# FLEXLAB™: THE WORLD'S MOST ADVANCED BUILDING EFFICIENCY TEST BED

## FLEXLAB CLOSES THE ENERGY-EFFICIENCY ACHIEVEMENT GAP FOR BUILDINGS

> *This facility could be the most important building in the country.*
>
> **JES PEDERSEN**
> CEO, WEBCOR BUILDERS

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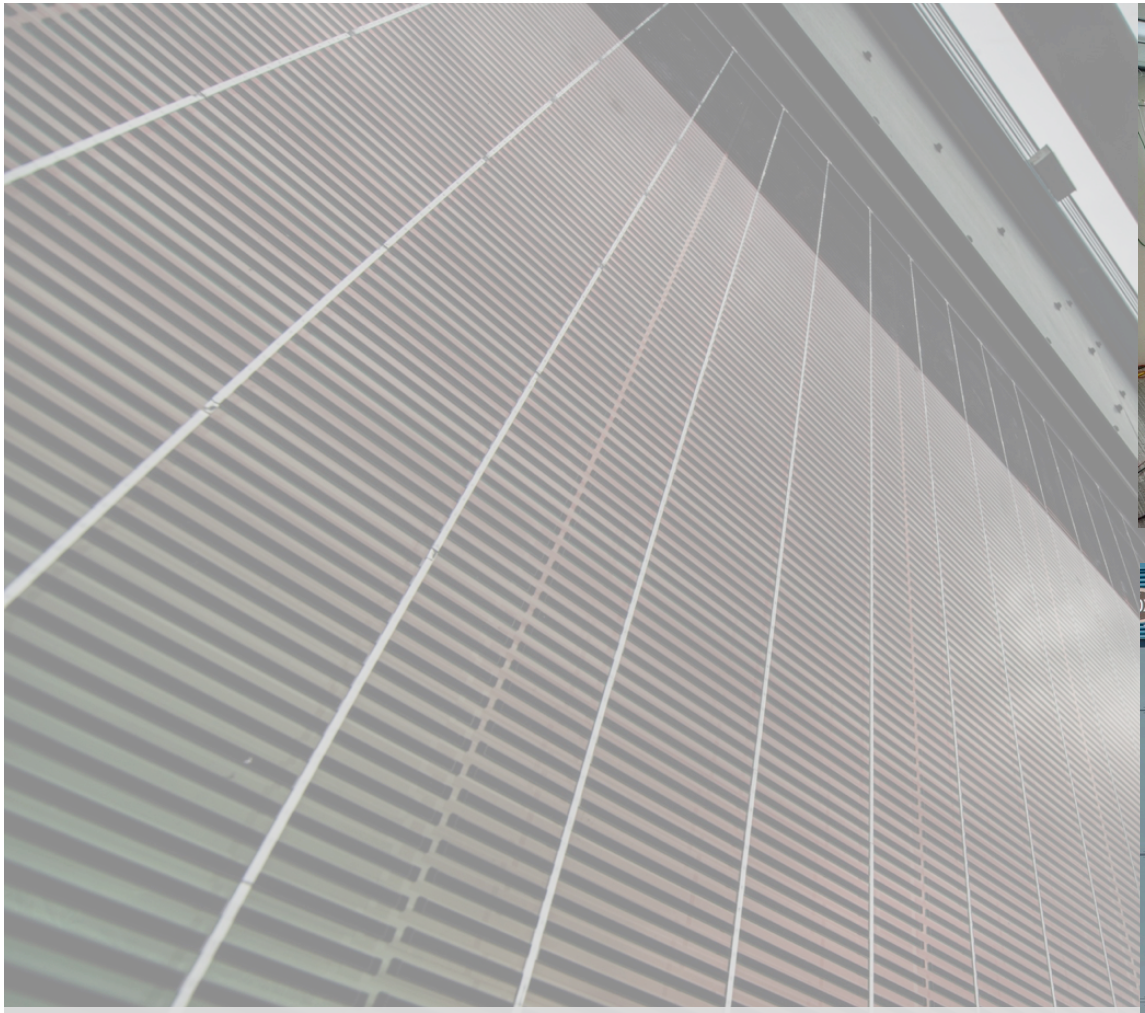
**LBNL's FLEXLAB,** the Facility for Low Energy eXperiments in Buildings.

