Better Buildings Webinar Series

We'll be starting in just a few minutes….

Tell us…please send your responses to the webinar organizers via the chat window:

1. **What topics are you interested in for future webinars?**
2. **How are you addressing plug load?**

Better Buildings
U.S. DEPARTMENT OF ENERGY

Plug into Energy Savings:

Strategies and Resources for Reducing Plug Load Energy Use in Your Buildings

December 1, 2015
3:00-4:00 PM ET

U.S. DEPARTMENT OF ENERGY

Overview and Agenda

- Welcome & Introductions
- Plug load Overview – National Renewable Energy Laboratory (NREL)
- Case Study – Stanford University
- Case Study – U.S. General Services Administration (GSA)
- Additional Resources
- Question & Answer Session

Today's Presenters

Name		Organization
Rois Langner		NREL
Moira Hafer		Stanford University
Jason Sielcken		GSA

Rois Langner

National Renewable Energy Laboratory (NREL)

U.S. DEPARTMENT OF ENERGY

Better Buildings Alliance

Plug and Process Load (PPL) Technical Solutions Team

December 1, 2015

Technical Lead Lab: The National Renewable Energy Laboratory (NREL)

BBA PPL Team Goals

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Better Buildings®
U.S. DEPARTMENT OF ENERGY

Members work with DOE's network of research and technical experts to develop and deploy innovative, cost-effective, energy savings solutions.

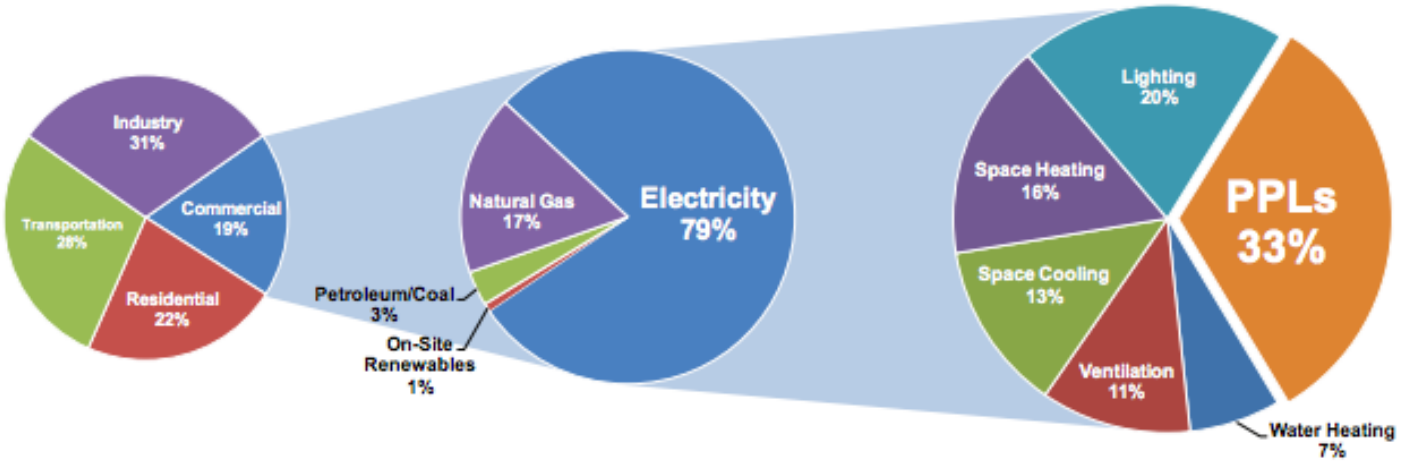


Figure 1. PPLs account for 33% of the total energy consumed by commercial buildings. *Graph by Chad Lobato, NREL; Data source: DOE (2010)*

Why PPLs?

PPLs account for an increasingly large percentage of a building's energy use

Reduce PPL energy use by:

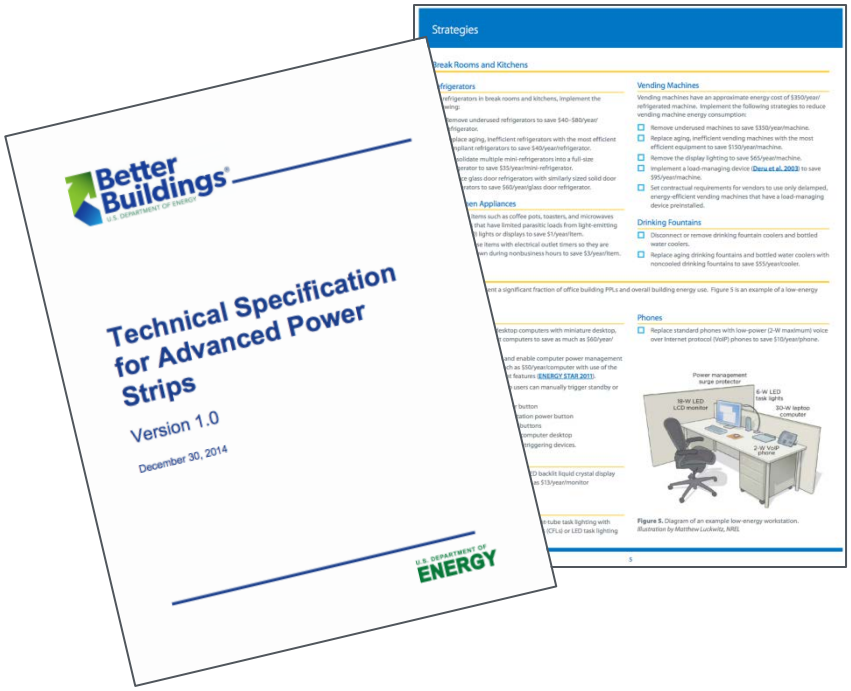
- Assessing PPL energy consumption
- Selecting appropriate control strategies
- Exploring efficient PPL design solutions
- Identifying utility incentives
- Institutionalizing policies and procedures for PPL energy reduction

