Advances in Plug Load Control Technology

Dr. Kim Trenbath

CalPlug Workshop #16

November 16, 2020

Outline

1. Introduction
2. 2019 Landscaping Study
3. Emerging Technologies for Plug Load Management (PLM)
4. Integration
5. Administrative Strategies
6. Diversity

Introduction

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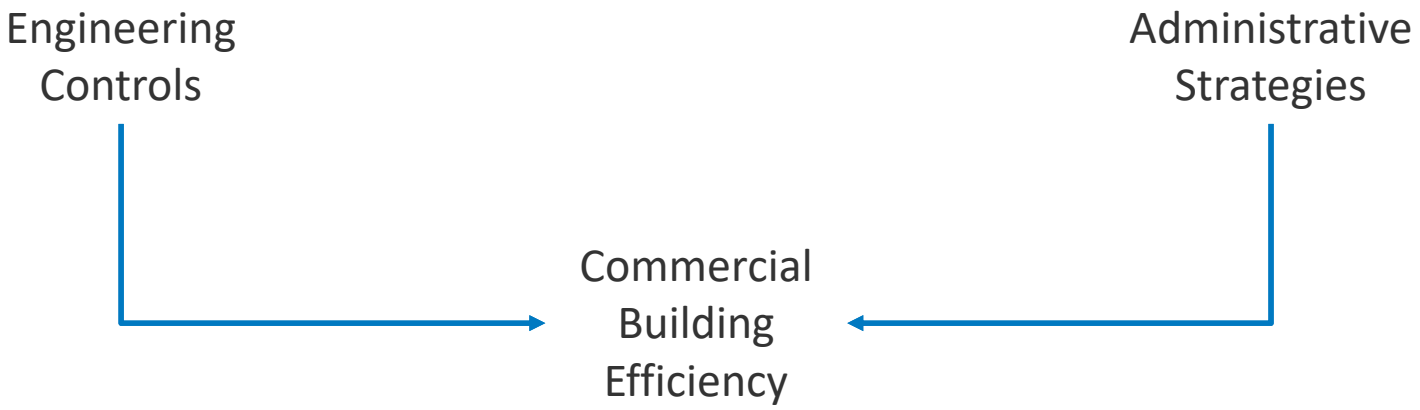
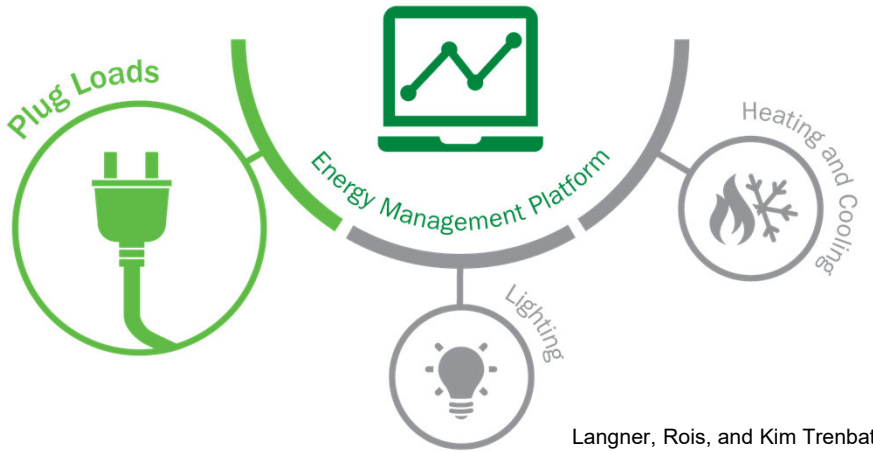
https://betterbuildingssolutioncenter.energy.gov/alliance/technology-solution/plug-process-loads