DOE's unique facility dedicated to:

- Developing and testing solutions for **low-energy**, **integrated building systems** under realistic operating conditions
  - Comprehensive whole building **systems integration**
  - **End use integration** (HVAC, lighting, windows, envelope, plug loads)
  - **Controls integration**
  - **Simulation and tools** for design through operations
- Commercial buildings focus
  - Office, retail, educational, multi-family, some residential applications
  - New construction and retrofit



## Integrated Building Systems, Tools and Grid Integration R&D

- Real world testing conditions
- Unparalleled data collection, interpretation and analysis capability
- Risk reduction in early testing and demonstration
- Insightful testing opportunities

## Comparative Testing

## Controlled Environment

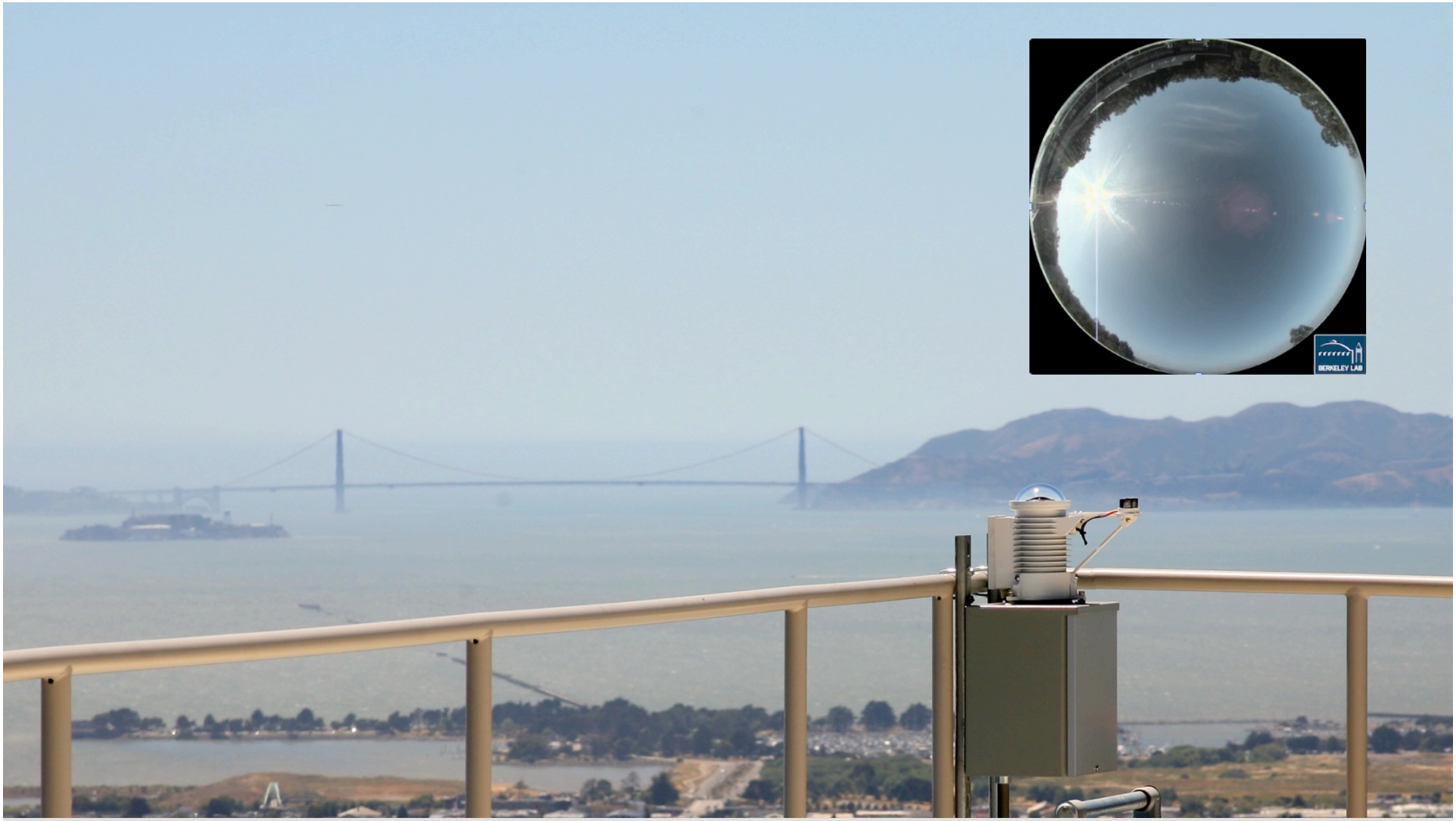
- Simulates all climate loads of lower 48 states
- Solar orientation studies
- Controlled internal loads

