Getting Beyond Widgets
Integrated Systems for Commercial Buildings

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Problem Statement

Most building retrofit projects are component-based, addressing only one piece or type of equipment at a time.

Systems-based retrofits addressing multiple components in an integrated manner have the potential to provide significantly greater savings; 50%+ (Regnier et al, 2017).

Challenges:

- Systems are inherently more complex and disruptive to implement
- Utility portfolios currently set up for widget-based incentive programs
- Lack of industry awareness of how systems can provide deeper savings in contrast to widget-based upgrades

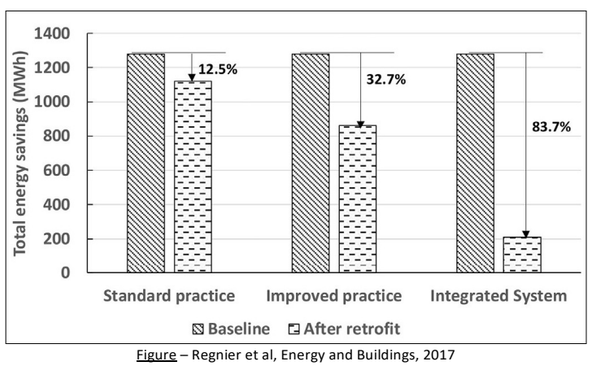
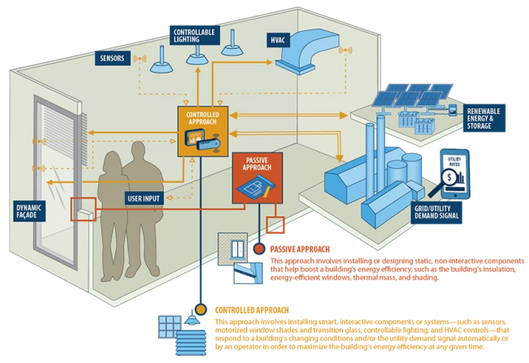


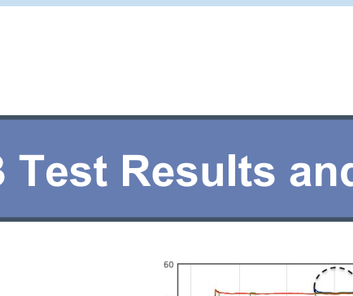
Figure – Regnier et al, Energy and Buildings, 2017



Integrated Systems Package

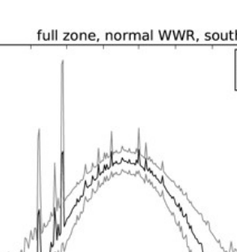
Integrated Systems DSM Package

System specifications

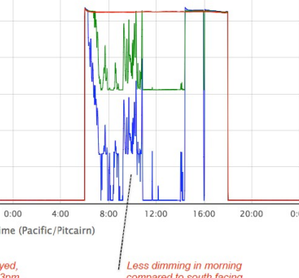


FLEXLAB savingsdata to 'deem' system savings

Quantify marketimpact

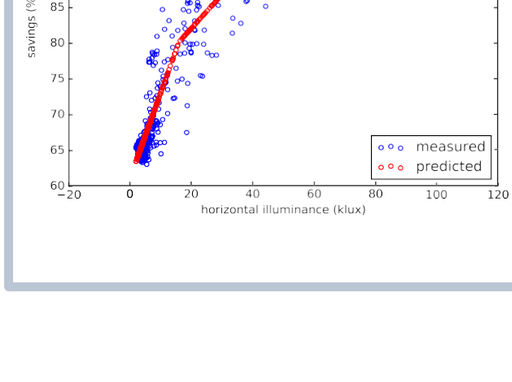


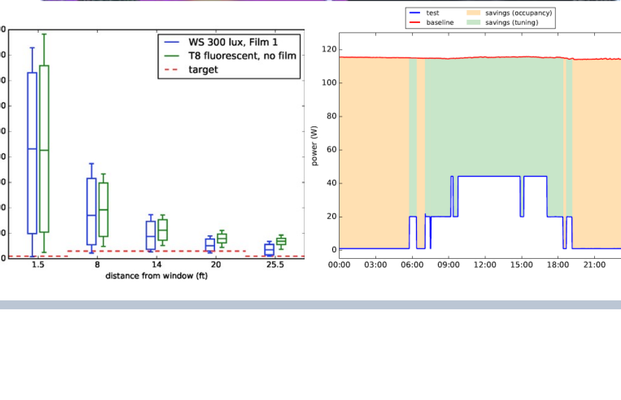
Savings persistence guidance forcustomers



Program implementation guidelines, training

FLEXLAB Test Results and Analysis





Developing Integrated Systems for Utilities

Project Tasks

- Provide utilities and customers with streamlined package of information, tools and validated savings data to implement system-level projects, achieving deep savings, without complexity and cost of custom programs.
- Develop and evaluate three integrated systems packages (photos below):
  1. Automated shading with daylight dimming controls
  2. Workstation-specific lighting with daylight control
  3. Task/ambient lighting with plug load occupancy controls
- Quantify marginal benefits of systems relative to component-based approaches through combination of measured performance data from LBNL's FLEXLAB® test facility and energy simulations.