Advances in Plug Load Control Technology



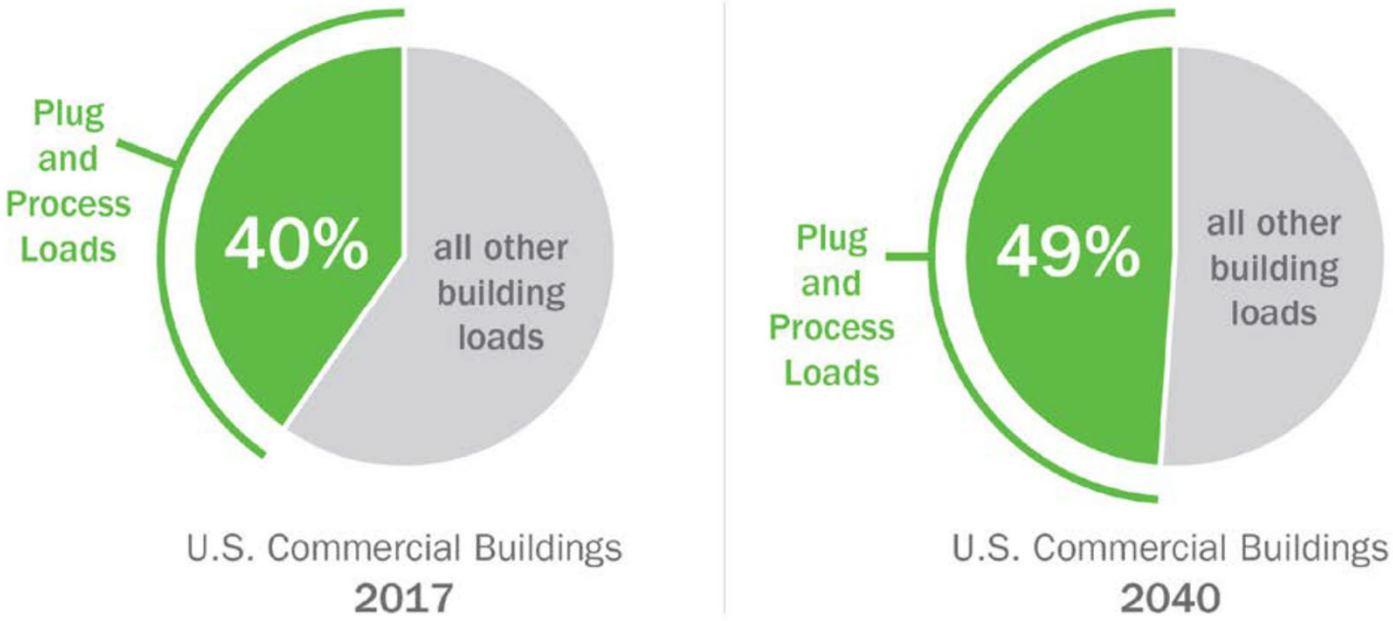
2019 Landscaping Study

Integrating Smart Plug and Process Load Controls into Energy Management Information System Platforms



Langner, Rois, and Kim Trenbath. 2019. Integrating Smart Plug and Process Load Controls into Energy Management Information System Platforms: A Landscaping Study. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5500-74080. https://www.nrel.gov/docs/fy19osti/74080.pdf.

Challenge



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).

Smart Outlets