## High Flexibility — Interior and Exterior

- HVAC, lighting, glazing, skylights, shading

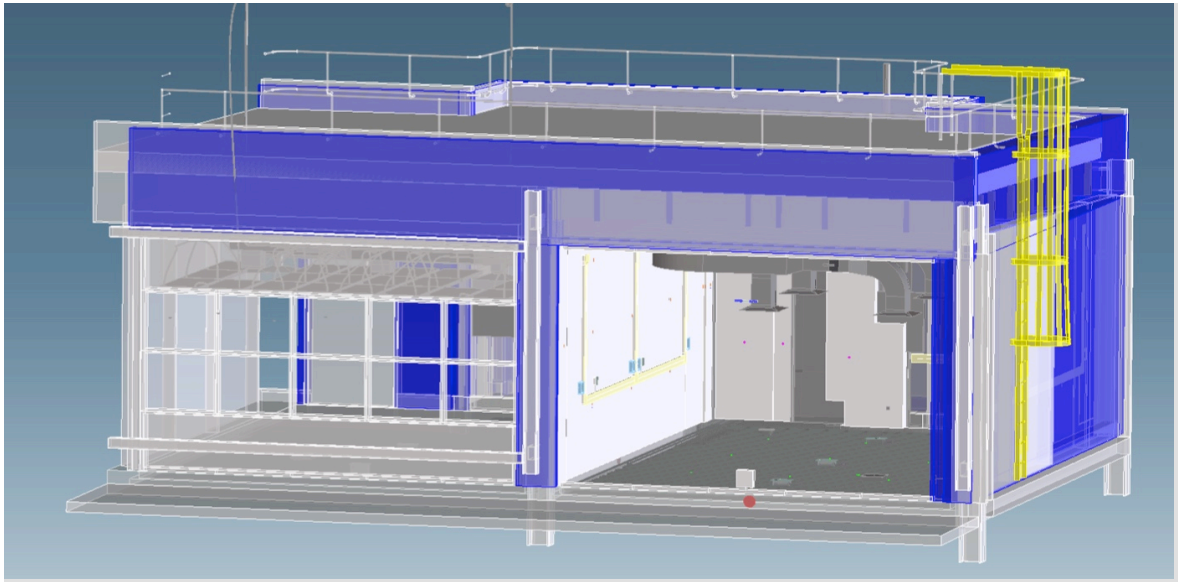
## Mockup New Construction and Retrofit

- 1980s to current code to net zero



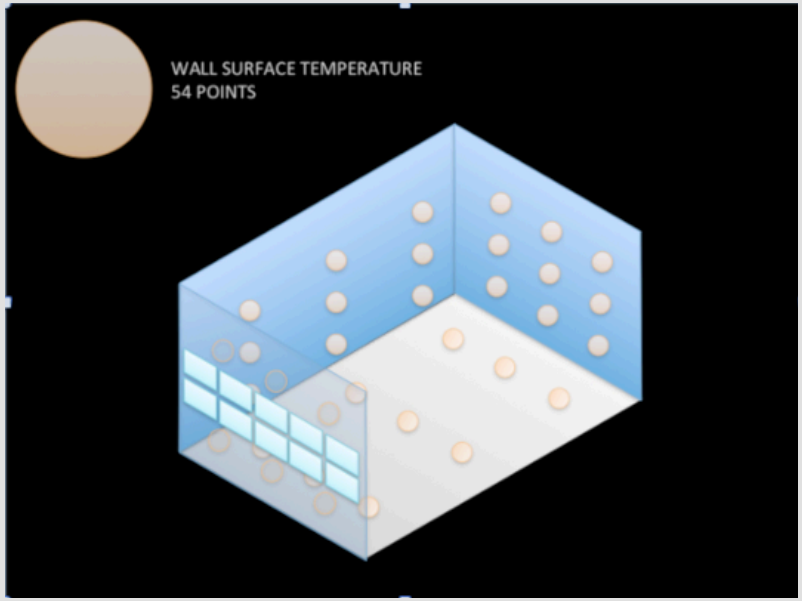

## High Precision Atmospheric Monitoring

- High dynamic range sky imaging
- Global and diffuse horizontal irradiance and illuminance
- Air temperature, relative humidity, air pressure and wind speed