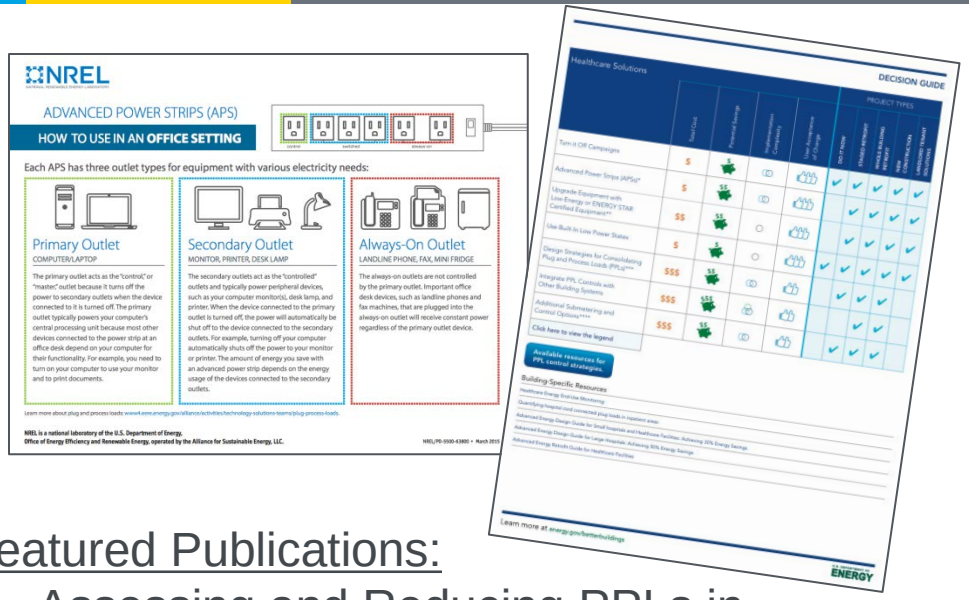
Figure 5. Diagram of an example low-energy workstation.
Illustration by Matthew Luckwitz, NREL

Available PPL Resources

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

- *Fact Sheets*
- *Technical Reports*
- *Presentations*
- *Case Studies*
- *Technical Specifications*
- *How-To Graphics*
- *List of Utility Incentives*





Featured Publications:

- Assessing and Reducing PPLs in Office and Retail Buildings
- Technical Specification for Advanced Power Strips
- How To Use Advanced Power Strips in an Office Setting
- Utility Incentives for Advanced Power Strips
- Decision Guides for PPL Controls

PPL Solutions

- Messaging, or Turn it Off! Campaigns
- Advanced Power Strips
- Upgrade Equipment with Low-Energy or ENERGY STAR ®-Certified Equipment
- Use Built-In Low Power States for Equipment
- Design Strategies for Consolidating PPLs
- Integrated PPL Controls with Other Building Systems
- Submetering and Control Options

Illustration by Marjorie Schott, NREL

Upcoming Projects & Events

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Upcoming Projects:

- Technology & behavioral study comparing thin-client/server-based computing systems to traditional computing systems
  - Technical report
  - Case study

NREL PIX #24594

NREL PIX #23249

Ongoing PPL Events:

- Bi-Annual BBA PPL Technical Team Calls
- 2016 Better Buildings Summit: May 9-11, DC
- Continually update resources on BBA PPL website

Join the BBA PPL Tech Team

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

https://www4.eere.energy.gov/alliance/activities/technology-solutions-teams/plug-process-loads

Team Members

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Members

- American Society for Healthcare Engineering (ASHE)
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)**
- CB Richard Ellis Group, Inc.
- First Potomac Realty Trust
- Glenborough, LLC
- Grand Valley State University
- Gundersen Lutheran Health System
- Health Care Without Harm
- Hines
- IBM
- Legacy Health System
- Newmark Grubb Knight Frank Global Corporate Services
- **Parmenter Realty Partners**
- PeaceHealth
- Stanford University
- Studley
- The Home Depot, Inc.
- **The Tower Companies**
- Tishman Speyer
- Ulta Inc.
- University of Maryland Medical Center
- University of Miami
- U.S. General Services Administration
- Wawa, Inc.

