System architectures
• Power management/sleep modes/power scaling
  • New 16nm chipsets of STBs will accelerate improvement
• “Whole home” solutions: 1 DVR + thin client(s)
• Cloud technology offering virtual DVR/STB
• Shift to IP-based content delivery
• Turnover of pre-VA stock almost complete
Savings to come:
- Improved deep sleep capabilities
- Better power scaling
- Fewer STB purchases:
  - 23M in 2018 vs. 46M in 2014
  - DVRs: 6M vs. 12M avg 2013-16
- Continued move to IP delivery
- Shift to app-based service with smart TVs, low power over-the-top boxes, and mobile devices
Small Network Equipment: Industry VA

Average Energy Usage by Equipment Type, Weighted by Broadband Speed

Source: D&R 2018 SNE Annual Report
Smart speakers & video streaming devices: the next STBs?

- Roughly 100 million in use as of mid-2018
- Popular speakers are energy efficient with low standby use despite constant listening for users
- Speakers accounted for about 783 GWh ($100M) in 2018
- Video streaming devices are also efficient: 11-24 kWh/yr vs. 35-100 kWh/yr for service provider STBs
- Streaming devices used about 727 GWh in 2018
- AppleTV and Amazon Fire TV use less than 1W in standby
- Linking smart speakers to TVs can double annual TV energy use!
  - Some 2018 models experienced jump in standby from 0.5W to 20W
- Video streaming devices can increase TV consumption as well
  - User setup options can disable energy-saving features

<table>
<thead>
<tr>
<th>Product</th>
<th>On-Mode Power (Watts)</th>
<th>Standby Power (Watts)</th>
<th>Annual Energy Use (KWh/Yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google Home Mini</td>
<td>1.7</td>
<td>1.4</td>
<td>12.3</td>
</tr>
<tr>
<td>Amazon Echo (2nd Gen.)</td>
<td>2.4</td>
<td>1.6</td>
<td>15.2</td>
</tr>
<tr>
<td>Google Home</td>
<td>2.2</td>
<td>1.9</td>
<td>17.1</td>
</tr>
<tr>
<td>Apple HomePod</td>
<td>5.9</td>
<td>1.9</td>
<td>21.6</td>
</tr>
<tr>
<td>Harman Kardon Invoke</td>
<td>4.2</td>
<td>3.8</td>
<td>33.4</td>
</tr>
</tbody>
</table>

Source: NRDC 2019
POTENTIAL IMPACT OF POOR WAKE BY VOICE IMPLEMENTATION IN TVs

**Today**
- Average On Mode: 57 W
- Average Standby Mode: 0.3 W
- Total Annual Energy: 106 kWh/year

**Possible Tomorrow**
- On Mode: 57 W
- Standby Mode: 20.8 W
- Total Annual Energy: 248 kWh/year

*Increase of 142 kWh/year or 134%*
Research Needs

😁 Consumer expectations for functionality, wake-up time, etc.

人も Characterization of commercial sector end-uses and potential for energy efficiency

- Widespread use in hospitality, healthcare, office
- Specialty equipment types with unique features
- Impact of new streaming options

 반드시 Upstream energy use associated with consumer pay-TV services and video streaming and projected changes as STB use declines
Thank you!

Jennifer Amann
jamann@aceee.org
202.507.4015
Questions and Member Updates

• Discussion
  • Questions
  • Comments
  • Member Updates
    • Please send to ppl@waypoint-energy.com
Thank You!
Appendix
Relevant specification for devices used in the Research Support Facility workstation study.

<table>
<thead>
<tr>
<th>Device</th>
<th>Model</th>
<th>Relevant Specifications</th>
</tr>
</thead>
</table>
| Zero Clients         | Wyse P20 Zero Client—Tera 1100 | □ Dedicated hardware personal computer over internet protocol engine  
                       |                              | □ Operational power consumption rating: 15.4 W |
| Laptops              | Dell 1                       | □ Processor:  
                       | (1) Latitude E6410     |   ○ (1) Intel Core i7-M620 (CPU 2.67 GHz)  
                       | (2) Latitude E6439     |   ○ (2) Intel Core i7-3520M (CPU 2.90 GHz)  
                       | (3) Latitude E6330     |   ○ (3) Intel Core i5-3320M (CPU 2.60 GHz)  
                       | (4) Latitude E6420     |   ○ (4) Intel Core i5-2540M (CPU 2.60 GHz)  
                       |                              | □ RAM:  
                       |                              |   ○ (1,2,4) 4.00 GB  
                       |                              |   ○ (3) 8.00 GB  
                       |                              | □ System Type: 64-bit OS |
| Monitors             | Dell (Model # G2210)         | □ Panel Size: 22-in  
                       |                              | □ Display Type: LED-backlit LCD monitor / TFT active matrix  
                       |                              | □ Operational Power Consumption Rating: 18 W  
                       |                              | □ Standby/Sleep Power Consumption Rating: 0.15 W |
| Keyboard and Mice    | Varied                      | Varied                  |
| Advanced Power Strip | iGo Advanced Power Strip     | □ Power draw less than 0.5 W |
| Plug Load Data Logger| Onset HOBO Plug Load Logger (Model USX120-018) | □ Accuracy: 0.5% up to 14 amp continuous; up to 1.0% over 14 amp when equipment being monitored is at 100% duty cycle  
                       |                              | □ Resolution: 10 mW down to 1 watt loads at 120 VAC |
| Data Analysis Software | HOBOware (Version 3.7.8)     | Allows for plotting and analysis of logged data |

1 Numbers in parenthesis correspond to workstation number
Load Profile

The load profile graph illustrates the power consumption of different workstations throughout the day. The graph shows the following:

- **Occupied Hours**: The period during which the workstations are active.
- **Lunch Break**: The period of lower power consumption due to a lunch break.

