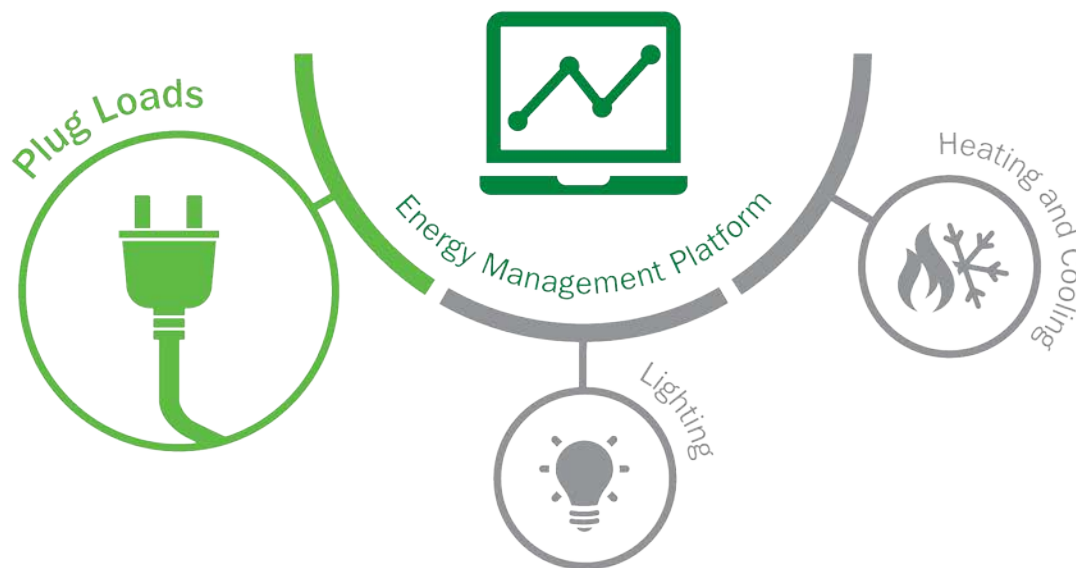


Streamlining IoT Plug Load Controls into BAS and EMIS Platforms – A Landscaping Study



Performing Organization: National Renewable Energy Laboratory

Principle Investigators: Rois Langner and Kim Trenbath, Technical Leads for the Better Buildings Alliance Plug & Process Load Technical Research Team

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Project Summary

Timeline:

Start date: 10/1/2017

Planned end date: 4/27/2018

Key Milestones

1. Final draft of literature review; 4/27/18
2. FY 18 Remainder: Collect feedback, coordinate with other labs & stakeholders, incorporate outcomes into AOP/other proposal processes

Budget:

Total Project \$ to Date (though March 2018 Fiscal Period):

- DOE: \$27,000
- Cost Share: \$0

Total Project \$:

- DOE: \$40,000
- Cost Share: \$0

Key Partners:

NREL
Waypoint Energy
Better Buildings Alliance (BBA) Plug & Process Load (PPL) Team
BBA Energy Management Information System (EMIS) Team

Project Outcome:

Plug load data and controls are not commonly integrated into Building Automation System (BAS) and EMIS platforms, although many have the capability to do so. The aim of this landscaping study is to identify the current state of the BAS, EMIS, and plug load control market, and understand ways to better integrate plug load controls into these platforms for more streamlined and efficient building operation.

Team



Rois Langner

BBA PPL Technical Team Lead
National Renewable Energy Laboratory



Dr. Kim Trenbath

Acting BBA PPL Technical Team Lead
National Renewable Energy Laboratory

Project Support:

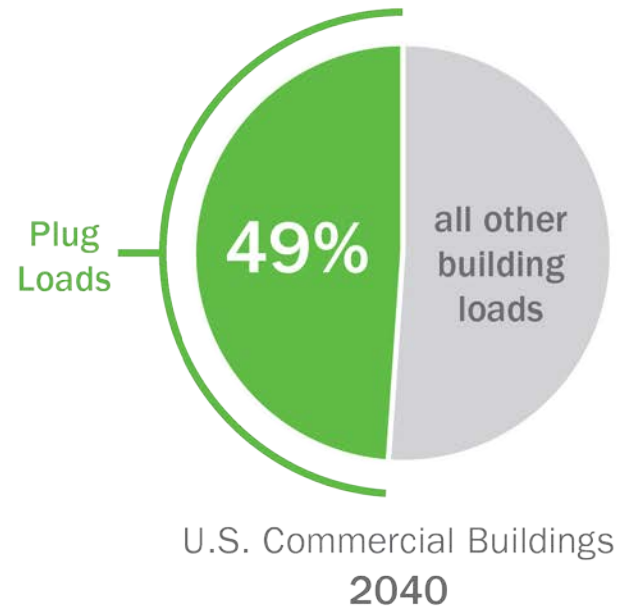
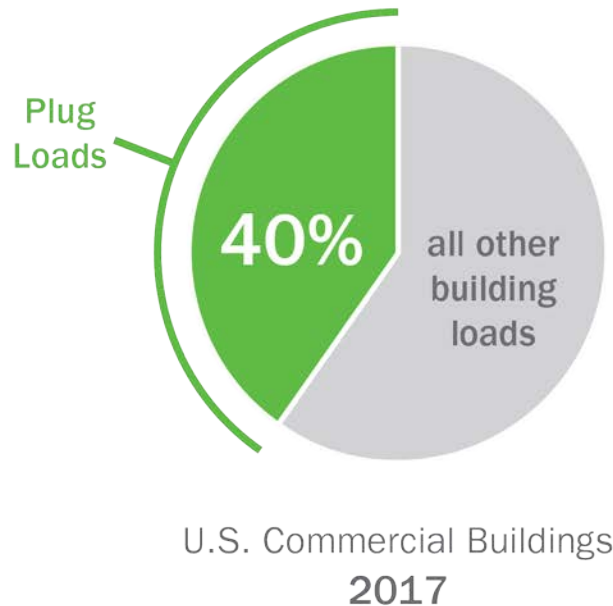
- Marta Schantz, Waypoint Energy
- Sormeh Konjkav, Waypoint Energy

Future Potential Collaborators:

- NREL – PPL Team
- LBNL – EMIS Team
- ORNL – Envelope Team
- NREL – Space Conditioning Team
- PNNL – Lighting Team
- Industry Stakeholders - TBD

Challenge

Plug loads consume a very large portion of whole-building energy use, and they are often not monitored or controlled



Percentage of whole-building energy attributed to plug loads in residential and commercial buildings in 2017, and projections for year 2040 (data from EIA Annual Energy Outlook 2018).

Challenge

- Plug load controls are not typically integrated into BAS or EMIS platforms
- Smart building systems are still very siloed

Integrating plug load controls can help us:

- 1 Streamline data management
- 2 Move beyond widgets
- 3 Explore more demand response opportunities

Approach

- 1 Assess Current State of the Market
- 2 Identify Opportunities for Future Research
- 3 Develop Plan to Address Research Needs

3 Major Project Goals

Approach

1 Assess Current State of the Market

Evaluate:

- Current state of wireless plug load meter & controls
- Existing integration into BAS or EMIS platforms
- Ease & cost to implement
- Current market direction
- Market gaps



Approach

1 Assess Current
State of the Market

2 Identify Opportunities
for Future Research

Potential Research Opportunities:

- Evaluate ways to improve ease
& cost of integration



Approach

1 Assess Current
State of the Market

2 Identify Opportunities
for Future R&D

Potential Research Opportunities:

- Evaluate ways to improve ease & cost of integration
- Assess ways to streamline data management and alerts



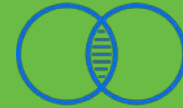
Approach

1 Assess Current
State of the Market

2 Identify Opportunities
for Future R&D

Potential Research Opportunities:

- Evaluate ways to improve ease & cost of integration
- Assess ways to streamline data management and alerts
- Research data flows to better integrate plug load data and controls