Partners

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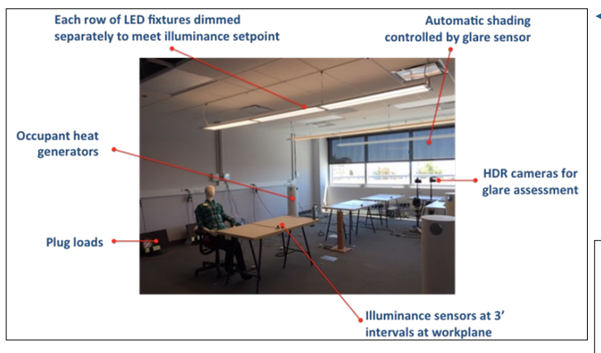
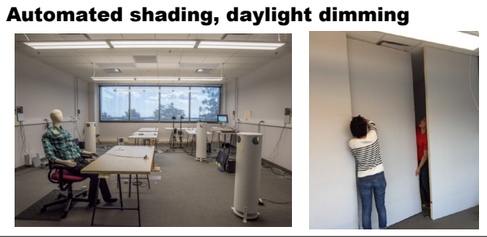
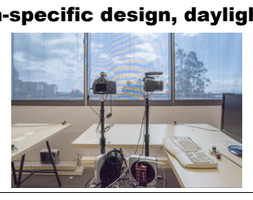
FLEXLAB Test Setup

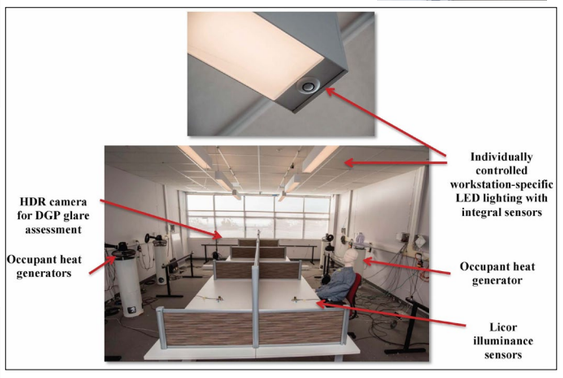


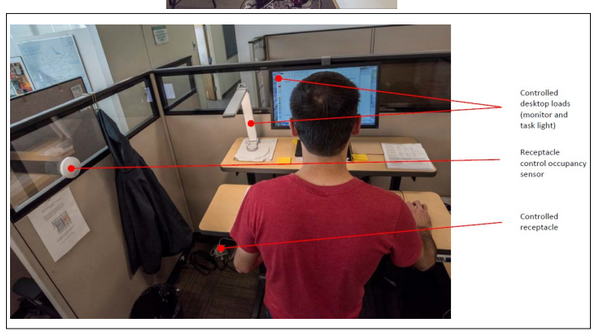
1. Automated shading, daylight dimming



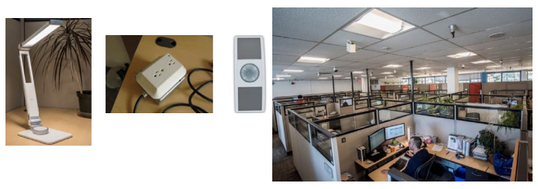
2. Workstation-specific design, daylight dimming







3. Task/ambient lighting, plug load control

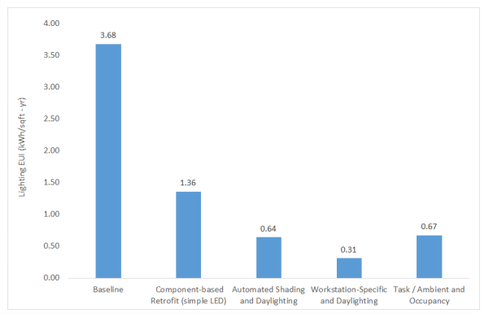


Savings Comparisons

All three systems were compared to a component-based approach: a simple fluorescent-to-LED fixture retrofit.

The LED retrofit achieved 63% savings, while the systems approaches yielded savings of 82-92%, or ***51-77% savings over the LED upgrade***.

Option	Lighting EUI (kWh/sf/yr)	Ligh%ng Savings	
		Relative to Baseline	Relative to Component-Based Retrofit
Baseline (Fluorescent, scheduled control)	3.68	–	–
Component-based Retrofit (LED)	1.36	63%	–
Automated Shading and Daylighting	0.64	83%	53%
Workstation-Specific and Daylighting	0.31	92%	77%
Task / Ambient and Occupancy	0.67	82%	51%



More Information

Resources:

Regnier, C., P. Mathew, A. Robinson, P. Schwartz, J. Shackelford, T. Walter. 2018. Beyond Widgets: Validated Systems Energy Savings and Utility Custom Incentive Program Systems Trends . ACEEE ***Draft***

Regnier, C., P. Mathew, A. Robinson, P. Schwartz, J. Shackelford, T. Walter. 2018. Energy Savings of Systems-Based Building Retrofits: A Study of Three Integrated Systems. Lawrence Berkeley National Laboratory. ***Draft***

Regnier, C., T. Hong, K. Sun, M.A. Piette. 2017. Quantifying the benefits of a building retrofit using an integrated system approach: A case study. Energy and Buildings 159, 332–345.

Regnier, C., P. Mathew, A. Robinson, P. Schwartz, T. Walter. 2016. Beyond Widgets –Systems Incentive Programs for Utilities. ACEEE

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cbs.lbl.gov/beyond-widgets-for-u5li5es

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