Smart Outlet Desired Characteristics

Commercially Available	Limited
Connectivity and System Robustness	Streamlined Integration of PPL Data into EMIS Platforms
Local and Remote Access to Data	Interoperability with Other Building End-Use Systems and Platforms
Streamlined Data Management	Control Automation
Robust Cybersecurity Practices	Demand Response Capabilities
	Automatic and Dynamic Load Detection (for better “plug & play” capabilities)

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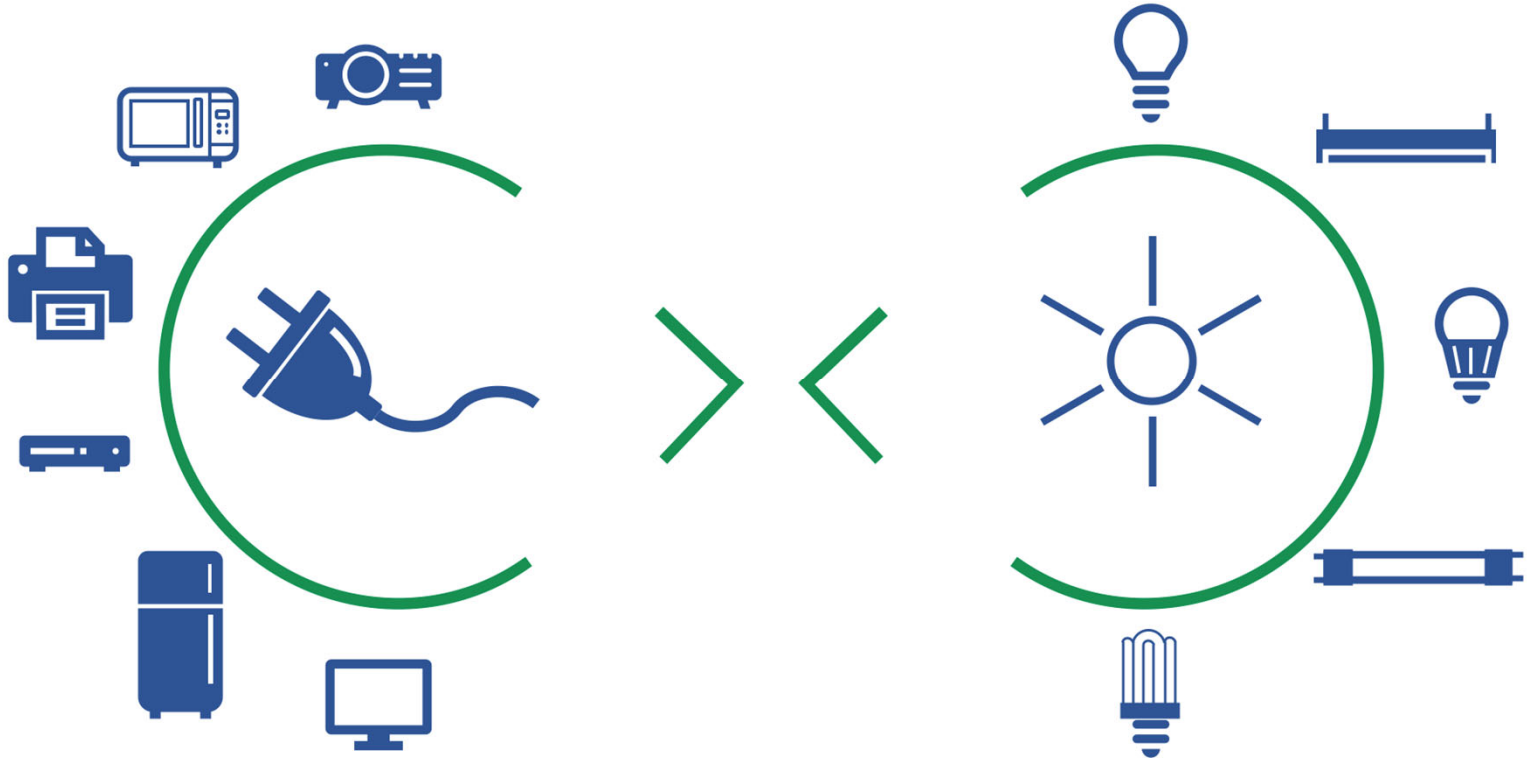
Integrating plug loads and lighting



