U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

National Laboratory Testing Facilities Available to Buildings Industry

Disclaimer: Testing facilities and capabilities are subject to change. All inquiries regarding availability of testing facilities should be directed to contacts associated with the laboratory.

About

About the Directory

This directory brings together buildings related lab testing capabilities and facilities of four national labs. Start with the Table of Contents if you are interested in learning about capabilities at a specific laboratory. You will find links to additional information and contacts under each laboratory's section.

About the Advanced Building Construction (ABC) Initiative and ABC Collaborative

The Department of Energy's Advanced Building Construction (ABC) Initiative accelerates the speed and scale of U.S. building decarbonization through industrialized innovations that deliver low carbon, affordable, and appealing new buildings and retrofits. Industrialization refers to streamlining manufacturing, business models, and installation of technologies to become reproducible at scale. To do this, the ABC Initiative provides support to accelerate innovations coming out of RD&D through commercialization and scaling, all informed by market needs.

The ABC Initiative established the industry-led ABC Collaborative. The ABC Collaborative is a first-of-its-kind effort to align key stakeholders and harness collective industry knowledge to accelerate action and demand for industrialized construction to decarbonize our nation's building stock. Key stakeholders involved in the ABC Collaborative include researchers, manufacturers, factory owners, building owners, investors, and market enablers (e.g., professional associations, nonprofits, non-government organizations, and other supportive organizations).

Table of Contents

- Lawrence Berkeley National Laboratory
  - Building Technology and Urban Systems
  - Residential Building Systems Group (RBS)
  - Indoor Environment Group
- National Renewable Energy Laboratory
  - Building Technologies and Science Center
  - Industrialized Construction Innovation
  - Partnerships
- Oak Ridge National Laboratory
  - Building Technologies Research and Integration Center (BTRIC)
- Pacific Northwest National Laboratory

Lawrence Berkeley National Laboratory Facilities

Building Technology and Urban Systems Division

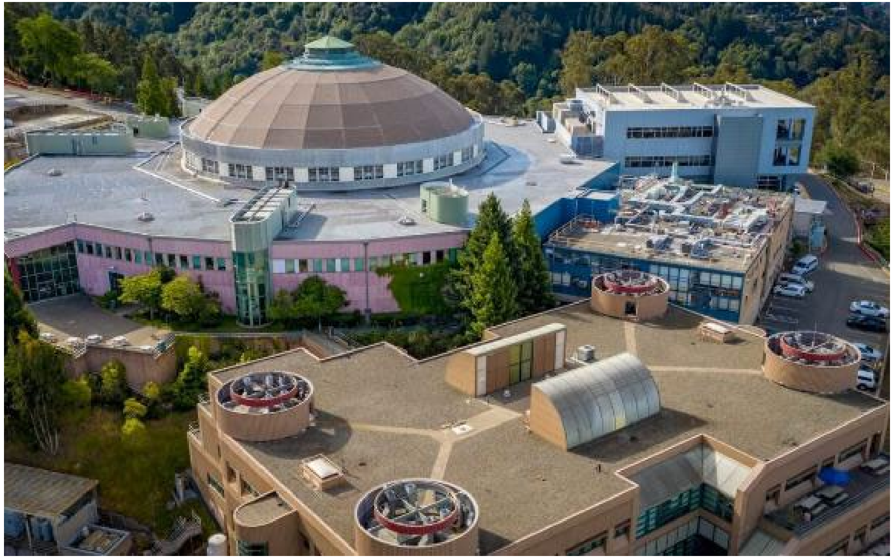
The Building Technology and Urban Systems Division at Berkeley Lab has an extensive array of testing capabilities for material characterization and performance monitoring of a wide range of building technologies.

Learn more about labs and testing capabilities:

- Solar Optical Properties Laboratory
- Infrared Thermography Laboratory
- Mobile Window Thermal Test Facility (MoWiTT)
- Advanced Windows Testbed
- Lighting Systems Laboratory
- FLEXLAB
- Connected Devices Laboratory

Explore Case Studies supported by a variety of funding sponsor types.

BERKELEY LAB



Contact: Jessica Granderson
Interim Division Director
P: 510.289.3887
E: JGranderson@lbl.gov

Building Technology and Urban Systems Division

The Solar Optical Properties Laboratory applies and develops methods to characterize the solar-optical properties of specular and optically complex glazing and fenestration materials that are used as components in window and shading systems.

Download a summary of the Solar Optical Properties Laboratory

BERKELEY LAB

Contact: Jacob Jonsson
Energy Technology Researcher III
P: 510.486.7329
E: jcjonsson@lbl.gov

Building Technology and Urban Systems Division

The Infrared Thermography Laboratory focuses on characterization of heat transfer through window and framing systems using measurements combined with high-resolution infrared thermography imaging of samples placed within a controlled environmental chamber. Prototype improvements are made through visualization and analysis of localized surface heat transfer around edges, spacers, and other connections between surfaces of highly insulating window and framing systems. Quantitative data are used to understand complex heat flows and to validate finite element heat and fluid flow numeric models. Simulation tools incorporating these models are used in national efforts to rate and label window performance so that consumers can compare products.

Download a summary of the Infrared Thermography Laboratory

BERKELEY LAB

Contact: Howdy Goudey
Senior Scientific Engineering Associate
P: 510.486.5981
E: cwgoudey@lbl.gov

Building Technology and Urban Systems Division

The Mobile Window Thermal Test Facility (MoWiTT) is dedicated to the evaluation of the thermal performance of window systems by measuring the net energy flow through full-scale sample windows in two side-by-side, room-size outdoor calorimeters. Net energy flow is characterized as a function of ambient conditions, enabling scientists to derive U-factor and solar heat gain coefficient (SHGC) properties of innovative systems. Because the facility is mobile, samples can be exposed to different orientations and climates. Accurate measurements of time-varying heat flows under realistic outdoor conditions also enable scientists to derive and validate numerical models used in simulation software, improving confidence in the specification of new products.