* Steering Committee member

** Ex-Officio Steering Committee member

Members in **bold** have taken the Better Buildings Challenge

Thank you!

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Rois Langner
National Renewable Energy Laboratory
Rois.Langner@nrel.gov
Phone: (303) 275-4329

Moira Hafer

Stanford University

U.S. DEPARTMENT OF ENERGY

A Data-Driven Approach to Plug Load Energy Reduction Programs

Moira Hafer
Stanford University
Better Buildings Alliance Webinar

December 1, 2015

Stanford Equipment Inventory Overview

- **Comprehensive 220-building equipment inventory**
- **Goals:**

1. Quantify campus plug load energy consumption and understand its composition
2. Identify viable plug load energy reduction opportunities
3. Collect data that supports university partners

Scope

- Types of equipment included:
  - Standard office equipment
  - Standard lab equipment
  - Common IT equipment
  - Kitchen & break room equipment
  - Gym equipment
  - Other
    - EH&S hazards
    - Water fixtures
    - Occupancy data
- Attributes collected for each type of equipment to provide necessary details for estimating energy consumption

Collection Process by the Numbers

5
months

12
student interns

2,760
student work hours

55
types of equipment

220
buildings

17,077
rooms inventoried

110,536
pieces of equipment

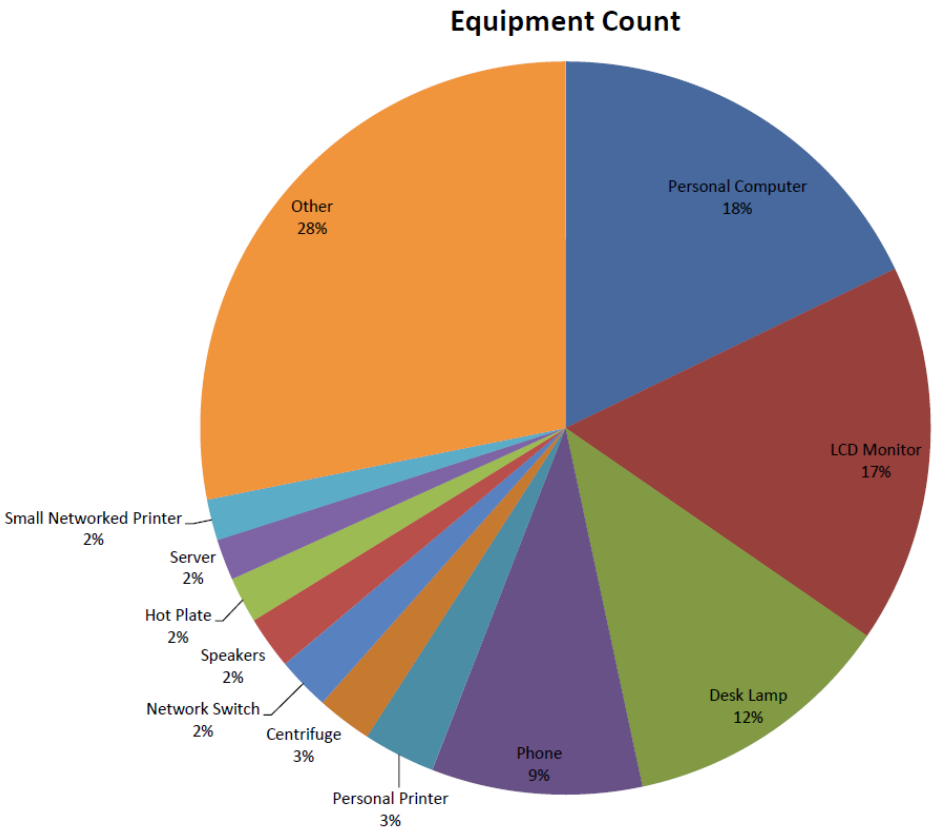
49,457,539 kWh
consumed per year

Data Collection Tool

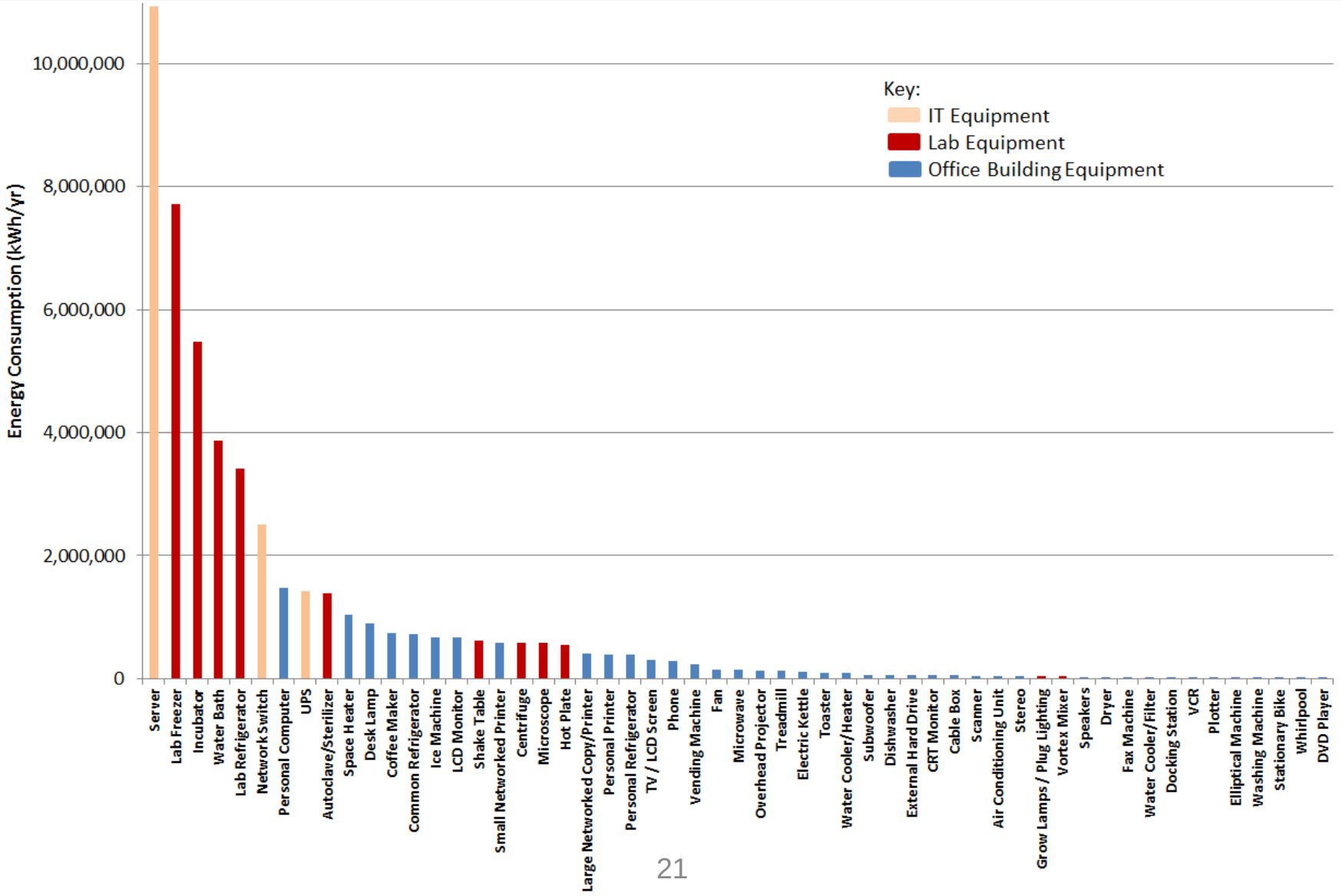
Interns used web application developed at Stanford to collect inventory data

Results (A) – Campus-wide Context

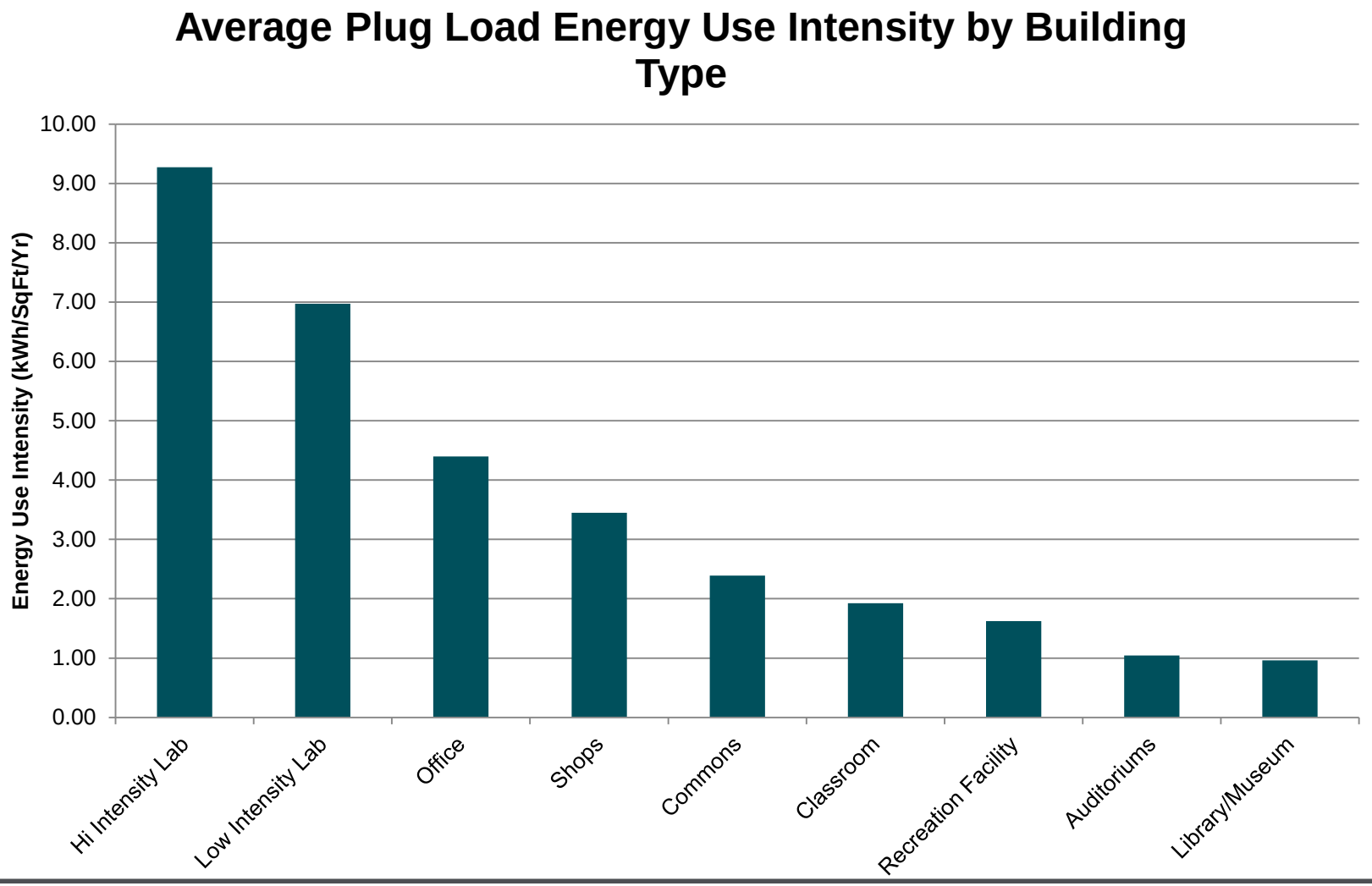
Total Equipment Count	**110,000**
Total Energy Consumption (kWh/yr)	**48,200,000**
Total annual cost	**$6.7 million**
Plug Load as % of Total Campus Electricity Use	**22%**
Plug Load as % of Electricity Use of 220 Bldgs	**32%**