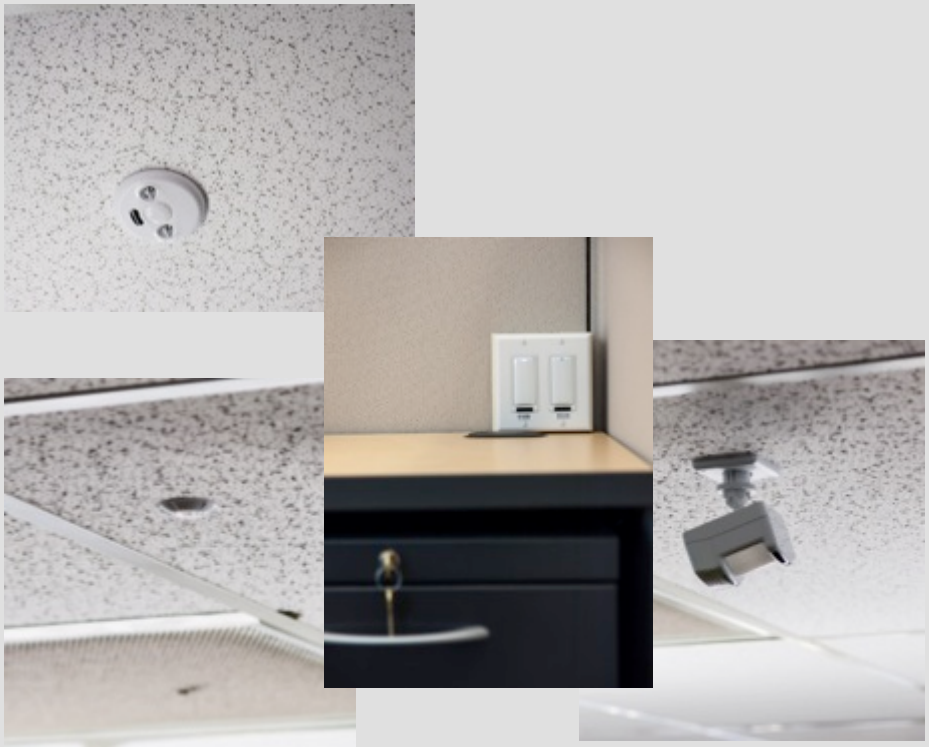
## Highly Instrumented and Metered

- Device and outlet level power measurement
- 1000s of high accuracy sensors: temperature, pressure, air and water flow, heat flux, etc.
- Sensor level data security
- Complete controls interoperability and scripting capability
- Robust data acquisition configured for a range of I/O
- Capable of stand-alone or integrated communications protocols



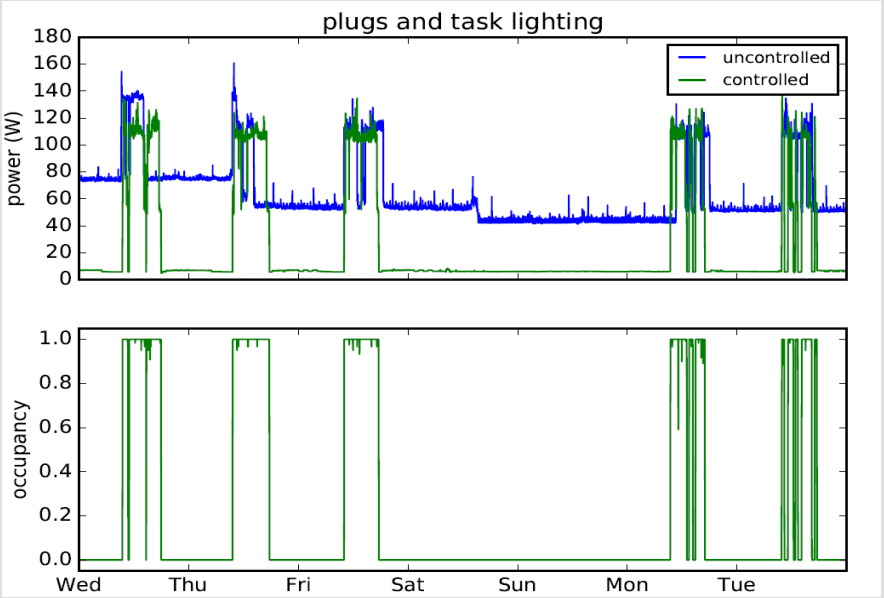
# Occupied Testbed Capabilities

- 3000sf occupied workspace
  - Core and perimeter, networked IT
- Lighting zone level and workstation/occupant level occupancy sensing capability
- Capable of multiple zones for comparative testing
- Photosensors at individual workstations
- Reprogrammable lighting and plug loads controls
- Individual occupant controls – workstation digital switches reprogrammable to control lights or plugs
- Power measurement at individual outlet level and each light fixture
- Basic Human Subjects Protocol already in place