Download a summary of the MoWiTT Facility

BERKELEY LAB

Contact: Howdy Goudey
Senior Scientific Engineering Associate
P: 510.486.5981
E: cwgoudey@lbl.gov

Building Technology and Urban Systems Division

The Advanced Windows Testbed enables investigations of system-level interactions between innovative façade systems and lighting and HVAC systems. Users can conduct outdoor tests in three full-scale, side-by-side instrumented test chambers. Each chamber is thermally isolated so that window heat flow measurements can be made on a comparative basis. The chambers are designed to emulate typical private offices, so that daylighting, comfort, and human factors studies can be conducted as well. Exterior and interior window attachments can be rotated every three to five days using hoist mechanisms, enabling a maximum of eight different test conditions to be evaluated over a solstice-to-solstice period. Scientists collaborate with industry to vet prototype systems; working out control system designs for dynamic, intelligent façade systems or characterizing the luminous environment resulting from innovative daylighting systems. Performance data are used to assess market readiness and quantify energy and non-energy benefits of new technologies prior to commercial release.

Download Advanced Windows Testbed One-pager

BERKELEY LAB

Contact: Christoph Gehbauer
Energy Technology Researcher III
P: 510.486.4146
E: cgehbauer@lbl.gov

Building Technology and Urban Systems Division

The Lighting Systems Laboratory investigates how digital technologies can be applied to lighting control systems to improve energy efficiency through a variety of control strategies, including daylighting, scheduling, setpoint tuning, and occupancy-based controls. Environmental sensing plays a vital role in the success of such technologies. Goniometric measurements of sensors enable characterization of response so that photoelectrically controlled lighting systems can be modeled using software tools. This laboratory and fully occupied buildings on the LBNL campus are used as living laboratories, enabling researchers to test out the viability and reliability of digital systems, from embedded device networks to wireless networks and monitoring systems.

BERKELEY LAB

Contact: Rich Brown
Energy Policy Research Scientist
P: 510.486.5896
E: REBrown@lbl.gov

Building Technology and Urban Systems Division

FLEXLAB® lets users test energy-efficient, demand flexible building systems individually or as an integrated system, under real-world conditions. FLEXLAB testbeds can monitor and assess heating, ventilation, air conditioning, lighting, windows, building envelope, control systems and plug loads — in any combination. In addition, FLEXGRID provides PV and other DERs, grid simulation and emulation capabilities to study whole building, grid interactive management of onsite energy demand, production and storage.

FLEXLAB consist of 4 testbeds with 2 cells each for comparison studies. Each cell represents a single thermal HVAC zone in a commercial building for real-time comparison studies, assessing energy performance, thermal and visual comfort and IAQ.

Download FLEXLAB One-pager

BERKELEY LAB

Contact: Cindy Regnier, P.E.
Executive Director FLEXLAB
P: 510.486.7011
E: CMRegnier@lbl.gov

Building Technology and Urban Systems Division

The Connected Devices Lab develops prototypes and tests small devices and plug loads with a focus on:

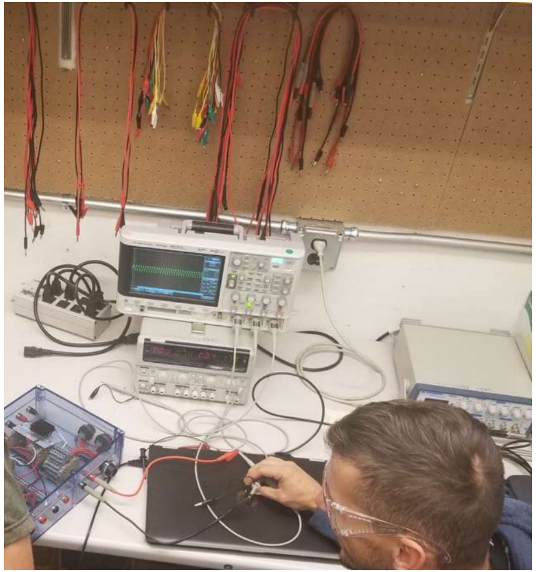
- Energy Reporting
- Zero Standby Energy
- Direct DC Devices
- Small DC System Testing
- Communication and Networks

The Lab contains equipment intended to support design, fabrication, and testing of electronic products. Available instrumentation focuses on accurately measuring and evaluating the products' energy and communication characteristics.

Probing signals and voltage levels are tested for various prototypes. The lab has measurement equipment suitable for conducting IEC 62301 tests (standby power) and other communications test procedures.

This lab is particularly well suited for examining energy use and communications characteristics of the devices, such as in routers, computers, PoE lighting, and other networked equipment.

BERKELEY LAB



Contact: Cindy Regnier, P.E.
Executive Director FLEXLAB
P: 510.486.7011
E: CMRegnier@lbl.gov

Residential Building Systems Group (RBS)

The Residential Building Systems Group (RBS) works to reduce building energy use while providing occupants a healthy, safe, and pleasant indoor environment. To this end, we seek to:

- Provide controlled, conditioned, and directed ventilation while reducing unintended and uncontrolled leakage through the thermal envelope (infiltration).
- Identify, evaluate, and manage pollutant sources that affect indoor environmental quality (IEQ). These sources include "off-gassing" from materials in our homes, exhaust gasses from in-home combustion appliances, and outdoor pollutants.
- Find the best ways to improve the energy performance, durability, health and comfort of existing homes.
- Develop codes, standards, test methodologies, diagnostics and other guidance for the building industry.
- Promote proven but underutilized HVAC technologies and develop new technologies that provide building services at reduced energy use.
- Understand the role of behavior in building operation and find ways of saving energy through changes in behavior.

