



USER FACILITY FOR LOW ENERGY INTEGRATED BUILDING SYSTEMS

Cleantech to Market Final Presentation

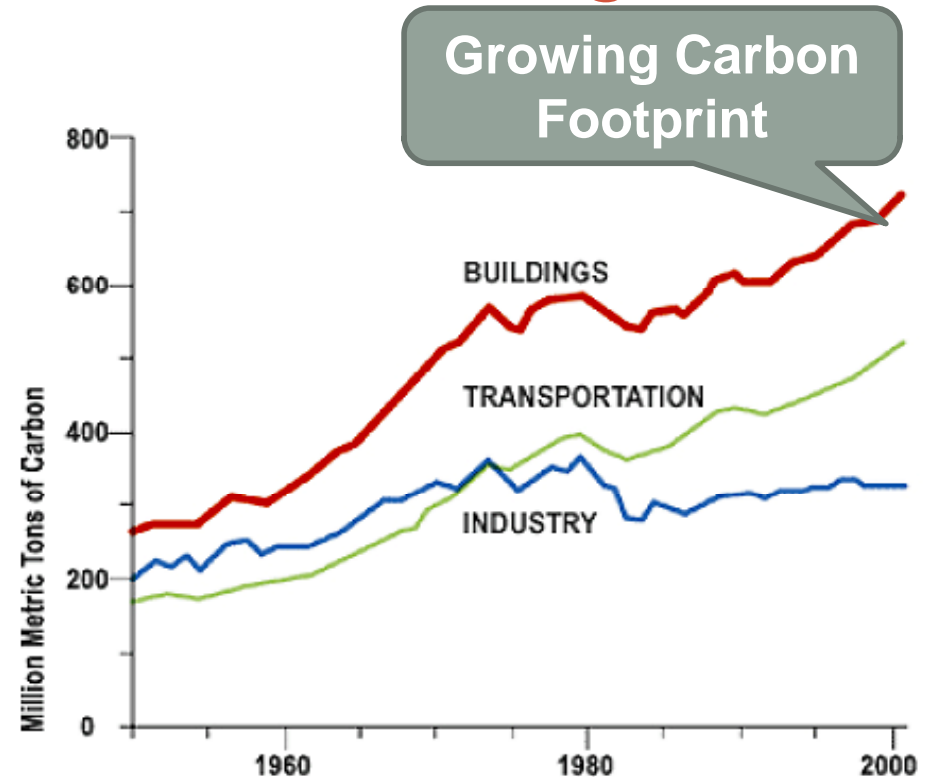
For the Environmental Energy Technologies Division of Lawrence
Berkeley National Laboratory

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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

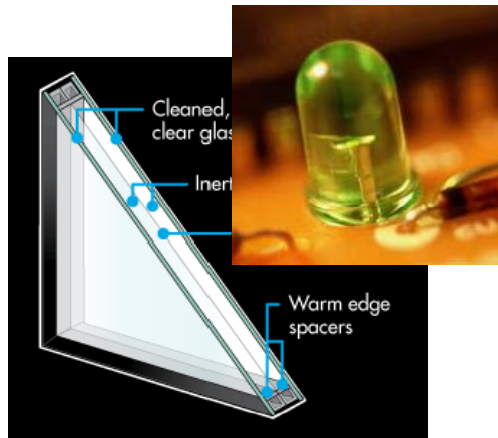
\$120B annual energy bill



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

A set of testbeds will provide critical use data on cutting-edge efficiency products

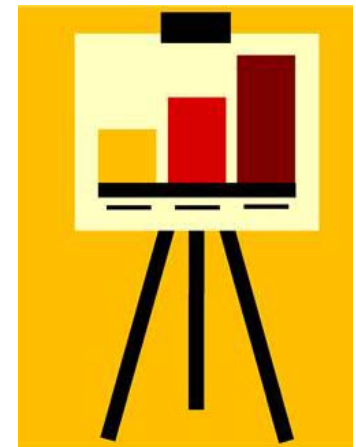
Product(s)



