Project Goals and Objectives

• Design and construct the facilities to
  – address key technical challenges for low-energy buildings
  – facilitate R&D on multiple building components and systems concurrently
  – provide extreme flexibility
  – integrate components being tested into building systems: envelope, lighting, HVAC, electrical
  – automate data collection, virtual modeling, and “live” building systems optimization
  – demonstrate facility capabilities, display current data collection, and visualize testing results
Reality vs Simulation

- LBNL has a long history of measuring performance of building systems under realistic conditions
- Some critical performance issues can only be determined with field measurements
- User Test Bed Facility continues this tradition
- Simulation still has a critical role:
  - “All Models are Wrong but Some are Useful”
MoWiTT: Mobile Window Thermal Test Facility
Reno, NV, 1985-2000
LBNL Façade Testbed Facility

2003-2006 Electrochromic windows

Industry Advisory Groups:
- Manufacturers
  - Glazing, Shading, Framing, Lighting Controls
- Designers
  - Architects, Engineers
  - Specifiers
- Owner/Operators
  - Public, Private
- Utilities

2007-2009 Automated Shades
Full-Scale Test Bed in Oakland GSA Federal Building, 1990s

- Side-by-side test offices
- Stage 1: Unshaded large-area electrochromic windows
- Stage 2: Automated interior blinds with “optimal” controls
- Integrated control between window and lighting system
Partnering with a Building Owner: NY Times Company
Intelligent Lighting and Shade Control

- Automated Shading
  - (Multifunctional)

- Dimmable lighting
- Addressable
- Affordable
  - (1/3 original cost estimate)
    - Multifunctional

Occupied 2007

Interior: *New York Times* office with
dimmable lights and automated shading
Outcomes and Benefits

• **For Manufacturers**
  – Ability to more rapidly design, prototype and test new energy efficient products and systems. Feedback on system performance that will allow optimization. Performance data that could drive increased investment in new technologies and systems.

• **For Architects and Engineers**
  – Ability to specify new innovative systems with confidence, thereby achieving higher energy performance targets.

• **For Facility Managers**
  – Insights into improved operational practices and more realistic building performance targets.

• **For Code Officials and Utilities**
  – Ability to tighten existing codes or offer new rebates and incentives based on confidence in measured performance data under realistic conditions.

• **For Building Owners**
  – Increased confidence in investing in high efficiency retrofit solutions and new buildings.

• **For Federal, State, Local Efficiency Planners**
  – Ability to more accurately predict EE program impacts.

• **For Researchers**
  – Access to high quality performance data will advance R&D in new technology, allow validation of simulation codes, provide insights into opportunities of new breakthroughs.
# Who Are We Working With?

<table>
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<th>Lighting &amp; Controls</th>
<th>Windows &amp; Facade</th>
<th>Building Systems</th>
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<td>• Adura Technologies</td>
<td>• Apogee</td>
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<td>• Schneider Electric</td>
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<td>• Siemens</td>
<td>• Nysan</td>
<td>• Autodesk (software)</td>
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<td>• Universal Lighting Technologies</td>
<td>• Sage Electrochromics</td>
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<td>• WattStopper</td>
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<td>• VELUX</td>
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Lawrence Berkeley National Laboratory
LBNL as the center of national Hub for Building Performance Testing: Potential National Network Partners
Project Scope

• Up to ten new test beds
• Eight test beds in front of Building 90
• Two test beds inside Building 90
• Demolition of existing trailer buildings in front of Building 90
• Rearrange parking stalls at south side of Building 90
• Low water use landscaping
Project Overview

- Preliminary Design Underway
- Completed site analysis and selection
- Design completion scheduled Fall 2011
- Construction start scheduled Spring 2012
- Construction completion Spring 2013
- $15.7M ARRA Funds
Demolish Building 90 Trailers

- Trailers contain 17,138 gsf of offices
- Installed over 30 years ago
- Past their expected life
EXTERIOR MATERIALS

- Test Bed exterior – Vertical corrugated metal panel
- Test Bed signage – Flat metal panel w/ bright white supergraphic text, Test bed doors similar
- Test Bed entries – Hazard yellow entry pad w/ white arrow
- Hazard yellow bollards
- Mechanical Equipment – Painted to match the building
Building Features

• Interchangeable façade elements, shading, glazing, skylights
• Two cells in each testbed for comparative studies
• Flexible interior space
• Flexible HVAC systems
• Interchangeable lighting
• Sensors and instrumentation
Building Systems

• Integration studies in low-energy building solutions
  – Dynamic envelope control, lighting, daylighting
  – Studies on comfort factors including glare, thermal distribution, operative temperature

• Low-energy systems to be studied include:
  – Airflow distribution
  – Natural ventilation and displacement ventilation
  – Night-time purge/slub cooling
  – Indirect evaporative cooling
  – Ceiling fans
  – Chilled beams
  – In-slab radiant cooling and heating
Questions?