Results (B) - Energy Consumption by Equipment Type



Results (C) – Energy Consumption by Building Type



Plug Load Energy Savings Programs

Estimated to save a total of $260,000 - $1.8 million annually

Program	Expected Annual Savings	Average ROI	% Plug Load Reduction
Equipment Retrofits	$261,000	2.7 years	3.9%
Space Heating	$40,000	1.7 years	0.6%
Sustainable IT	$728,000[1]	4.4 years	10.6%
Green Labs	$703,000	11 years	10.3%
Procurement Strategy	$85,000	N/A	1.2%
Total	$1,800,000	3.6 years	27%

[1]The additional savings from reduced power needs and cooling costs from server consolidation and virtualization could equal over 990,000 per year, bringing energy reduction from Sustainable IT plug load measures to the equivalent of 25% of total plug loads.

Thank you!

Moira Hafer

mbhafer@stanford.edu

For more information, visit us at

http://sustainable.stanford.edu

Jason Sielcken

U.S. General Services Administration (GSA)

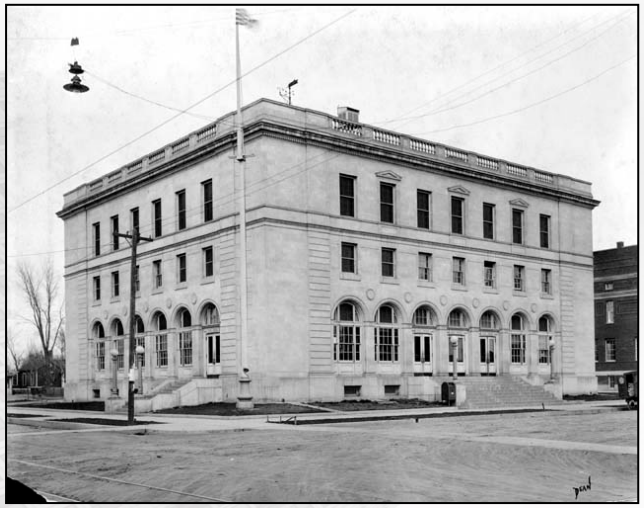
U.S. DEPARTMENT OF ENERGY

WAYNE N. ASPINALL FEDERAL BUILDING & US COURTHOUSE

PPL ENERGY INCENTIVE DATA REVIEW & LESSONS LEARNED

December 2015

PROJECT OVERVIEW:



- Building Constructed in 1918 with a major addition in 1938
- Listed on the Nation Register of Historic Places Required SHPO & ACHP Review / Comment
- Project Focus: Major preservation and rehabilitation effort balanced with a deep energy retrofit and capability for energy production within the footprint to achieve net zero
- Houses 8 federal agencies + the US Courts

PROJECT OVERVIEW:

- Design Build Procurement
- Target of LEED Platinum & Class A Net Zero
- SHPO & GSA reviews required a substantial reduction to the visibility of the renewable energy resource post award
- Challenge: Reduce the PV : Maintain ZNE