Test Facility



Results



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

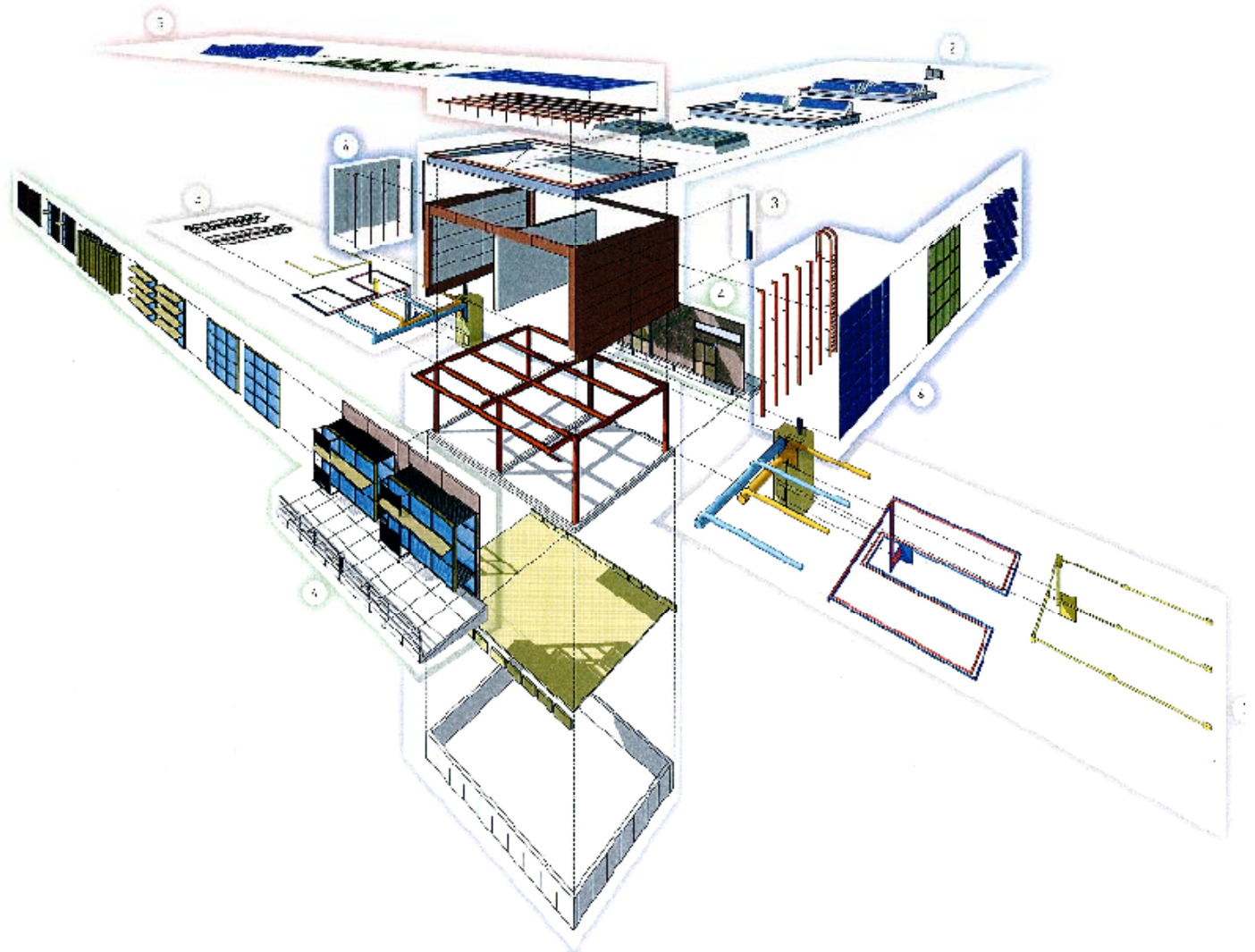
Flexibility

Integration

Interaction


Control

Standards




Objective

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

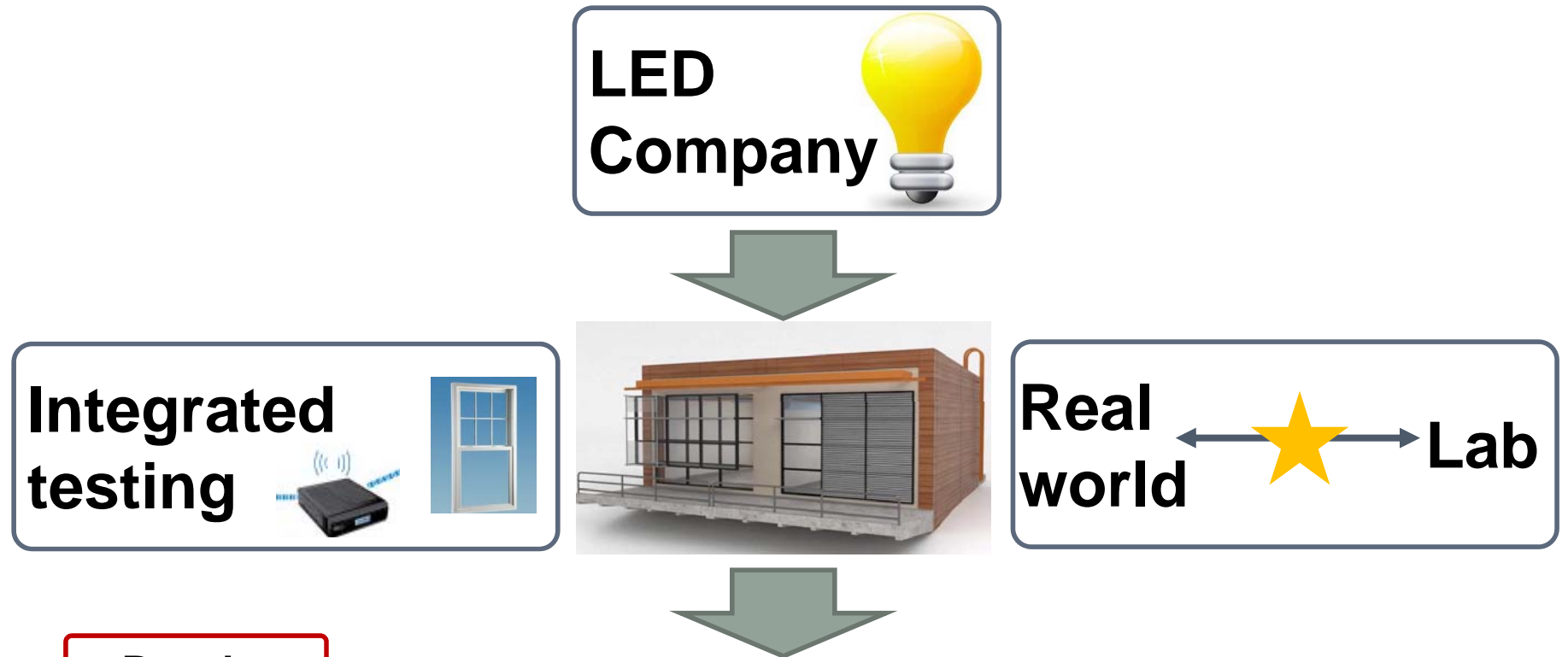


Question: How can the facility provide ideal value to each user segment and drive facility use?



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

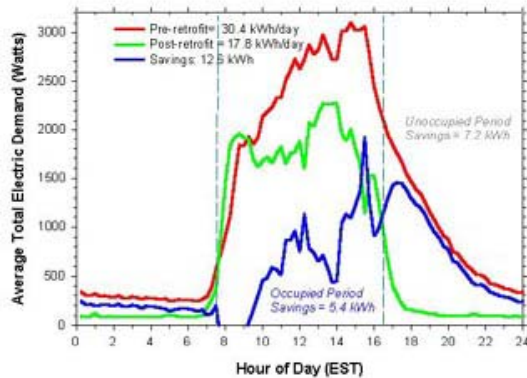


Results

- Commercialization potential
- Data for VCs and builders
- LBNL Validation