BERKELEY LAB

The context for our work is the recognition that a building is a system composed of interdependent sub-systems that must be calibrated with each other and with the building as a whole to operate effectively.

Contact: Iain Walker
Staff Scientist
P: 510.486.4692
E: iswalker@lbl.gov

Indoor Environment Group

Indoor Environment at Lawrence Berkeley National Lab performs cutting-edge research to advance health, productivity and energy efficiency in the built environment. Within Indoor Environment, the Air Quality Testing Laboratory is a unique research facility for the development and validation of innovative air quality technologies.

The facility offers access to bench-scale experiments, room-sized chambers and a broad range of analytical facilities to:

- Develop and test air cleaning technologies (active and passive).
- Characterize building materials for pollutant and moisture control.
- Optimize HVAC, ventilation and range hood technologies.
- Evaluate exposure and health effects in occupants.

BERKELEY LAB

Learn more about the Air Quality Testing Laboratory's technical capabilities and tools here.

Contact: Brett Singer
Staff Scientist
P: 510.486.4779
E: bcsinger@lbl.gov

National Renewable Energy Laboratory Facilities

Buildings

NREL's buildings research is transforming energy through building science and integration. NREL's research significantly enhances the resiliency, efficiency, and affordability of energy systems across the United States and the world.

Explore labs and testing capabilities:

- Systems Performance Laboratory
- Commercial Buildings Research Infrastructure (CBRI)
- Thermal Test Facility
- Integrated Energy Capabilities

NREL

Contact: Shanti Pless
Senior Building Energy Research Engineer
P: 720-878-5646
E: shanti.pless@nrel.gov

Buildings

The Energy Systems Integration Facility's Systems Performance Laboratory is a one-of-a-kind testing space that connects appliances, a home, and even a community in an end-to-end energy ecosystem.

Key Infrastructure and Services

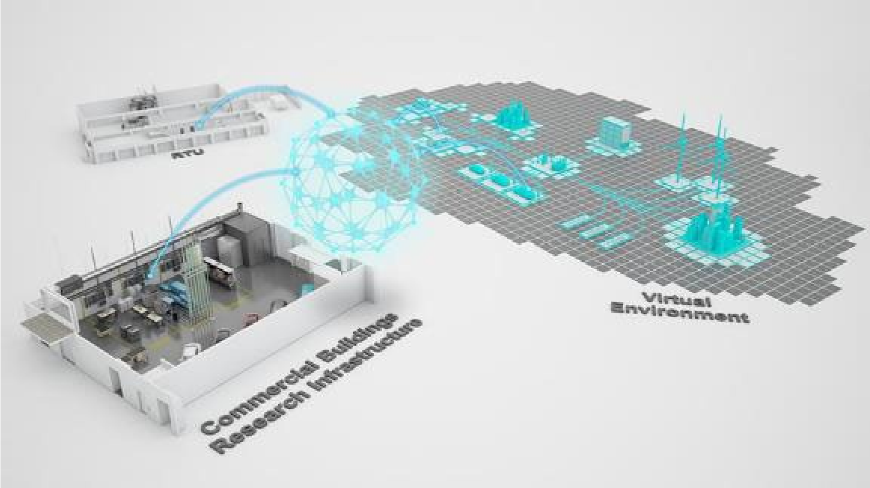
- Three residential mock homes, equipped with major appliances and other typical loads
- Connections in each home for 120/240 volts of electric service, water, and natural gas
- Residential advanced metering infrastructure and breaker panels with circuit-level power meters for each test home
- Data acquisition and control systems to collect sensor data related to each appliance and to manage controls for simulated occupancy
- Environmental chambers that can impose location-specific heating, ventilation, and air-conditioning loads through application of hardware-in-the-loop techniques

NREL

Buildings

NREL's Commercial Buildings Research Infrastructure (CBRI), located in the Energy Systems Integration Facility (ESIF), is critical in determining how commercial grid-interactive efficient buildings can provide load flexibility for the future grid.

The CBRI fast-tracks scalable solutions with energy use, generation, and storage among buildings and the larger electric grid. Described as a flight simulator for commercial buildings, the CBRI integrates hardware and the virtual environment to evaluate technologies in a more flexible and reconfigurable manner. For example, this infrastructure can be used to characterize the performance of behind-the-meter thermal and battery energy storage and integrate it with a building simulation to see how the energy storage will impact the building performance.



Buildings

The Thermal Test Facility is a flexible multipurpose laboratory that enables detailed evaluation and development of building and thermal energy systems. The recently upgraded facility is designed to measure the grid-interactive performance of technologies—from metascale (e.g., one-tenth scale) devices, up to systems that are 10 refrigeration tons (or 35 kilowatts-thermal).

Download Thermal Test Facility One-pager

NREL

Buildings

Integrated Energy Capabilities at the Energy Systems Integration Facility (ESIF) are helping researchers address the unique challenges that are shaping the electric grid today—and discovering solutions that will shape the future.