Approach

1 Assess Current
State of the Market

2 Identify Opportunities
for Future R&D

Potential Research Opportunities:

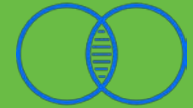
- Evaluate ways to improve ease & cost of integration



- Assess ways to streamline data management and alerts



- Research data flows to better integrate plug load data and controls



- Develop “best practices” protocols for:
 - System management
 - Cybersecurity
 - Facility manager/IT staff responsibilities
 - Stakeholder communication

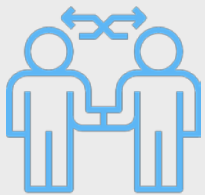


Approach

- 1 Assess Current State of the Market
- 2 Identify Opportunities for Future Research
- 3 Develop Plan to Address Research Needs

Potential Partners:

- BBA PPL Team
- BBA EMIS Team
- Wireless plug load meter & control companies
- EMIS platform developers
- Facility managers and IT staff (for technology demonstrations)
- Utilities



Impact

Future R&D work in this area can impact:



Energy Savings

- ✓ Up to 40% energy savings per device
- ✓ Up to 10% whole building energy savings
- ✓ Energy savings from integrated systems
- ✓ Grid-interactive efficient buildings

- Address CBI's program goal: Reduce energy use intensity (EUI) in commercial buildings by 25% by 2030.
 - Annual savings potential for U.S. plug loads is approximately 1.6 Quads, or 1.7% of national primary energy consumption.



Building Operation

- ✓ Easier data access & management
- ✓ Better system integration
- ✓ Improved DR Capabilities
- ✓ Improved cybersecurity
- ✓ Facility manager & IT engagement

Progress



Assess Current
State of the Market



Identify Opportunities
for Future Research



Develop Plan to
Address Research
Needs

- 4/27/18 Landscaping study completed
- Remainder of FY 18:
 - Collect feedback
 - Coordinate with other labs & stakeholders
 - Incorporate outcomes into AOP/other proposal processes

Stakeholder Engagement

Future Potential Collaborators:

- NREL – Plug Load Team
- LBNL – EMIS Team
- PNNL – Lighting Team
- ORNL – Envelope Team
- NREL – Space Conditioning Team
- Industry Stakeholders:
 - Plug load control companies
 - EMIS platform developers
 - Facility managers and IT personnel
 - Utilities



Engagement Activities:

- Coordinate various smart device landscaping studies developed by the National Labs
- Engage with industry stakeholders on approaches to address potential research opportunities



Remaining Project Work



Assess Current
State of the Market



Identify Opportunities
for Future Research



Develop Plan to
Address Research
Needs

- Incorporate DOE feedback into landscaping study
- Coordinate with:
 - Potential project stakeholders
 - Other DOE projects and project leads (including national labs)
- Integrate landscape outcomes into core DOE research areas
 - Cybersecurity
 - Beyond widgets (system integration)
 - Fault detection & diagnostics
 - Demand response
 - Utility engagement
 - Smart building technology integration
 - Grid-interactive efficient buildings
- Propose future research ideas

Thank You

National Renewable Energy Laboratory

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Kim Trenbath: 303-275-3710 | kim.trenbath@nrel.gov

REFERENCE SLIDES

Project Budget

Project Budget: \$40,000 (Small part of Systems Tech R&D AOP project)

Variances: None

Cost to Date (through March 2018 Fiscal Period): \$27,000

Additional Funding: None

Budget History

FY 2017 (past)		FY 2018 10/1/2017 to 4/27/2018 (current)		FY 2019 (planned)	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
\$0	\$0	\$40,000	\$0	\$0	\$0

Project Plan and Schedule

Project Schedule												
Project Start: October 1, 2017	Completed Work											
Projected End: April 27, 2018	Active Task (in progress work)											
	Milestone/Deliverable (Originally Planned)											
	Milestone/Deliverable (Actual)											
	FY2018											
Task	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Past Work												
Q3 Milestone: Final draft of literature review												