- Potential partnerships

Reports and data will inform market and commercialization strategy

Raw Data



Cost savings

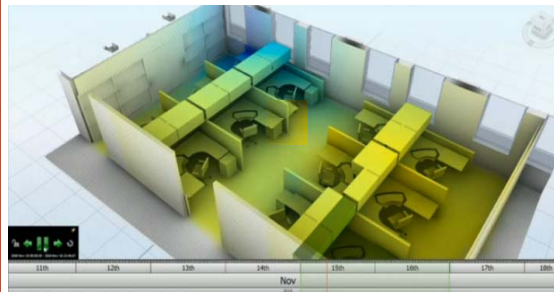
Energy Use

Human Comfort

Simulation

Extrapolation

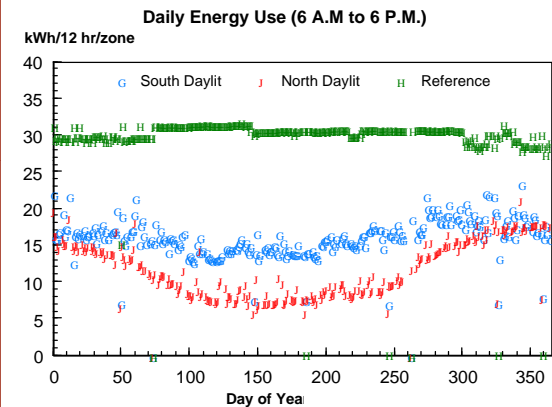
System Calibration



Optimization of:

- # lighting fixtures
- Control algorithm
- Day lighting

Variability



Time of day & year

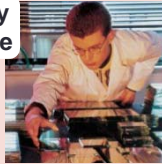
Human impact

Lab vs. real-world conditions

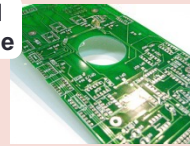
Diverse users will derive different value from the facility and use it differently

