USER FACILITY FOR LOW ENERGY INTEGRATED BUILDING SYSTEMS

Cleantech to Market Final Presentation

For the Environmental Energy Technologies Division of Lawrence Berkeley National Laboratory

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There is a sizeable market in energy consumption by commercial buildings

37% of electricity in US
21% of all US energy use
18% of carbon footprint

$120B annual energy bill

Building renovation (valued at $438 billion) and new building construction ($785 billion) account for 13.4% of US GDP

Data: LLNL 2010, DOE BEDB 2009
A set of testbeds will provide critical use data on cutting-edge efficiency products.

Many potential users are very excited about the new facility.
The test facility is a multi-purpose environment for energy efficiency testing

Features
- Interchangeable parts
- Two cells
- 6-8 testbeds: rotational, 2-floor
- Live environment

Measurements
At a system or component level
- Energy usage / savings
- Temperature, air quality
- Light levels, glare, radiation
The facility integrates building systems designed to address key technical challenges for low energy buildings.
Objective

**Goal**: Support all emerging efficiency technologies to reach market as quickly as possible.

**Question**: How can the facility provide ideal value to each user segment and drive facility use?

**Objective**: Understand how to ideally engage each user according to their needs and use characteristics.
**Use Case:** Technology is often proven in simulations, but validation is reached through real-world execution.
Reports and data will inform market and commercialization strategy

Cost savings
Energy Use
Human Comfort
Simulation
Extrapolation

Optimization of:
- # lighting fixtures
- Control algorithm
- Day lighting

Time of day & year
Human impact
Lab vs. real-world conditions
Diverse users will derive different value from the facility and use it differently
Early to Mid stage product companies find more value in the facility than do Late stage companies.
### User Benefits by Product Category

<table>
<thead>
<tr>
<th>Technology Type</th>
<th>Windows &amp; Facades</th>
<th>Controls</th>
<th>Lighting</th>
<th>Builders / Architects</th>
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<tbody>
<tr>
<td>User Benefits</td>
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Windows/Facades and Lighting sectors have the greatest interest in using the facility.
Alternatives exist for the LBNL building test facility

No Testing

Other Facilities

~10 other energy efficiency test facilities around the country
- Spread out across the country
- Most are focused on specific technologies
- 1 fully integrated (Oakridge National Lab)

In House

PHILIPS

SIEMENS
Alternatives fall short in offering key user benefits

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<th>Other Facility</th>
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Three key areas of user value
Many users are very enthusiastic about using the new test facility.

- **Mid Stage Company**
  “There is incredible value in facilitating partnerships”

- **Lighting Company**
  “We are very interested, real world application testing is so important”

- **Windows Company**
  “It sounds like this facility was built for us – we want to be the first customer!”

- **VC**
  “LBNL validation of efficiency improvement would be extremely useful for early stage products”

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**Facility interest by current testing behavior**

- **Currently test**
  - 100% interest

- **Do not test**
  - 80% interest

- **Percent Interest**
  - 100
  - 80
  - 60
  - 40
  - 20
  - 0

- **n=16**

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*Graph details:*
- X-axis: Current testing behavior (Do not test / Currently test)
- Y-axis: Percent interest (0% to 100%)
- Legend: Interested, Uninterested
Key targets according to user benefit analysis

Product Category
- Facades
- Lighting

Key User Benefits
- Technical validation
- Customer interaction

Product Lifecycle Stage
- Early Stage
- Mid Stage

Key User Benefits
- Flexibility (integration)
- Partnership facilitation
Vision of optimal offering

- Hands-on operational and maintenance support
- Partnership facilitation
- Scientist expertise
- Convenient and flexible scheduling
- Advisory board of key users and LBNL executives
Conclusion

- There is a big need to reduce building energy consumption

- LBNL facility will help bring cutting-edge efficiency products to market
  - Real world application testing
  - Integrated testing
  - Measurement and performance data

- Potential users are very interested!

- **Competitive advantage**: Partnership facilitation, testing expertise, customer interaction

- **Key targets**: windows/facades and lighting companies and early and mid stage technologies
Thank You

Questions welcome!
Buildings consume about 70% of all electricity used in the US, and that number is rising.

Source: EIA, State Energy Data 2005
Lighting, heating/cooling, and electronics make up a large portion of electricity use in buildings.

Source: EIA, State Energy Data 2005
Building construction makes up 13.4% of US GDP

- 2006 estimated value of all U.S. construction is $1.77 trillion (including renovation; heavy construction; public works; residential, commercial, and industrial new construction; and non-contract work).

- In 2006, residential and commercial building renovation (valued at $438 billion) and new building construction (valued at $785 billion) is estimated to account for over 69% (approximately $1.22 trillion) of the $1.77 trillion.
Windows

US Residential Window Sales

- New Construction
- Remodeling/Replacement
- Total Construction