These capabilities include tools and approaches to enable better integration with the electric grid and other energy infrastructure, diversification of integrated energy streams for resilience, cybersecurity risk management, and customer participation in smart load management and energy generation. NREL's integrated energy research capabilities are available across six indoor high-bay laboratories, three outdoor test areas, and an associated control and visualization room.

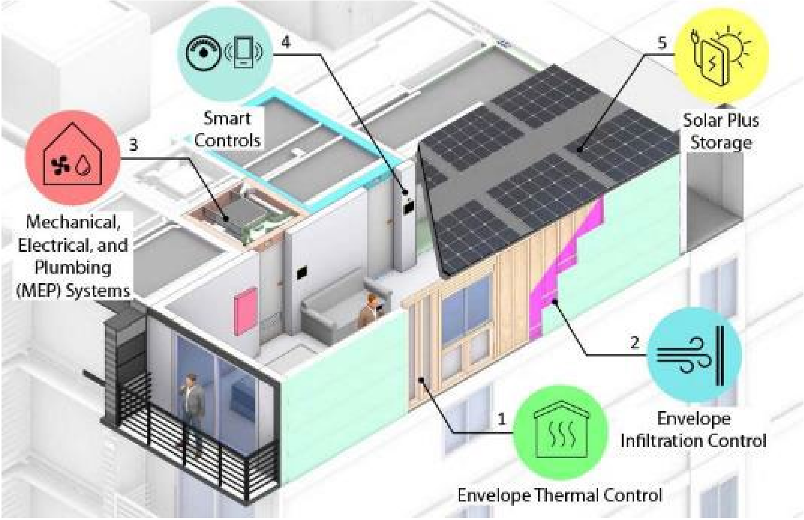
NREL

Industrialized Construction Innovation (ICI)

NREL leverages the benefits of industrialized construction—higher-quality buildings, faster construction timelines, improved productivity, increased technology integration, and labor cost savings—to enable cost-effective strategies for energy efficiency, integrated grid-interactive controls, and renewables in retrofit and new construction projects.

Explore labs and testing capabilities:

- ICI Research Block @ NREL
- Off-site Construction Productivity Modeling
- Construction Process Modeling and Visualization

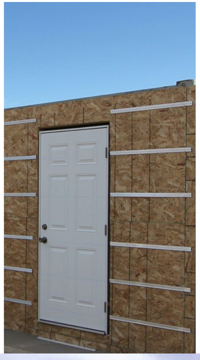


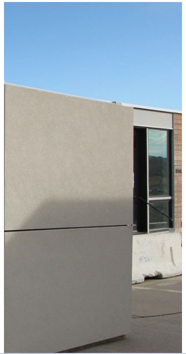
Contact: Shanti Pless
Senior Building Energy Research Engineer
P: 720-878-5646
E: shanti.pless@nrel.gov

ICI Research Block @ NREL

Outdoor modular unit energy research pad at NREL Golden Site

- Steel and wood framed volumetric modular units for outdoor environmental research demonstration
- Modular Apartment Systems integration and HVAC pod development
- Façade overclad installation research and development site at a full façade scale





Contact: David Goldwasser
Senior Building Energy Research Engineer
E: David.Goldwasser@nrel.gov

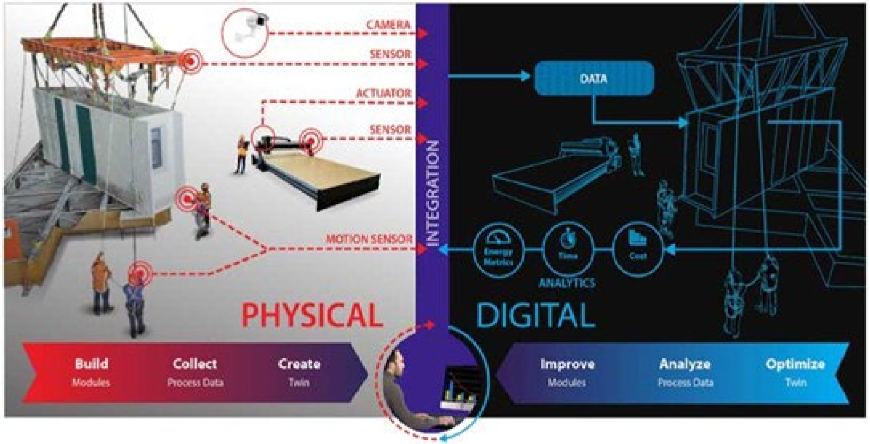
ICI Off-site Construction Productivity Modeling

Off-site factories still require a lot of manual labor, and so it is difficult to understand the implications of labor productivity, cycle time or even downtime.

Construction productivity modeling uses multi-sensor time and activity data capture from construction processes on-site and in-factory. These inputs are used in decarbonization strategy installation process models to optimize what-if scenarios in construction process improvements.