Technology Maturity

Early Stage



Mid Stage



Late Stage



Technology Type

Facades



Controls



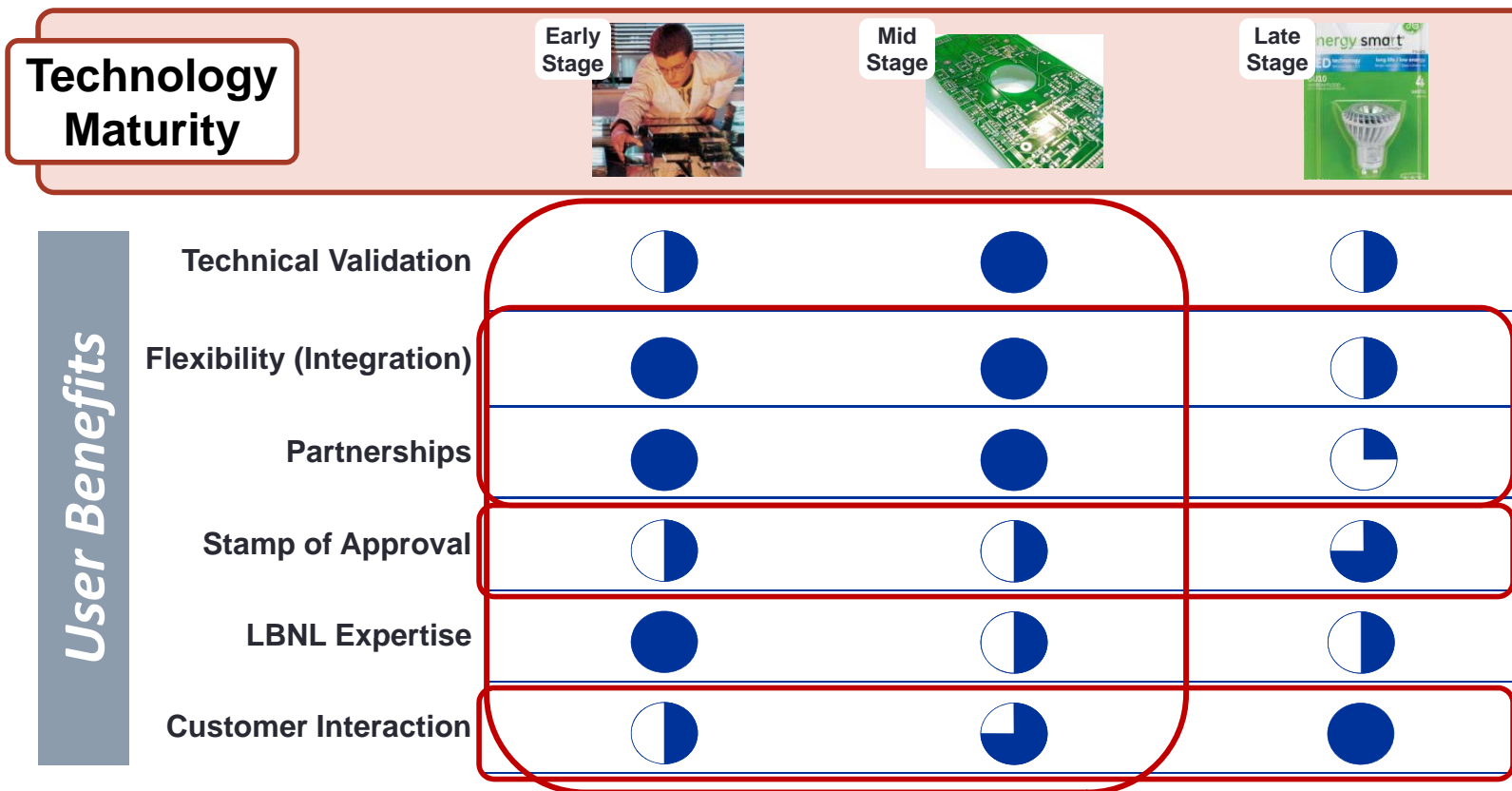
Lighting



HVAC,
Software,
Plumbing,
etc.