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Priority Research Areas

1. Integrating PPL data into EMIS platforms
2. Interoperability of PPL data with other building end-use data
3. Development and testing of automatic PPL controls.

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Emerging Technologies for PLM Research

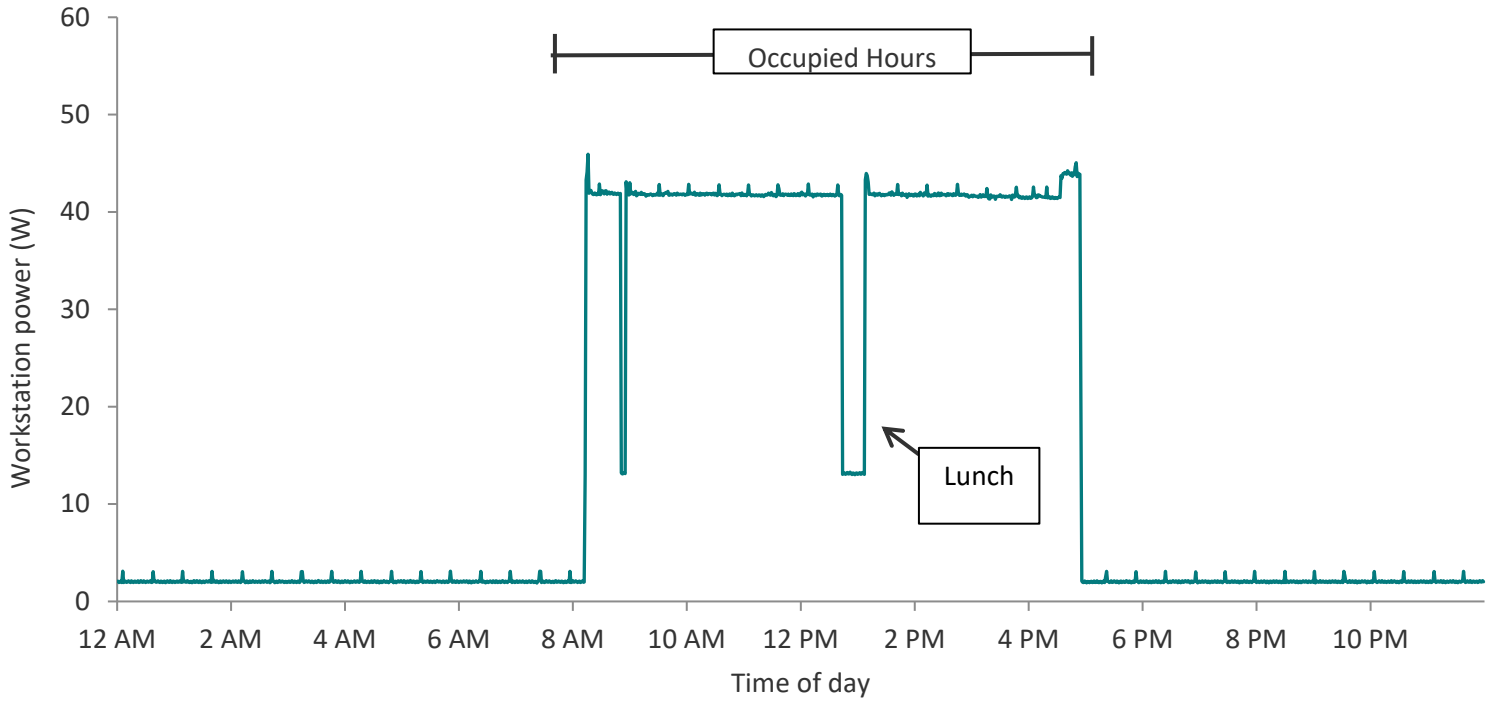
Semantic Interoperability Research

2020 Funding Opportunities

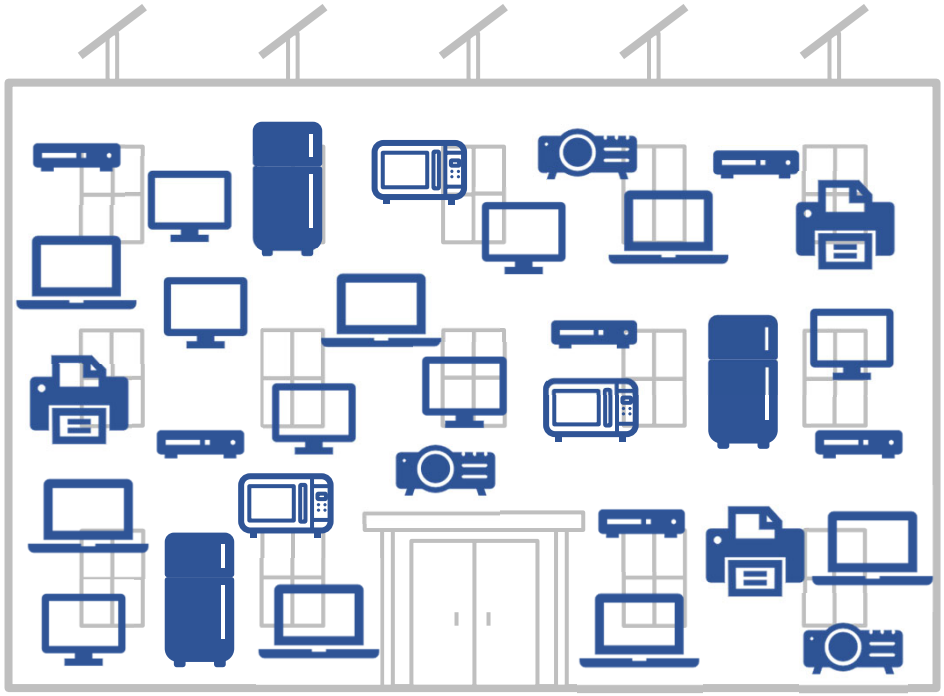
Research

- Emerging Technologies for Improved Plug Load Management Systems: Learning Behavior Algorithms and Automatic and Dynamic Load Detection

Learning Behavior Algorithms (LBAs)



Automatic and Dynamic Load Detection (ADLD)