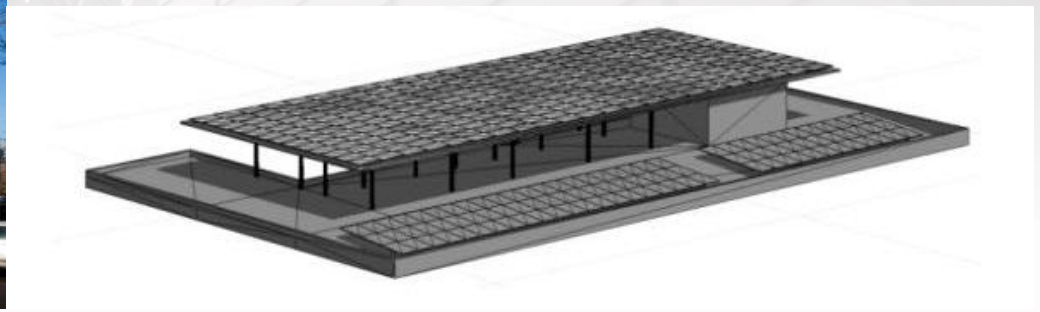
PROJECT OVERVIEW:

Optimize Building Envelope

Reduce Internal Loads

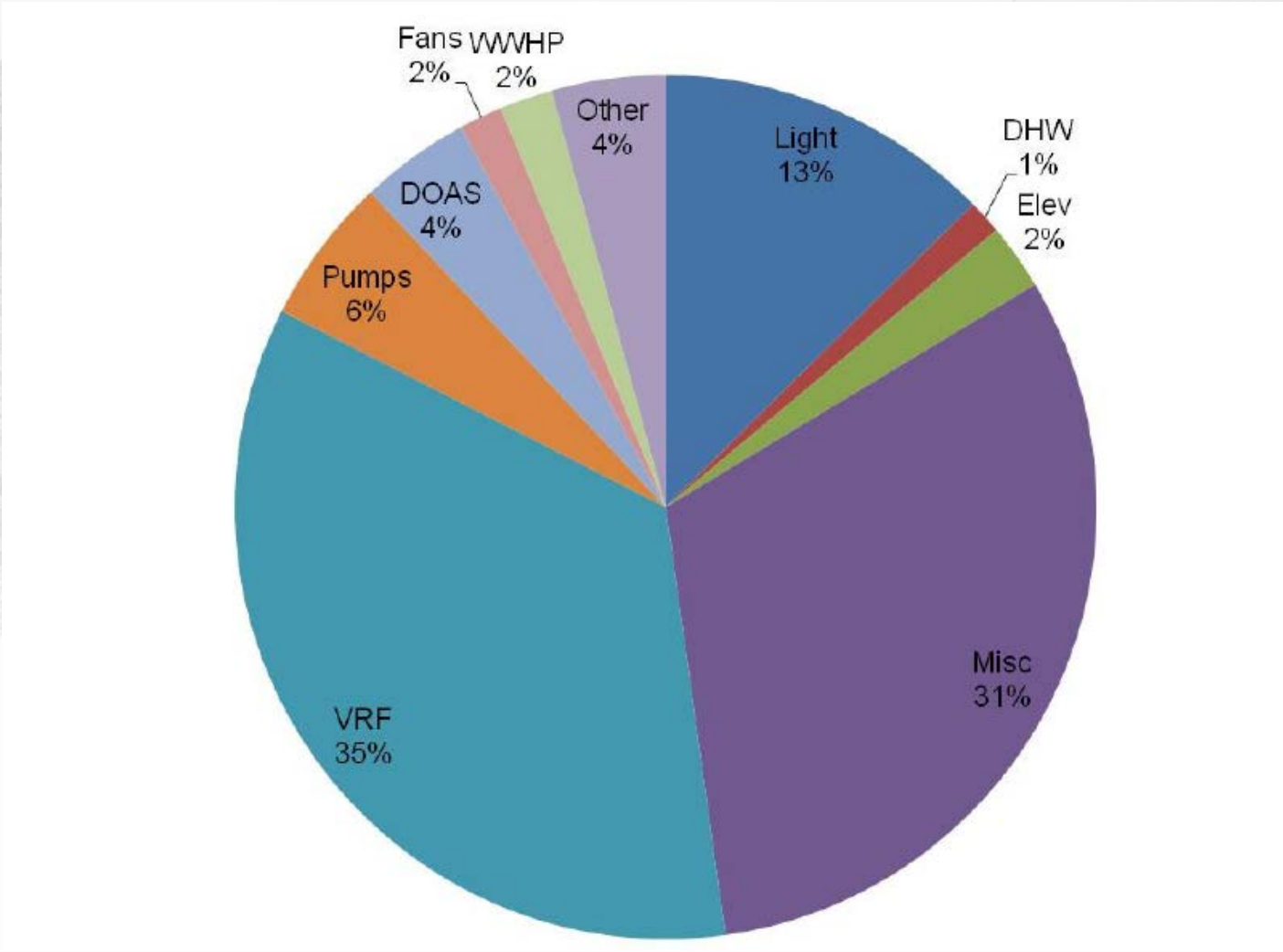
Design High Efficiency System

Match Building Load with On-site Renewable Energy

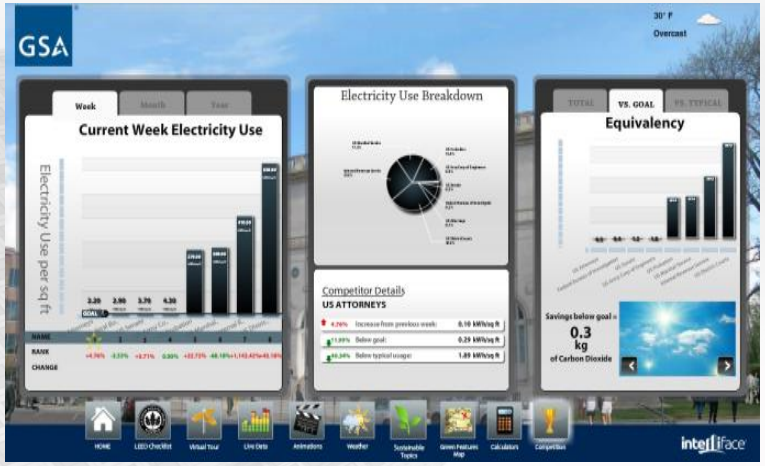


ENERGY USE BREAKDOWN:

SEPTEMBER 2013 – AUGUST 2014



PPL CONTROL STRATEGIES:



- 40,000 kWh/yr. – Cumulative target for all 51 employees for PPL (not including vertical transport).
- Sub-Metering to the Circuit Level
- Energy Information Displayed in the Lobby, with Access via Occupant Workstation
- Load Shedding Circuits Installed
- Utilized Load Shedding Plug Strips for Every Occupant

FINANCIAL INCENTIVE:

Take a portion of the RSF fee GSA collects for utilities and offer it back to the agency if they meet their energy target. **Reward Occupant Awareness & Response**

Agency target was based on their RSF, FTE Count, and Mission.

FINANCIAL INCENTIVE:

ACOE: 4,217 kWh/yr. Target

8 FTE | 4,724 RSF | Open Office, Typ. Office Equipment