The graph compares:

- **Laptop Workstation**:Red line, indicating higher power consumption.
- **Zero Client Workstation**:Teal line, indicating lower power consumption.

The y-axis represents the Workstation power (W) and the x-axis represents the Time of day, from 12 AM to 10 PM.
Avg Weekend Loads for workstation

- Laptop (sleep)
- Zero Client (idle)
- Zero Client (off)
Average power per user and per computing type during occupied and unoccupied hours

[Diagram showing power consumption for Zero client and Laptop for different workstations and occupancy statuses.]
Ave plug load per occupant, split by occupied (lt) and unoccupied (rt)
### Experimental design and user types for submetered workstations

<table>
<thead>
<tr>
<th>Workstation Number</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Type of User</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Zero Client (idle at night)</td>
<td>Laptop</td>
<td>Light</td>
<td>Mainly uses Excel and word processing</td>
</tr>
<tr>
<td>2</td>
<td>Zero Client (idle at night)</td>
<td>Laptop</td>
<td>Power</td>
<td>Most simulations run on a remote desktop. This remote desktop was accessed through the VM during week 1.</td>
</tr>
<tr>
<td>3</td>
<td>Laptop</td>
<td>Zero Client (off at night)</td>
<td>Medium</td>
<td>Mainly uses Excel and QGIS</td>
</tr>
<tr>
<td>4</td>
<td>Laptop</td>
<td>Zero Client (off at night)</td>
<td>Power</td>
<td>Most simulations run on a remote desktop. This remote desktop was accessed through the VM during week 2.</td>
</tr>
</tbody>
</table>
Time periods for which building-level plug load data were drawn, and associated Research Support Facility occupancy by wing.

<table>
<thead>
<tr>
<th>Date Range¹</th>
<th>A+B Wing Occupancy²</th>
<th>C Wing Occupancy²</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 8–June 5, 2013</td>
<td>773</td>
<td>209</td>
</tr>
<tr>
<td>August 17–Sep 17, 2014</td>
<td>934</td>
<td>262</td>
</tr>
<tr>
<td>March 8–June 5, 2016</td>
<td>831</td>
<td>304</td>
</tr>
</tbody>
</table>

¹ Dates chosen to coincide with available occupancy data and avoid summer months (which generally entail an influx of interns and increased vacation time).
² Occupancy numbers are as of the last day in the associated date range.

Assumptions used to define occupied and unoccupied hours for plug load calculations.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Hours Considered for Average Power Calculations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupied Hours</td>
<td>Weekdays, 9 AM–5 PM, excluding holidays and weekends</td>
</tr>
<tr>
<td>Unoccupied Hours</td>
<td>All days, 9 PM–4 AM</td>
</tr>
</tbody>
</table>
Current and projected power consumption of virtual machines in the Research Support Facility virtual desktop infrastructure

<table>
<thead>
<tr>
<th></th>
<th>Current Average</th>
<th>Current Max*</th>
<th>Future Average</th>
<th>Future Max*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power per Blade Server (W)</td>
<td>215</td>
<td>215</td>
<td>229</td>
<td>229</td>
</tr>
<tr>
<td># VMs per Server</td>
<td>25</td>
<td>40</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>Power per VM for Computation (W)</td>
<td>8.6</td>
<td>5.4</td>
<td>2.9</td>
<td>2.3</td>
</tr>
<tr>
<td>Total EqualLogic Storage Power (W)</td>
<td>1,898.5</td>
<td>1,898.5</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td># VMs in VDI</td>
<td>200</td>
<td>200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power per VM for Storage (W)</td>
<td>9.49</td>
<td>9.49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Server-Based Power per VM (W)</td>
<td>18.1</td>
<td>14.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Center PUE</td>
<td>1.16</td>
<td>1.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Server-Based Power per VM × PUE (W)</td>
<td>20.99</td>
<td>17.25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Refers to maximum possible VMs on one blade server.
## Total average power (W) comparisons across computing types

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Workstation</th>
<th></th>
<th></th>
<th></th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Zero Client Mean</td>
<td>22.84</td>
<td>19.99</td>
<td>15.29</td>
<td>14.47</td>
<td>18.15</td>
</tr>
<tr>
<td>Zero Client Std. Dev.</td>
<td>10.61</td>
<td>11.51</td>
<td>9.82</td>
<td>12.62</td>
<td></td>
</tr>
<tr>
<td>Zero Client Total (including VM Server)</td>
<td>43.83</td>
<td>40.98</td>
<td>36.28</td>
<td>35.46</td>
<td>39.14</td>
</tr>
<tr>
<td>Laptop Mean</td>
<td>22.86</td>
<td>15.73</td>
<td>17.27</td>
<td>16.47</td>
<td>18.08</td>
</tr>
<tr>
<td>Laptop Std. Dev.</td>
<td>24.15</td>
<td>17.30</td>
<td>16.10</td>
<td>20.37</td>
<td></td>
</tr>
<tr>
<td>Difference (Zero Client Total – Laptop)</td>
<td>20.97</td>
<td>25.25</td>
<td>19.01</td>
<td>18.99</td>
<td>21.05</td>
</tr>
<tr>
<td>% Higher (Zero Client vs. Laptop)</td>
<td>92%</td>
<td>161%</td>
<td>110%</td>
<td>115%</td>
<td>119%</td>
</tr>
</tbody>
</table>
Plug Loads
Smart Outlets