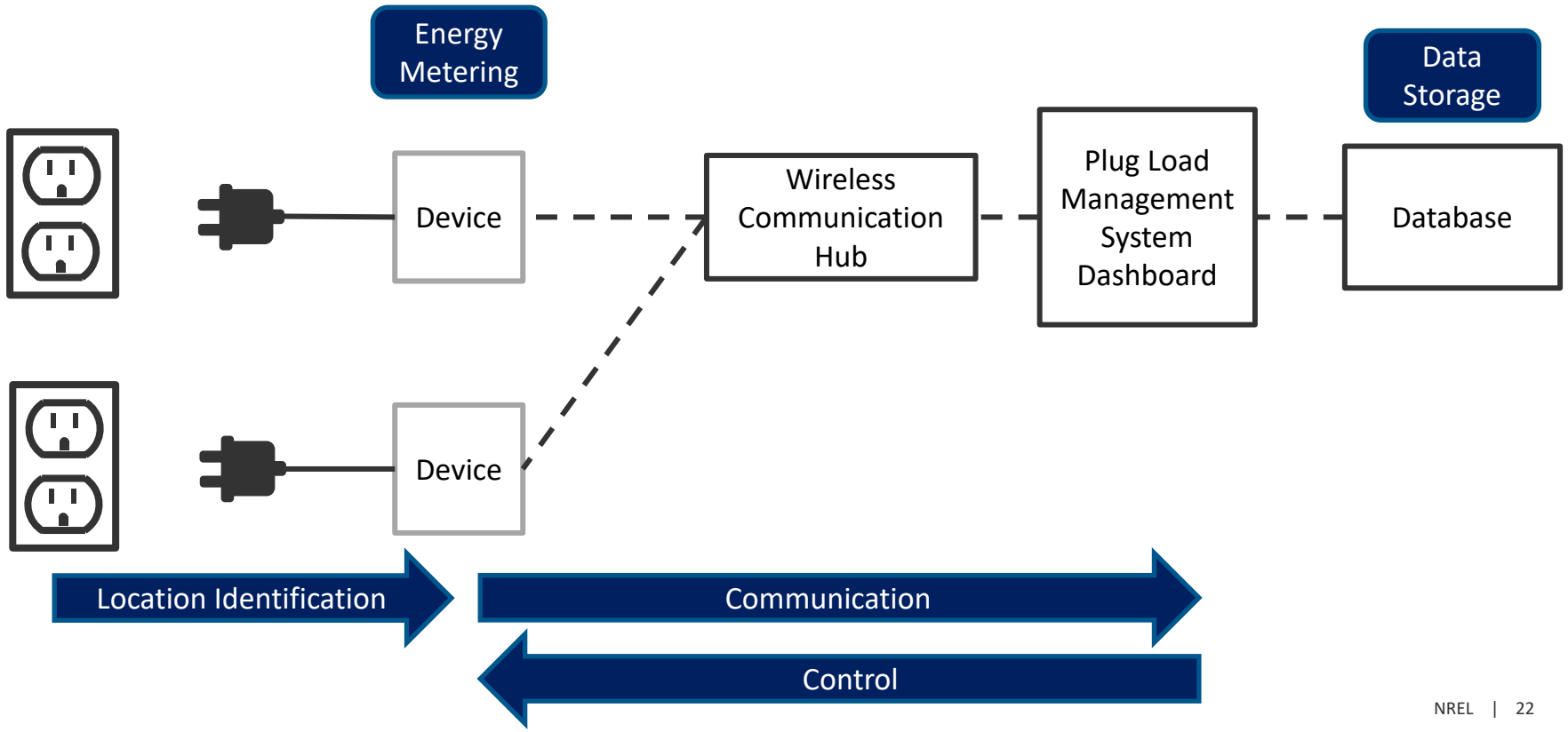


Findings

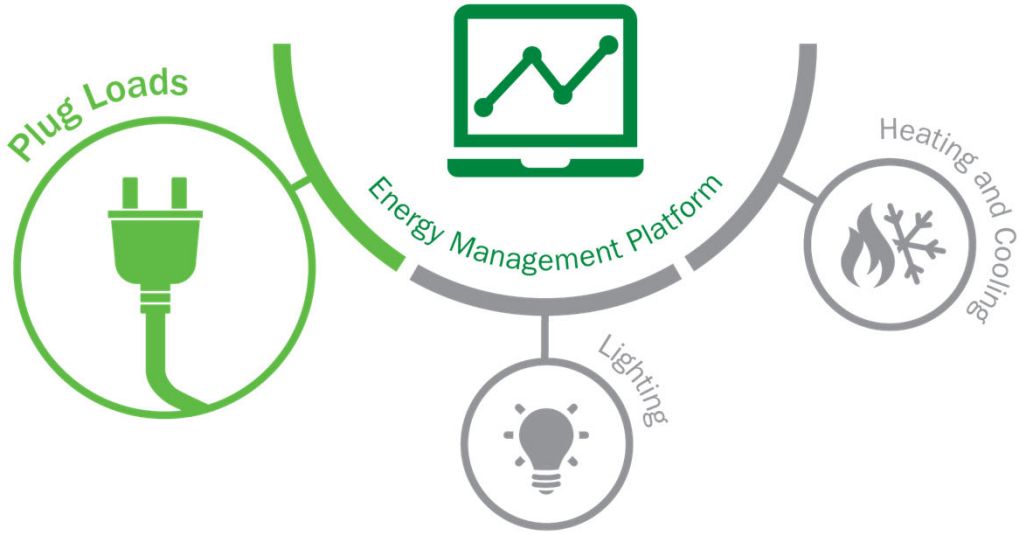
- Load detection: implicit versus explicit identification
- Five companies working on learning behavior algorithms
- Plug-and-play technologies are in R&D.

More details can be found on our 1-pager or the full ACEEE Report.