Read: [Simulating Off-site Construction Factories to Deliver Energy Efficient Modular Buildings]()

NREL



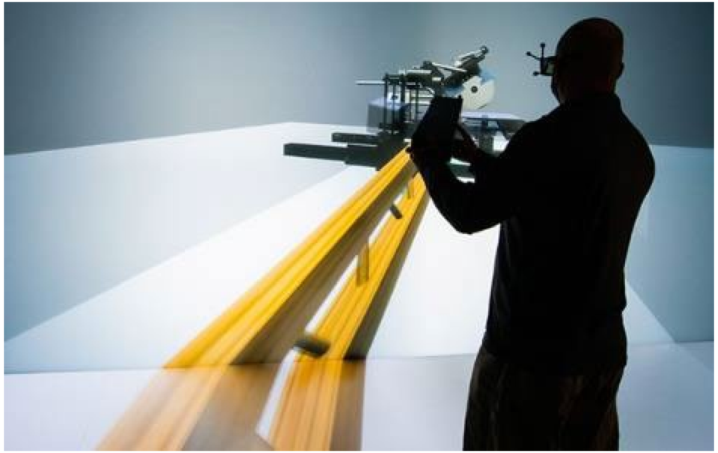
ICI Construction Process Modeling and Visualization

NREL is actively developing and testing Immersive Industrialized Construction Environments (IICE) for construction automation and worker-machine interaction to investigate possible solutions and increase workforce productivity. Improvements in this area:

- Encourage workforce specialization in energy efficiency construction
- Enable wider adoption of energy-efficient products into a workforce training program
- Addresses the lack of multi-skilled workers

Read: Immersive Industrialized Construction Environments for Energy Efficiency Construction Workforce

NREL



Partnerships

Past projects in these labs with industry partners have ranged from $50k to $500k and lasted a month to 2 years.

Learn more about NREL's Technology Partnership Program and other various agreement types.

Explore past project outcomes:

- Blok-by-Blok: Lower Emissions and Costs With Net-Zero Energy Modules
- NREL and iUnit Open the Door to Grid-Integrated, Multifamily Construction
- Immersive Industrialized Construction Environments for Energy Efficiency Construction Workforce

NREL

Contact: Shanti Pless
Senior Building Energy Research Engineer
P: 720-878-5646
E: shanti.pless@nrel.gov

Oak Ridge National Laboratory Facilities

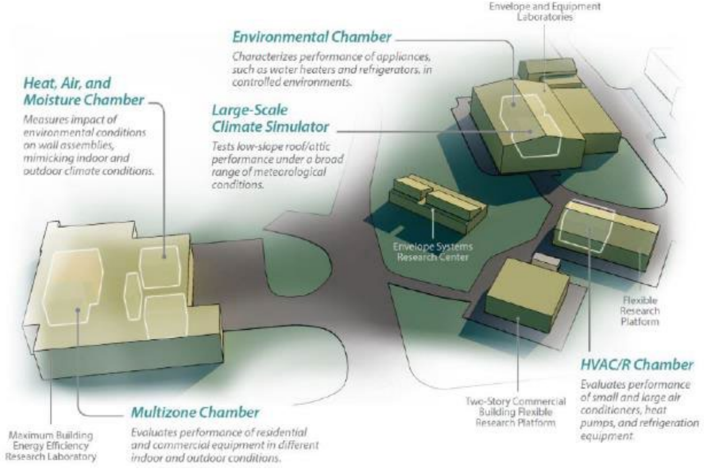
Building Technologies Research and Integration Center

The Building Technologies Research and Integration Center (BTRIC) is the Department of Energy's only designated user facility dedicated to performing early-stage research and development in building technologies. With the aim of improving the energy efficiency and environmental compatibility of residential and commercial buildings, research focuses on building envelopes, equipment, building systems integration, energy storage and building-to-grid interactions, sensors, transactive controls, and data modeling and simulation.

Explore labs and testing capabilities:

- Advanced Construction Laboratory
- Sustainable Materials
- Window Installation
- Flexible Research Platform
- Environmental Chambers
- Building Envelope
- Phase Change Materials
- Integrated Controls and Appliances
- Building Equipment
- Building Envelope Materials
- Integrated Building Deployment and Analysis
- Multifunctional Equipment Integration Group
- Technical Collaborations for Industry

OAK RIDGE National Laboratory



Contact: Melissa Lapsa
Building Technologies Program Manager
865.576.8620
lapsamv@ornl.gov

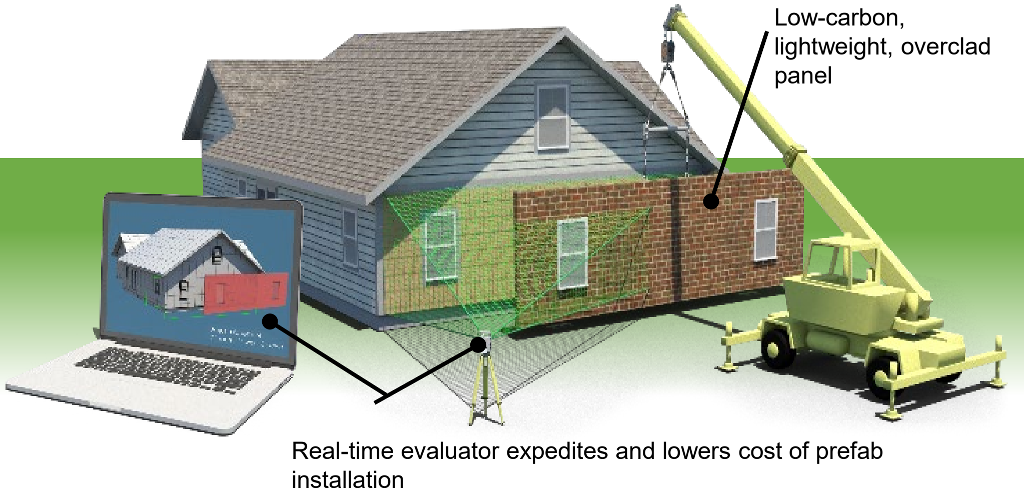
Advanced Construction Lab

The Advanced Construction Laboratory leads research and development efforts focused on modernizing the construction industry. As part of the Advanced Building Construction Initiative, headed by DOE's Building Technologies Office, the laboratory is instrumental to developing technologies for affordable, low-carbon, energy-efficient buildings.

