Berkeley Lab Test Facility For Low-Energy Integrated Building Systems

Lawrence Berkeley National Laboratory (LBNL) has received U.S. Department of Energy funding to design and build a novel User Test Bed Facility (UTBF) for Low-Energy Integrated Building Systems. This User Facility will be comprised of a set of test beds and simulation platforms for research, development, and demonstration of low-energy building technology, control systems, and building systems integration.

The facilities are designed to address key technical challenges for low-energy buildings. They will serve a national need to support the aggressive pursuit of energy efficiency strategies established by the Department of Energy (DOE) for existing and new buildings, and will promote the widespread deployment of these strategies. LBNL is currently developing a service model that will accommodate the varying industry and R&D needs required for effective development of deployable technologies systems.
Construction of the User Facility is scheduled to commence in 2011 and be completed by early 2013. Berkeley Lab will operate the facility and is fully committed to collaboration with industry upon opening. The Lab has begun to plan experiments with users to meet this aggressive objective, and is looking for additional partners and feedback. For more technical information that outlines the current capabilities of the facility and the type of design input sought from potential facility users please visit btech.lbl.gov/utbf.

Facility Capabilities

The User Facility will consist of a series of unique energy-efficient building systems test beds to be located in new and existing structures at Berkeley Lab. Researchers will be able to replace prototype building systems such as exterior building envelope, windows and shading systems, lights, heating, ventilation, and air conditioning (HVAC), energy control systems, roofs and skylights; as well as interior components such as ceilings and raised floors.

Users will be able to conduct focused research or product development on a single building system component, or on whole-building systems integration. For example, a research project could address energy-efficient window system prototypes or the energy performance of an entire integrated lighting, dynamic shading, and HVAC system. Each test bed will be provided with a base set of instrumentation for experimental use and data collection.
The User Facility has been envisioned with certain features to enable research for both new and retrofit building applications in the fields of controls, lighting, facades (including roofs/skylights), HVAC and miscellaneous loads. Minute data will be available on site and remotely via Web.

**INTEGRATED SYSTEMS TEST BED**
- Two cells at 20’w x 30’d x 12’h
  - Comparative studies possible
  - Interior/perimeter condition possible
  - Interchangeable façade elements, shading and glazing
  - Flexible interior space – raised floor, dropped ceiling
  - Flexible HVAC terminal systems
  - Radiant tubing in slab-on-grade, roof slab
  - Interchangeable lighting
  - Plug loads
  - Base set of sensors, instrumentation, and data logging capability
  - One test bed will rotate

**HIGH-BAY TEST BEDS**
- Two cells at 25’ x 25’ x 25’
  - High-bay (big box) studies, interchangeable skylight components, ability to install interstitial floor for two-story structure, double skin wall
  - The same façade and interior functionality as Integrated Test Bed
  - Calorimeter capabilities in one cell

Exploded view concept showing capability for replaceable and interchangeable systems
Berkeley Lab is currently in the process of designing the first fit-out of the facility and the basic functional components needed to support varying kinds of building technologies research. We are looking for guidance from potential users to ensure appropriate flexibility and capabilities are built into the facility to support the wide range of experimental proposals that will be solicited.

Feedback is welcome from all potential partners, both public and private, including product developers, innovators, research institutions, utilities, and manufacturers — all of whom have indicated their support and interest in using the facility. The Lab is particularly interested in assessing the functionality required to advance progress in low-energy product and control systems development.

FEEDBACK REQUEST
The following framework has been created to help guide thinking about how this facility could be used, and to help define its corresponding functional needs. The Lab would like to receive feedback on functionality both in the form of a proposed study- or use case, as well as commentary on the levels of system support that are provided.

Below is a hypothetical use case scenario to serve as an example for the development of your specific use cases. Note that the use case provided outlines the research objectives and technical features to be studied. Do not hesitate to work outside the bounds of the technical features that are currently provided. The Lab is willing to widen the facilities’ technical capabilities after receiving industry commentary. Feedback may be provided in this format, or may be provided in any other format suitable to your needs.

We encourage any further input on your needs as a whole in this area. Please review the facility’s additional technical support capabilities available at btech.lbl.gov/utbf, and consider the following questions when defining needs of potential experiments.

• If you currently operate test facilities, what functionality is missing from your current testing capabilities?
• What kinds of system interactions research would benefit your product or system (e.g., daylighting controls coupled with operable shades)?
  ◦ Define the research goals and needs addressed
  ◦ Define the durations or cycles in which you envision operating
  ◦ What are the interior environmental design conditions needed?
  ◦ What level of accuracy and control will be needed for the experimental systems (all)?
  ◦ What are the specific envelope needs?
  ◦ What are the specific HVAC needs?
  ◦ Are there any special measurement or instrumentation needs that would be desired?

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If your organization prefers to discuss functionality improvements or partnering opportunities, phone calls are welcome.

We are happy to discuss opportunities to demonstrate your high performance products and systems as part of the facility infrastructure installation.