VS.

US Marshals Service: 4,600 kWh/yr Target

2 FTE | 1,732 RSF | Open Office, Holding Cells, Typ. Equip., Security Equipment

---

$0.55/ kWh (rounded up to $18,000) vs. $0.10 kWh Utility

32,250 kWh Total Annual Plug Load Allowance for all Participating Agencies

IRS Annual Target = 14,000 kWh x 43.41% of total kWh available = $7,813.95

Additional **$0.25/kWh** if agency improves on their target.

RESULTS:

US ARMY CORP OF ENGINEERS:

- 8 FTE: 339 kWh/FTE ANNUALLY
- 0.6 kWh/RSF ANNUALLY

INTERNAL REVENUE SERVICE:

- 23 FTE: 609 kWh/FTE ANNUALLY
- 1.4 kWh/RSF ANNUALLY

US SENATE:

- 2 FTE: 628 kWh/FTE ANNUALLY
- 1.37 kWh/RSF ANNUALLY

US PROBATION:

- 2 FTE: 1,010 kWh/FTE ANNUALLY
- 0.9 kWh/RSF ANNUALLY

FEDERAL BUREAU OF INVESTIGATION:

- 3 FTE: 12,734 kWh/FTE ANNUALLY
- 11.49 kWh/RSF ANNUALLY

US DISTRICT COURTS:

- 2 PTE: 4,197 kWh/PTE ANNUALLY
- 1.34 kWh/RSF ANNUALLY

US MARSHALS SERVICE:

- 2 FTE: 3,223 kWh/FTE ANNUALLY
- 3.72 kWh/RSF ANNUALLY

US ATTORNEYS:

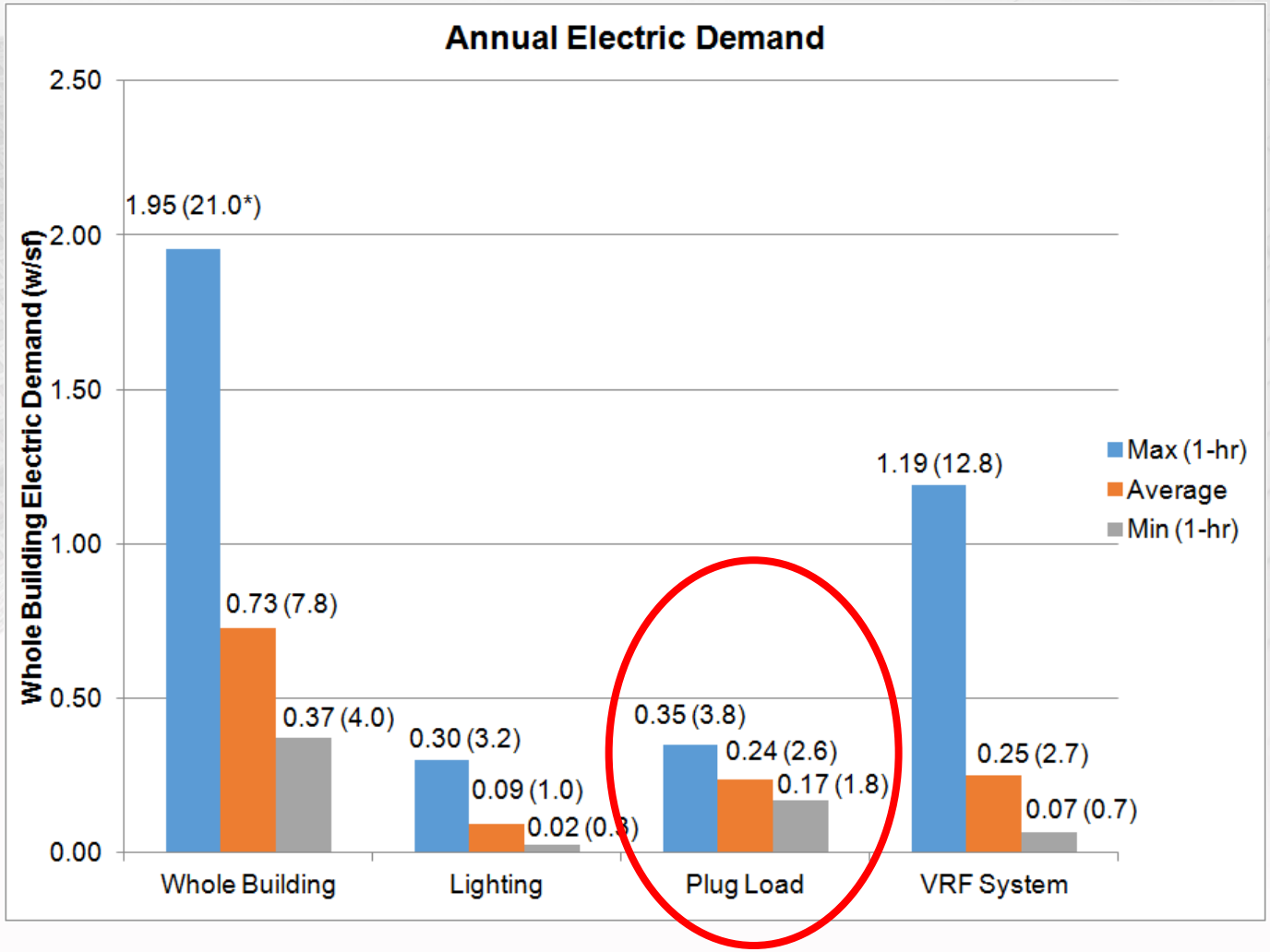
- 0 FTE: 0 kWh/FTE ANNUALLY
- 0.0 kWh/RSF ANNUALLY

NEXT STEPS:

1. I.T. SUPPORT & INVOLVEMENT IS CRITICAL
2. INCENTIVIZE MORE THAN JUST PLUG LOAD
3. CONSIDER THE INCENTIVE DURATION
4. CONSIDER WHERE THE INCENTIVE GOES – WHAT IS THE LOCAL RECOGNITION?
5. IS THE REWARD ENOUGH TO DRIVE CHANGE

2014 ELECTRIC DEMAND:

JANUARY 2014 – DECEMBER 2014



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DISCUSSION

CONTACT: JASON S. SIELCKEN, PMP, LEED AP BD+C

JASON.SIELCKEN@GSA.GOV

303.236.2972

Additional Resources

U.S. DEPARTMENT OF ENERGY

For More Information

NREL

- Better Buildings Alliance Plug & Process Loads

Stanford University

- Publication of Plug Load Inventory Results
- Guide for Installing Timers on Lab Equipment
- Guide for Installing Timers on Office Equipment
- Plug Load Inventory & Results Summary
- Sustainable Stanford Annual Report

GSA

- Wayne N. Aspinall Federal Building and US Courthouse

Q & A

U.S. DEPARTMENT OF ENERGY

Join us for the next Better Buildings Webinar

Registration is now open!

Cutting Edge Building Technologies – Join the Fun!

January 12, 3:00 – 4:00 PM ET

Presenters:
U.S. Department of Energy
New York Presbyterian Hospital
QM Power

Register here.

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2016

SAVE THE DATE

BETTER BUILDINGS SUMMIT

WASHINGTON, DC ▪ MAY 9–11



U.S. DEPARTMENT OF ENERGY

Additional Questions? Please Contact Us

betterbuildingswebinars@ee.doe.gov

Today's Presenters	Rois Langner National Renewable Energy Laboratory rois.langner@nrel.gov Moira Hafer Stanford University mbhafer@stanford.edu	Jason Sielcken U.S. General Services Administration jason.sielcken@gsa.gov
DOE Program Leads	Holly Carr DOE, Better Buildings Challenge holly.carr@EE.Doe.Gov	
Program Support	Kendall Sanderson JDM Associates ksanderson@jdmgmt.com	Holt Mountcastle JDM Associates hmountcastle@jdmgmt.com

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