Research areas include:

- Modernizing existing manufacturing facilities
- Simultaneously developing low-carbon materials and machine-assisted assembly for optimized construction solutions
- Offsite and onsite digital manufacturing methods
- Non-destructive diagnostic tools

Oak Ridge National Laboratory

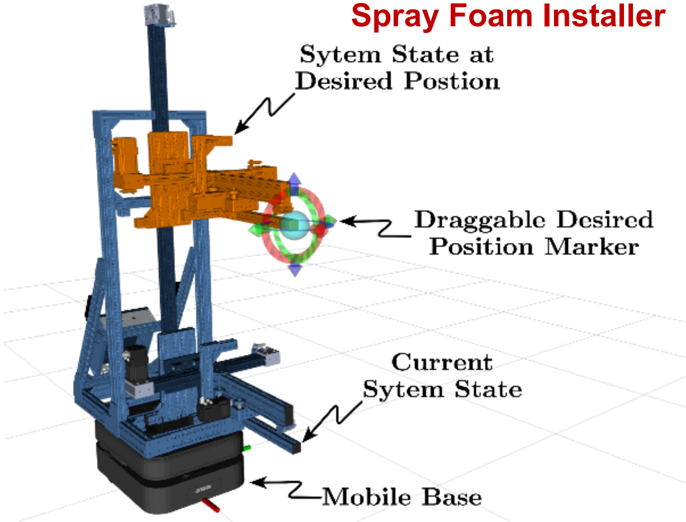


Contact: Diana Hun
Group Leader, Building Envelope Materials
865.574.5139
hunde@ornl.gov

Robotics and Automation
Advanced Construction Lab

The Advanced Construction Laboratory has expertise to develop autonomous robots for the construction industry that perform tasks alongside humans to increase worker safety, improve quality, increase installation speed, reduce waste, and lower overall cost.

Prototype of Autonomous Spray Foam Installer



Contact: Bryan Maldonado
R&D Staff, Building Envelope Materials
maldonadopbp@ornl.gov

Advanced AI-Assisted Software

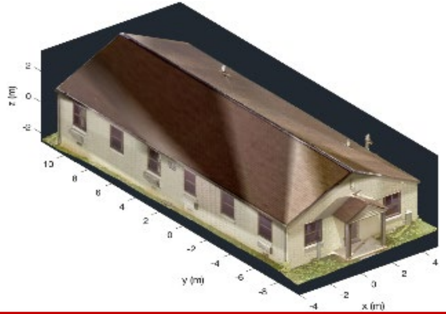
Advanced Construction Lab

The Advanced Construction Laboratory has expertise to develop advanced AI-assisted algorithms that automate processes to reduce errors, increase accuracy, expedite tasks, and lower overall cost.

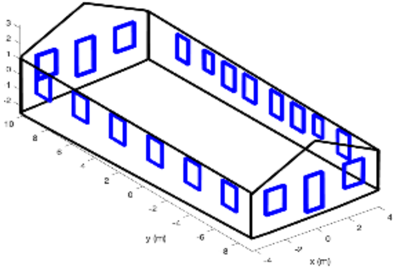
Oak Ridge National Laboratory

Building to be Retrofitted

3D Scan



Digital Twin



From point cloud data to digital twin with 1/8” accuracy in minutes

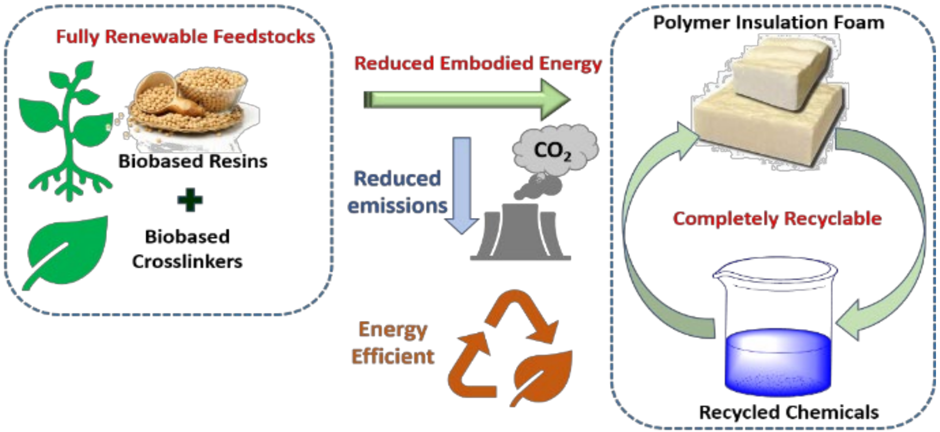
Contact: Bryan Maldonado
R&D Staff, Building Envelope Materials
maldonadopbp@ornl.gov

Low-Carbon Materials
Advanced Construction Lab

The Advanced Construction Laboratory has expertise to develop low-carbon building materials that can be designed to be installed using automated methods that increase productivity to attain affordable decarbonization. These capabilities go hand in hand with expertise in life cycle assessments that are used to select feedstock and manufacturing processes with the lowest embodied carbon.