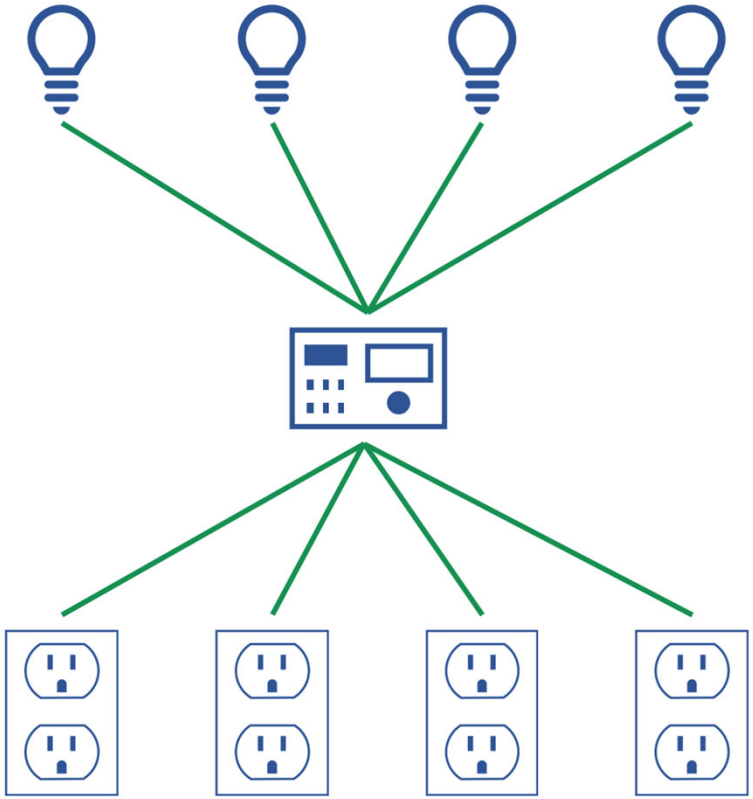
Automatic Type and Location Identification System (ATLIS)



Integration

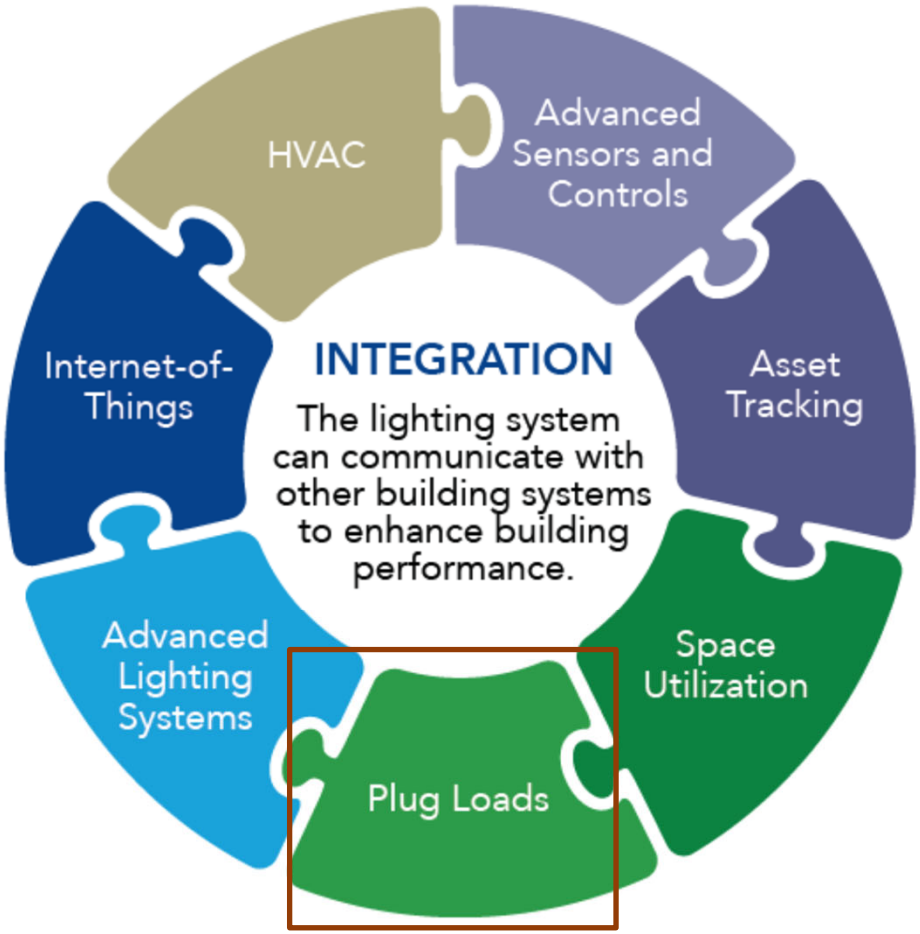


Integrating lighting and plug loads



INTEGRATED LIGHTING CAMPAIGN

- Provide relevant resources to inform projects
- Promote use of innovative lighting sensors
- **Encourage integration with other building systems such as HVAC and plug loads**
- Document and recognize integration and innovation