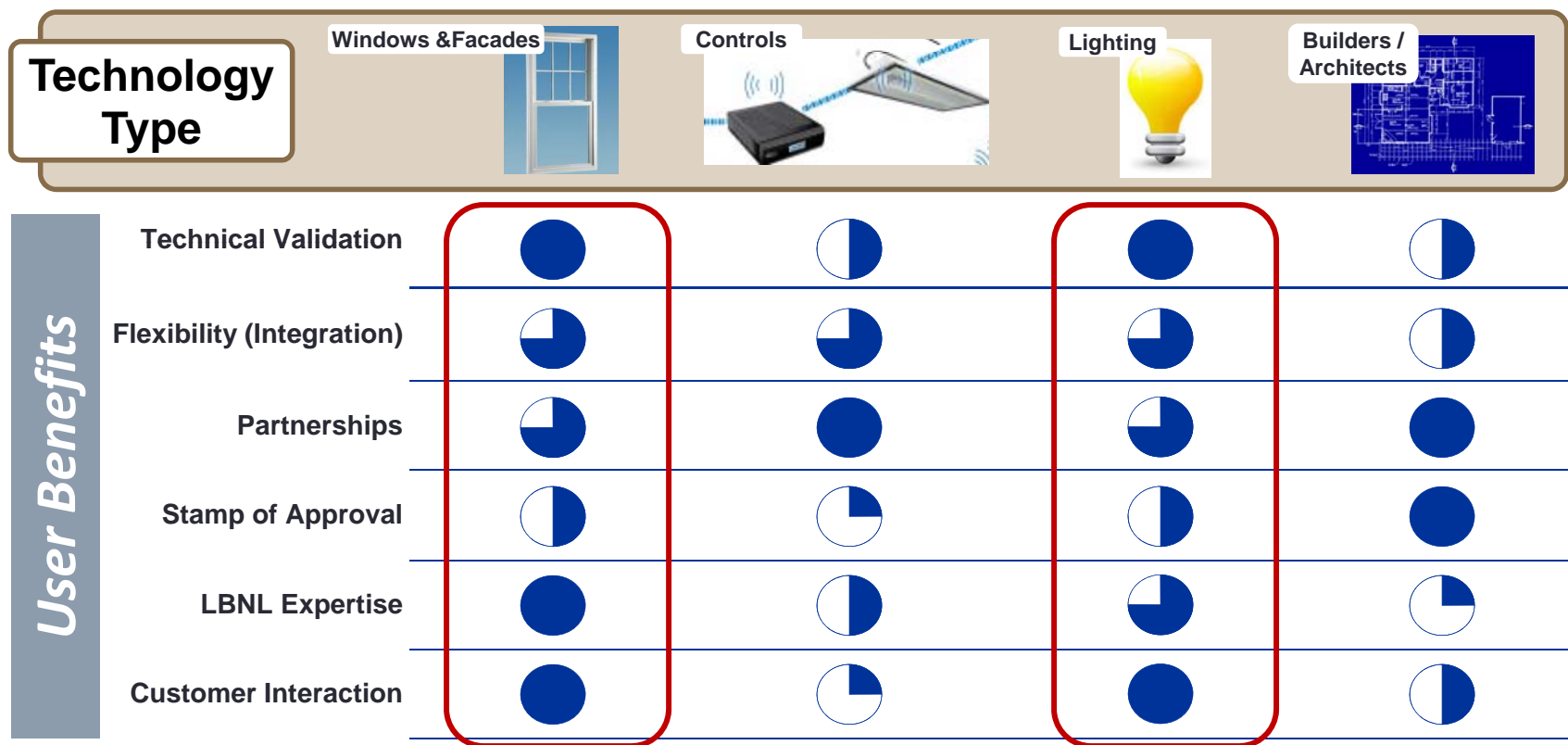


User Benefits by Technology Maturity



Early to Mid stage product companies find more value in the facility than do Late stage companies

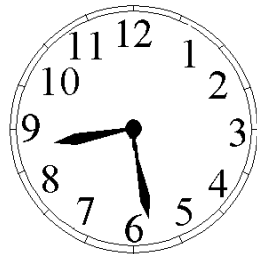
User Benefits by Product Category



Windows/Facades and Lighting sectors have the greatest interest in using the facility

