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Leading in LA: Shading as a gateway technology to deep retrofits



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# ET Program: Current Implementation Model (EE focused)

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<u>Program Purpose</u>: ETP supports increased energy efficiency market demand and technology supply by contributing to the development, assessment, and introduction of new and under-utilized EE measures. (i.e., technologies, practices, and tools).



# Technology Influence and Adoption Life Cycle – Conceptual





### NBI's Getting to Zero

NBI is responding to increasing urgency to reduce carbon emissions and increased demand for improved energy performance of new and existing buildings.

NBI's Market Change



Our Program Areas

(1) Building & Program Innovation

2) Zero Energy & Carbon Leadership

(3) Advancing Codes & Policy

> VanDusen Botanical Gardens Visitor Centre | Vancouver, BC Source: Nic Lehoux



### Leading in LA: A CEC EPIC Project



#### NBI

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BERKELEY LAB

#### Other team members

- The Energy Coalition
- CEES-Advisors
- Delos
- SCE, SDG&E

#### Site Partners

- City of Santa Ana
- CSU Dominguez Hills



#### Letters of Support

AERC, CEES/BOMA, Arup, Integral Group, P2S Engineering, Taylor Engineering, EHDD Architecture

#### **Manufacturer Partners**











TRC



#### The a,b,cs of Today's Takeaways

- 1. To scale energy solutions to existing buildings they must:
  - a) Be non-disruptive to tenants
  - b) Improve indoor environments
  - c) Meet owner's cost and savings parameters
- 2. This emerging shading technology provides:
  - a) Integration with daylight sensors and separation of view
  - b) Occupant direct control of heat, glare and view
  - c) Retrofit kits, self-power with micro-PV and performance dashboard to reduce costs

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### **Project Technologies**

- 1. Automated shades/blinds
- 2. LED + advanced lighting controls
- 3. HVAC control
- 4. M&V 2.0 procedures + sub-metering



## **Goal:** Validate viability and scalability of retrofit technologies in commercial buildings with **20%+** energy savings





### Why we want shades and blinds

- Heat control
- Glare control
- View control
- Privacy
- Targeted light direction
- Reduction of HVAC and electric lighting energy use
- Aesthetic aspects



bethany-legg-9248-unsplash





#### What's wrong with this picture?







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### What's wrong with manual shades and blinds

2017 Study by Univ. of Oregon:

- 51% of occupants did not change their window shades position even once.
- 20% adjust the shades once or so annually
- 24% seasonal users
- Only 6% actively adjusting shades daily









### Project Measure – Automatic shade/blind combo

- Shade/Blinds on S, E, and W Sides
- Shades Only on N Side
- Auto louver controls with manual shade controls with night reset







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### CSUDH Welch Hall Site Demonstration – Combined Measures

- Lighting
  - Full LED Retrofit of linear FL on Floors 1-4
- Windows
  - Full Shade/Blinds on Floors 1-4
  - Light well gets Shade/Blind treatment
- HVAC
  - New zone controllers
  - ASHRAE Guideline 36 sequences of operation









### **CSUDH Demonstration Site**



- Installed during unoccupied hours
- No electrician needed for blinds
- Individual controls provided to each occupant







# Solar PV Powered - reduces battery failure and maintenance









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## **Energy Savings**





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### LBNL FLEXLAB test

#### **Baselines and Test Period:**

- 1) Existing building:
  - T8 (1.0 W/sf), no dimming; manual blinds
- 2) Code Title 24:
  - T5 (0.69 W/sf); stepped dimming; manual blinds
- a) Summer: Jul 18 Aug 13
- b) Equinox: Sep 17 Oct 8
- c) Winter: Jan 5 Jan 30







### FLEXLAB Test Energy Savings – Impressive!

- Lighting: Summer: 60 76% | Winter: 49 63%
- HVAC Cooling: Summer: 19 36%









#### Scaling – overcoming barriers







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#### Greenhouse gas footprint reduction is the greatest driver of energy efficiency investments in the U.S., while globally it is energy cost savings







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## Uncertainty regarding savings was rated as the top barrier to energy efficiency investments in the U.S., while globally, it is lack of technical expertise









### Scalable solutions begin (and end) with behavior:

### Know the wants of your audience:

- Occupants want environmental control
- Facility staff want reliability, integration and clear performance information
- Owners want older buildings to remain competitive
  - Upgrades without disruption
  - Costs constrained
  - Reduced operational costs

Automated shades integrated with advanced lighting controls offer one solution





### Thank you!

### **Questions?**

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