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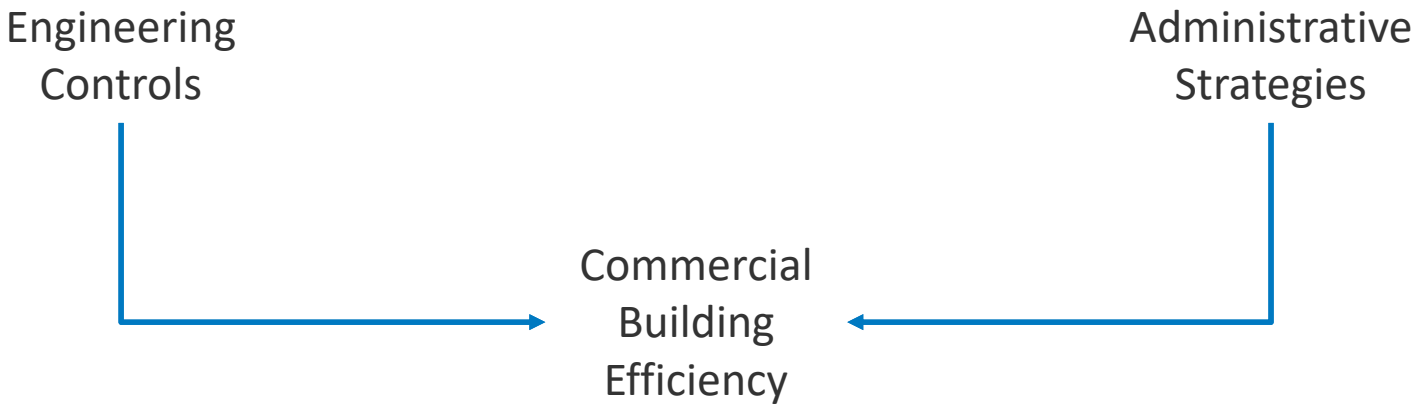
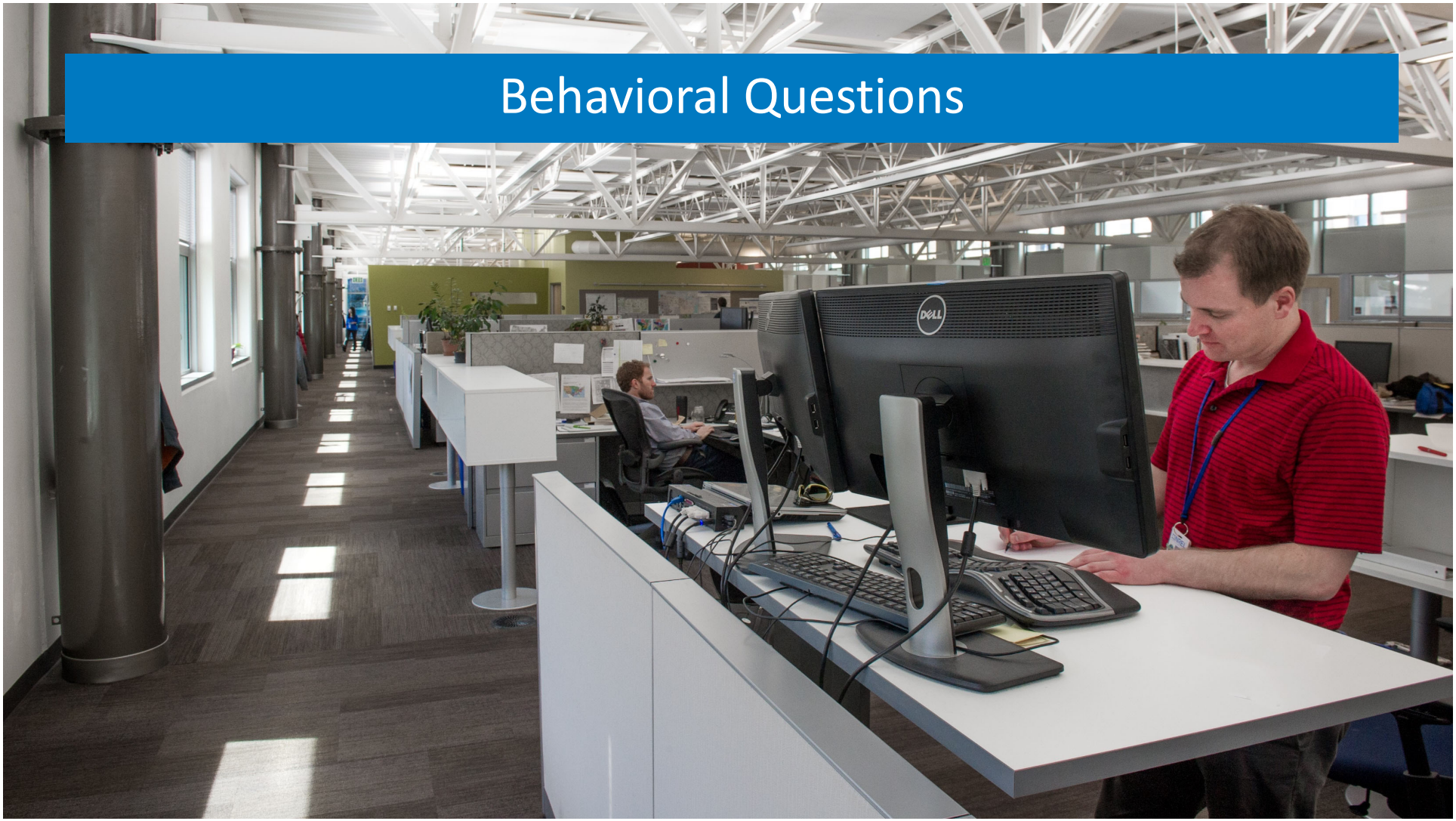