Oak Ridge National Laboratory

Low-Carbon, Recyclable, Biobased Foam Insulation



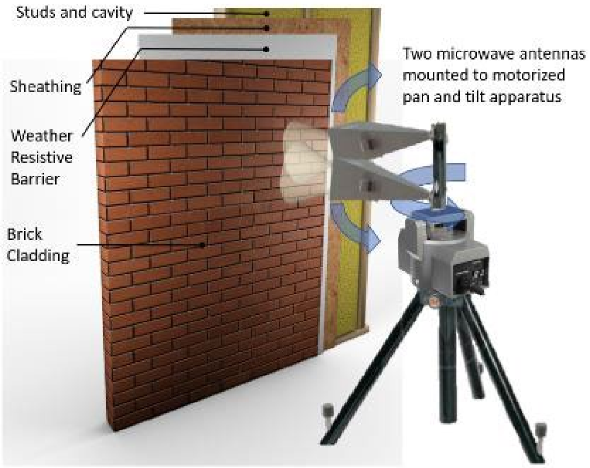
Contact: Diana Hun
Group Leader, Building Envelope Materials
865.574.5139
hunde@ornl.gov

Non-Destructive Diagnostic Tools
Advanced Construction Lab

The Advanced Construction Laboratory has expertise to develop hardware and software for non-destructive diagnostic tools that expedite building envelope retrofits by identifying deficient areas without having to dismantle the interior or exterior cladding.

Oak Ridge National Laboratory

Moisture Detector Concept



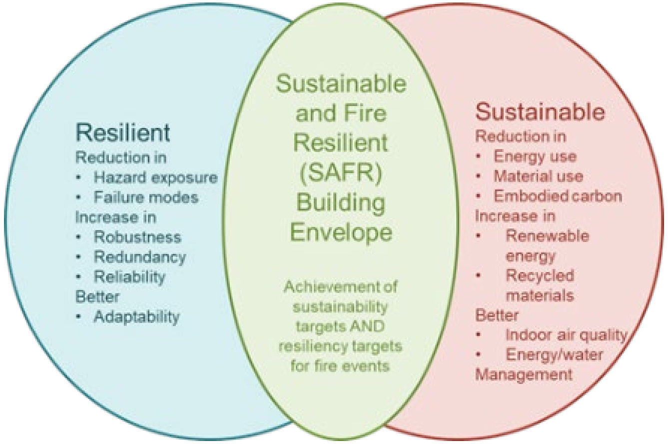
Contact: Philip Boudreaux
R&D Staff, Building Envelope Materials
865.576.7835
boudreauxpr@ornl.gov

Fire Resilient, Sustainable Building Materials

Advanced Construction Lab

The Advanced Construction Laboratory has expertise to facilitate the design and development of fire resilient, sustainable building materials by characterizing their fire performance and tailoring their integration into the building envelope.

OAK RIDGE National Laboratory



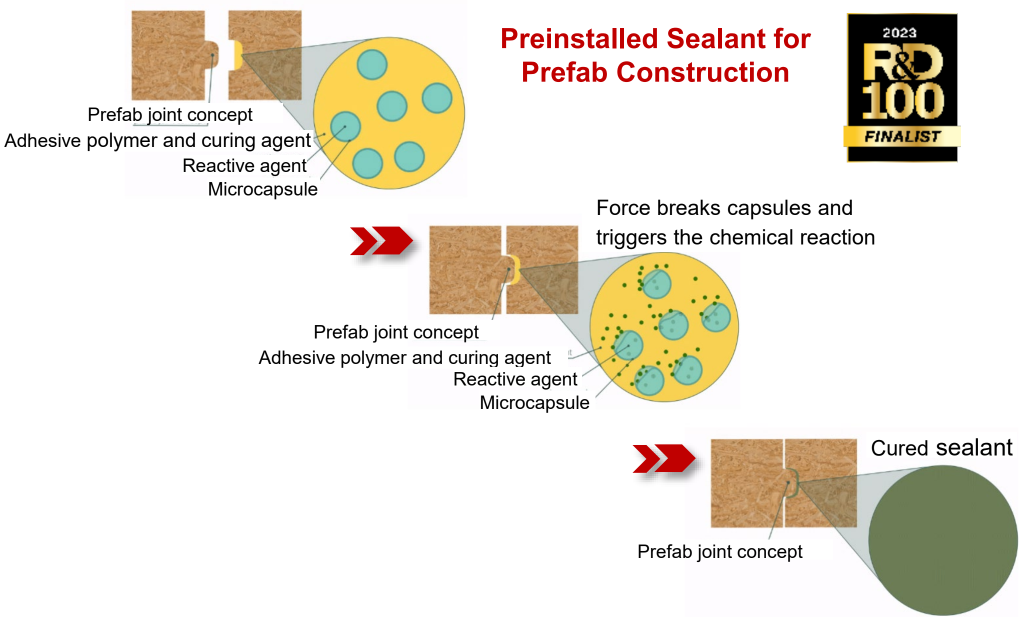
National Fire Protection Association, FPRF-2020-13

Contact: Anthony Aldykiewicz
Senior R&D Staff, Building Envelope Materials
aldykiewajjr@ornl.gov

Materials for Prefab Construction
Advanced Construction Lab

The Advanced Construction Laboratory has expertise to develop new building materials that are tailored to support the goals of the prefab construction industry that include increased worker safety, improved quality, increased installation speed, reduced waste, and lower overall cost.

Preinstalled Sealant for Prefab Construction



Contact: Diana Hun
Group Leader, Building Envelope Materials
865.574.5139
hunde@ornl.gov

Sustainable Building Materials Lab

The Sustainable Building Materials Lab conducts research for the development and deployment of technologies that enable reduction of embodied carbon and energy intensity of building materials.

Oak Ridge National Laboratory

Contact: Denise Silva
Senior R&D Staff, Building Envelope Materials
silvada@ornl.gov

Window Installation and Air and Water Leakage Testing

As part of the Building Envelope Materials Group, researchers have the facilities needed to develop and evaluate innovative window installation methods that lower cost and reduce air and water leaks. Additionally, ORNL has facilities to evaluate and optimize the performance of automated window shading devices in unoccupied residential and commercial test buildings.