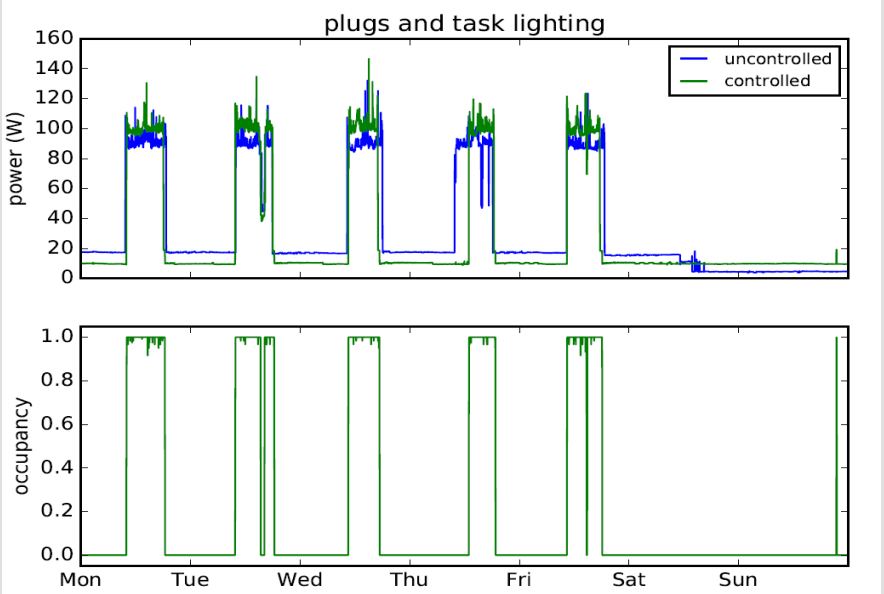


# Occupied Testbed – Sample Data, Plug Load Control

**Scenario 1**: high baseload overnight / weekends – energy savings of 60%




**Scenario 2**: lower baseload overnight / weekends – energy savings of 10%



# Other FLEXLAB Testing Capabilities for Occupancy Sensing

- Live or simulated occupancy data
- Comparisons with baseline technologies under controlled conditions
- Full controls integration capabilities
  - Wireless, wired, devices with various communication protocols
- HVAC controls integration:
  - Airside or hydronic systems, VAV or CAV, zone or individual level
- Lighting controls:
  - Overhead and task lighting, zone or fixture level controls
- Plug load controls
- IAQ: VOC sensing integration, ventilation controls
- Repeatability of conditions, controlled testing for reliability
- Testing under multiple market conditions, climates and solar orientations for single installation

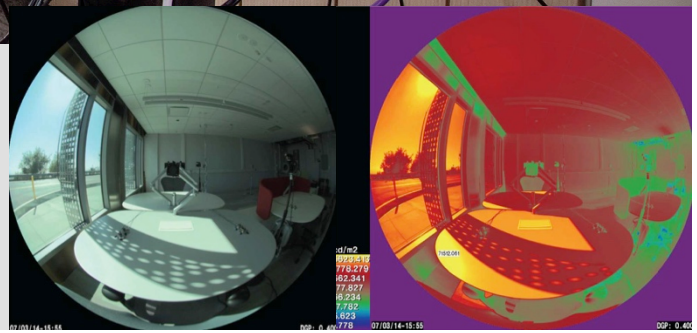
Easily configured partitions for zonal and geometry studies

*Working with LBNL & FLEXLAB*

- FLEXLAB Operations team to support integration with systems, data acquisition, controls
- LBNL subject matter expertise:
  - IAQ, Lighting, HVAC, Electronics, Simulation, Controls

**Performance validation:**

- Energy use, demand reduction
- Thermal comfort, visual comfort
- Indoor environmental quality



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