Alternatives exist for the LBNL building test facility

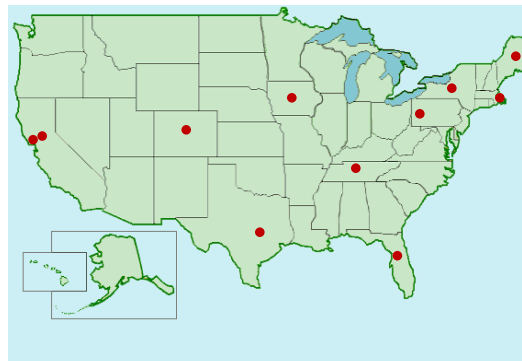
No Testing



way for the fan
is **experience**
at his new place

STANDARDS

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

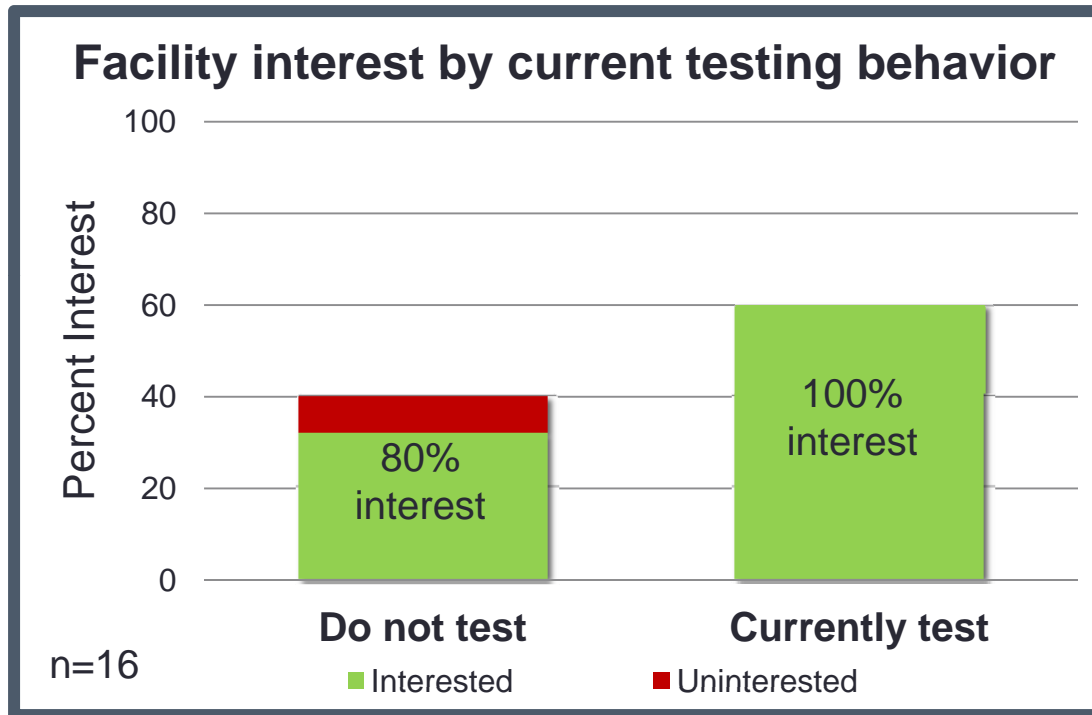
Alternatives fall short in offering key user benefits

	LBNL Facility	No Lab	Other Facility	In House
Technical Validation	✓	X	✓	✓
Flexibility (Integration)	✓	X	~	~
Stamp of Approval	✓	X	✓	X
Partnerships	✓	X	~	~
Testing Expertise	✓	X	✓	~
Customer Interaction	✓	X	~	~

User Benefits

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”

Key targets according to user benefit analysis

Product Category



Key User Benefits

Technical validation

Customer interaction

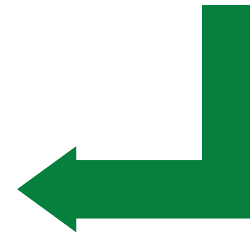
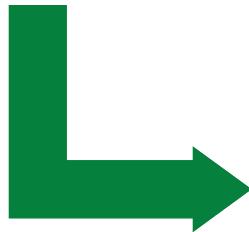
Product Lifecycle Stage



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

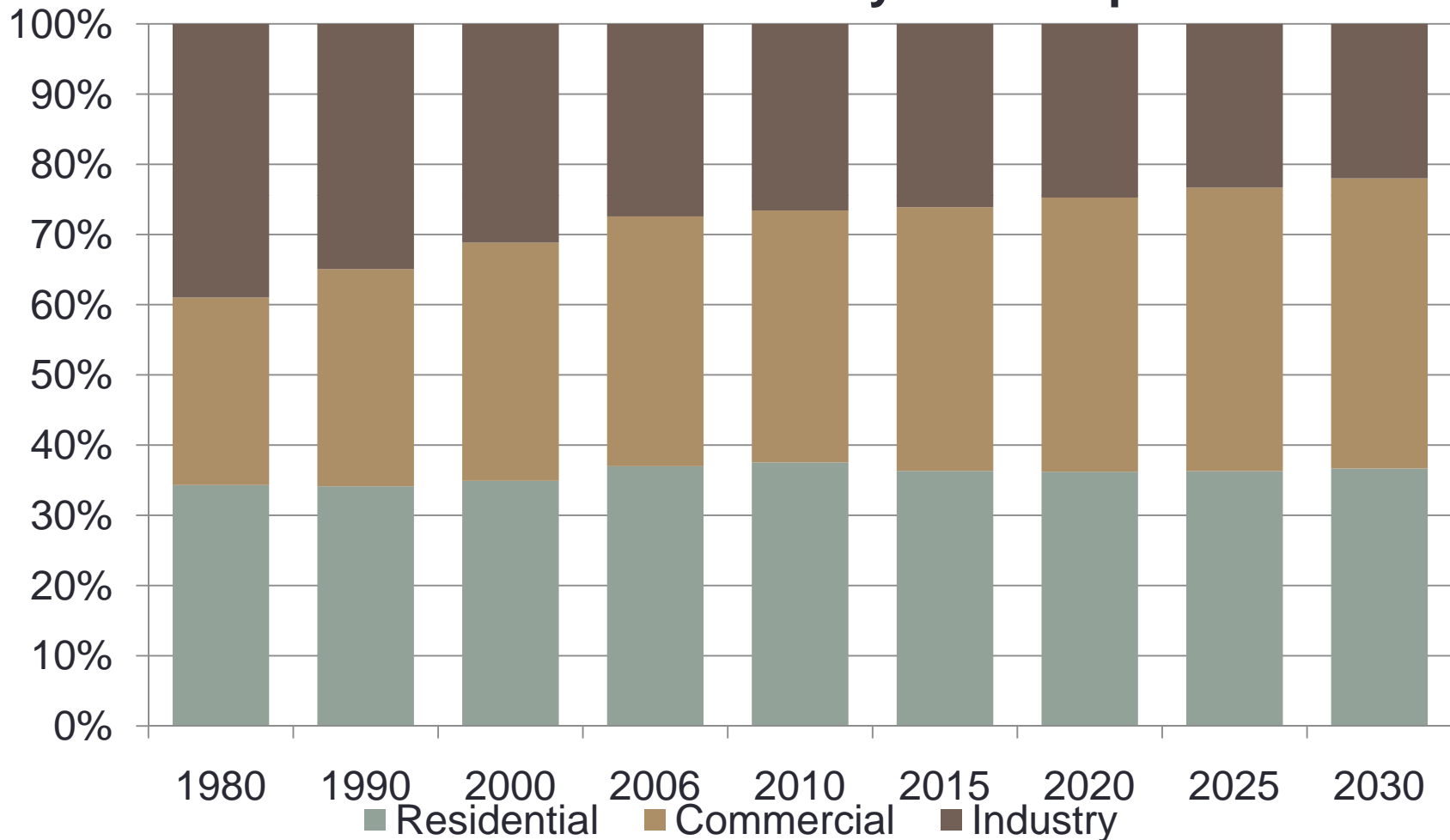
Questions welcome!