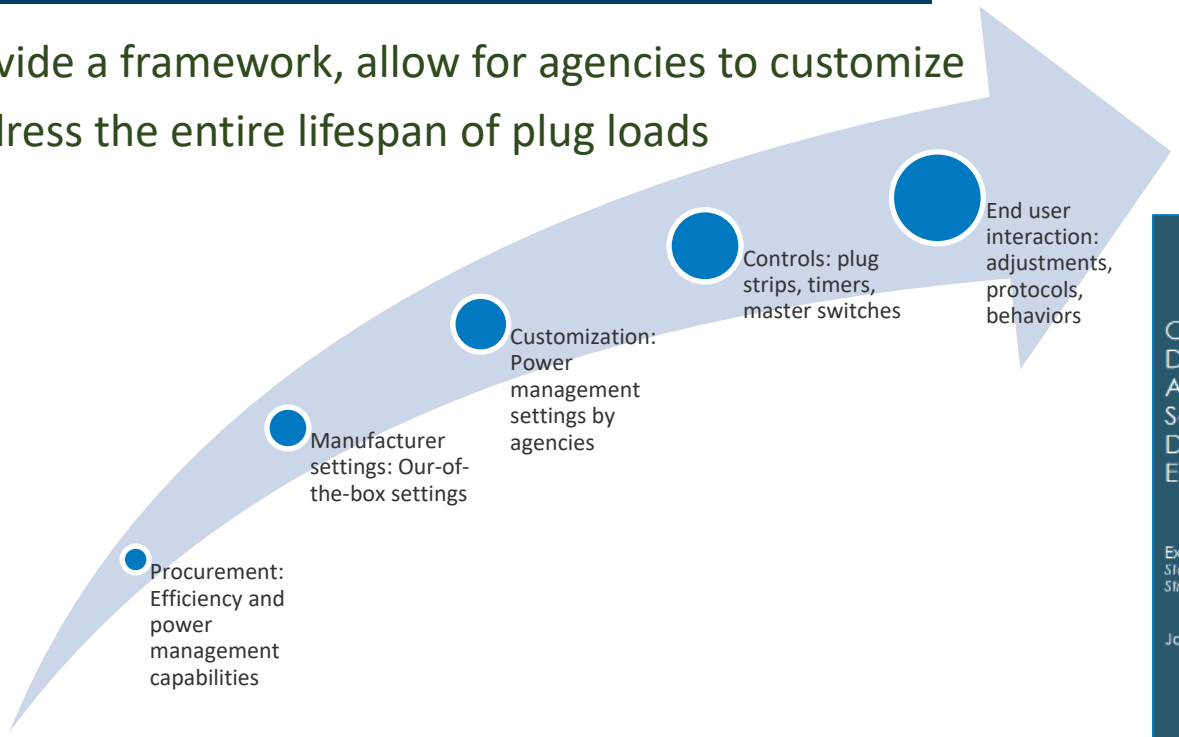
Behavioral Questions

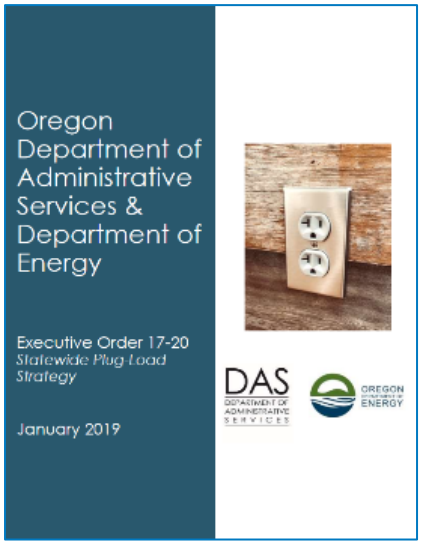


State of Oregon's Strategy

Guiding Principles

- Provide a framework, allow for agencies to customize
- Address the entire lifespan of plug loads



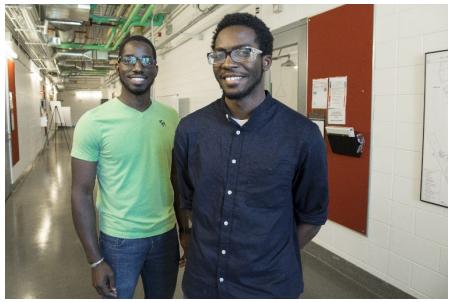


Diversity

Diversity

jump into STEM

One of JUMP into STEM's key objectives is to encourage diversity of thought and background in students entering the building science industry.



Thank you!

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