Appendix

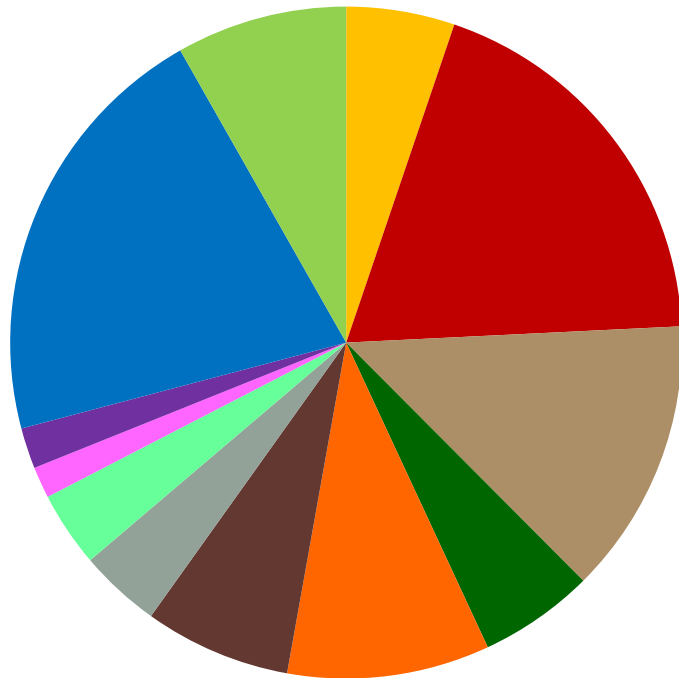
Buildings consume about 70% of all electricity used in the US, and that number is rising

Share of U.S. Electricity Consumption



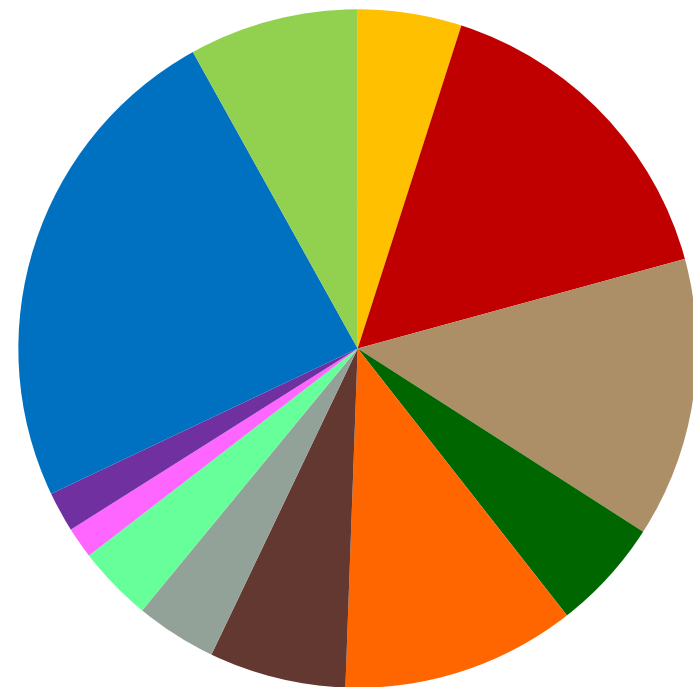
Lighting, heating/cooling, and electronics make up a large portion of electricity use in buildings

2010 Building Electricity Use



- Space Heating
- Lighting
- Electronics
- Refrigeration
- Cooking
- Ventilation

2020 Building Electricity Use



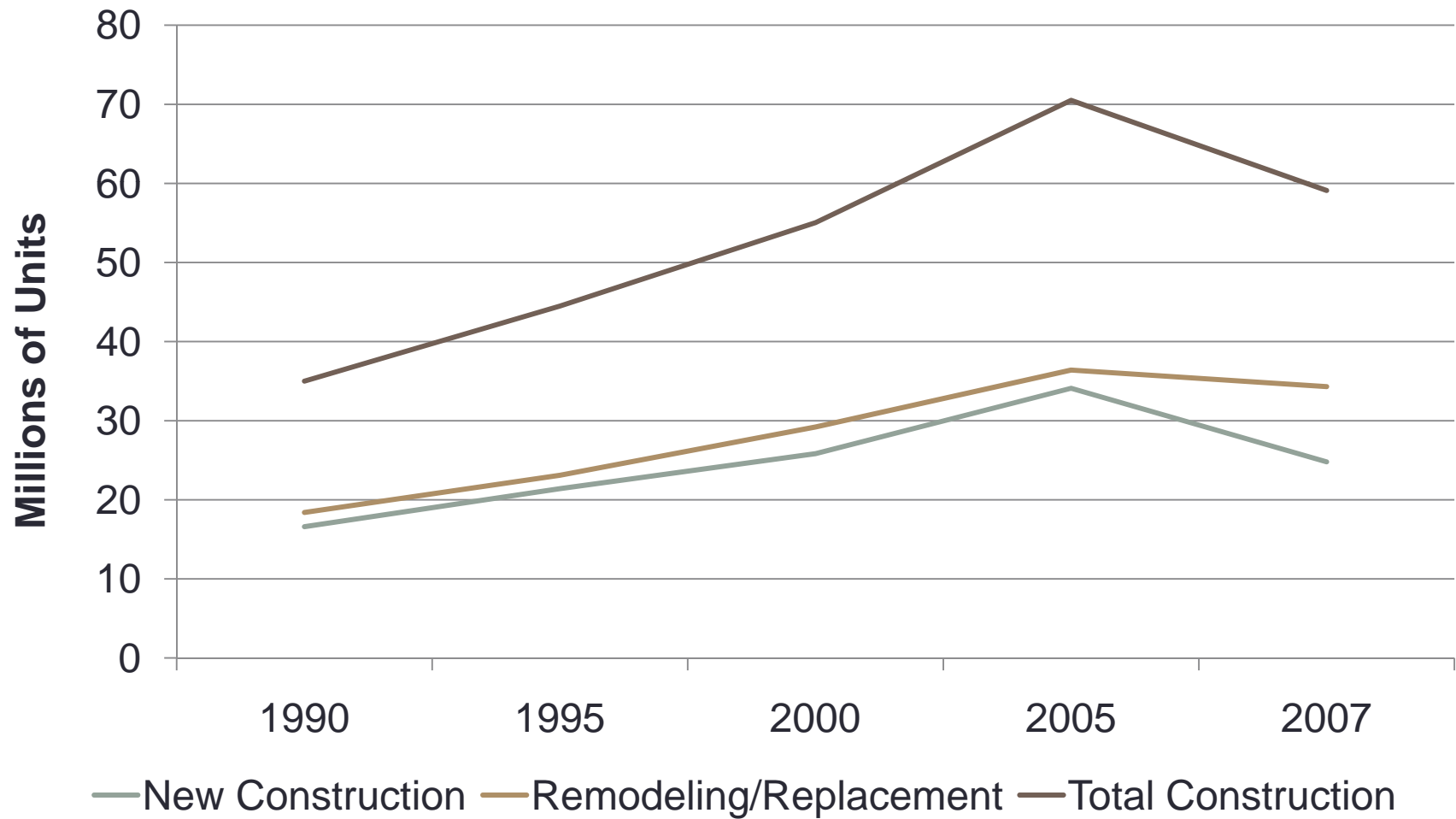
- Space Cooling
- Water Heating
- Wet Clean
- Computers
- Other
- Adjust to SEDS

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



Source: Buildings Energy Databook; <http://buildingsdatabook.eren.doe.gov/Default.aspx>