OAK RIDGE National Laboratory

Heat, Air, and Moisture Chamber

Yarnell House

Flexible Research Platform

Contact: Mahabir Bhandari
R&D Staff, Building Envelope Materials
865.574.0989
bhandarims@ornl.gov

Flexible Research Platform

The Flexible Research Platform (FRP) is a two-story multi-zone unoccupied research apparatus that can be used to physically simulate light commercial buildings common in the United States' existing building stock. The FRP can accurately monitor and evaluate various configurations of envelope systems and HVAC systems with system controls, occupant schedules, and plug loads. It allows users to apply desired test scenarios and settings and can also provide data collected during testing from more than 500 sensors.

Oak Ridge National Laboratory

Contact: Piljae Im
Group Leader, Integrated Building Deployment and Analysis
865.241.2312
imp1@ornl.gov

Large-Scale Environmental Chambers

ORNL has several environmental chambers to assess the performance of building equipment and envelope components, such as HVAC, heat pump water heaters, refrigerators, and insulation at environmental conditions ranging from -15F to 120F at various humidity levels.

Testing is performed at standard rating conditions to determine improvements versus baseline equipment and materials.

For HVAC equipment, there are chambers for the indoor and outdoor equipment. In addition, one of the chambers can be configured with up to four zones to enable testing with multiple indoor units

Wall and roof assemblies can be evaluated in test chambers that simulate indoor and outdoor temperature and humidity conditions.

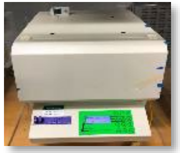
OAK RIDGE National Laboratory

Contact: Melissa Lapsa
Building Technologies Program Manager
865.576.8620
lapsamv@ornl.gov

Building Envelope Material Characterization

The Building Envelope Materials Research Group has numerous apparatuses to characterize the properties of materials used in building envelopes according to ASTM standards.

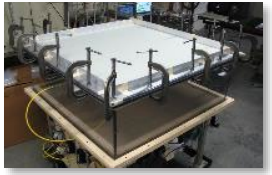
Oak Ridge National Laboratory


Heat flow meter


Hot disk thermal analyzer


Vacuum heat flow meter


Water permeability and sorption isotherms


Air permeability


Weathering accelerator

Contact: Som Shrestha
Senior R&D Staff, Building Envelope Materials
865.241.8772
shresthass@ornl.gov

Phase Change Materials (PCM) Lab

The PCM lab develops low-cost phase change materials and advanced characterization methods that support the DOE Building Technologies Office's Stor4Build Consortium.

Oak Ridge National Laboratory

Differential Scanning Calorimetry

Temperature and humidity chamber

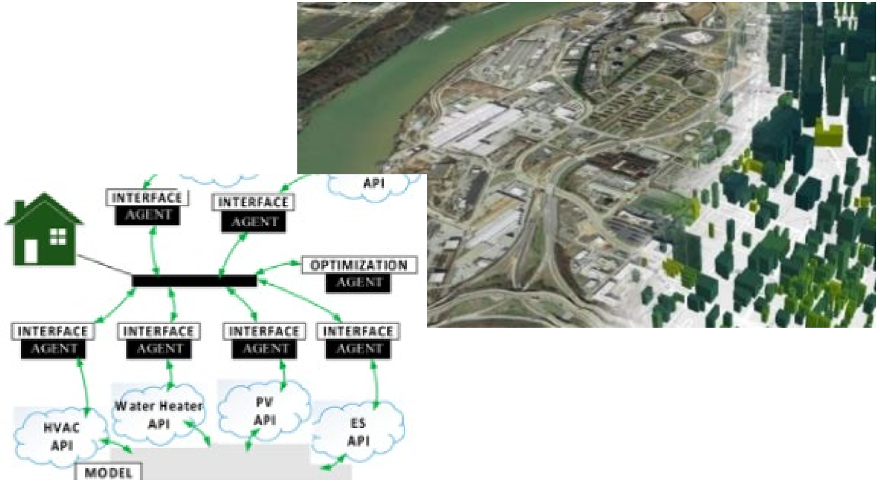
Accelerated thermal testing unit

Contact: Kyle Gluesenkamp
Senior R&D Staff, Multifunctional Equipment Integration Group
865.241.2952
gluesenkampk@ornl.gov

Platform for Integrated Controls and Appliances (PICARD) Lab

The PICARD lab is a hardware and software platform for integrated and connected equipment development. It is a physical test bed and demonstration facility for ORNL's research on advanced controls for grid interactive building equipment. The PICARD lab is strategically located next to ORNL's Grid Research Integration and Deployment Center (GRID-C).

Oak Ridge National Laboratory



Contact: Zhiming Gao
R&D Staff, Multifunctional Equipment Integration Group
865-2415018
gaoz@ornl.gov

Building Equipment Research Group

Building Equipment Research at ORNL develops innovative, energy-efficient and sustainable residential and commercial building equipment solutions for the connected world using extensive experimental facilities and advanced hardware-based design models as well as advanced process controls and novel materials. Group members are engaged in research and development activities in areas such as advanced vapor compression cycles, appliances, water heaters, heat pumps, air conditioners, dehumidifiers, refrigeration systems, and alternative refrigerants.

ORNL has executed numerous equipment technology research and development collaborations with industry and university partners. Through these collaborations, the Building Equipment Research Group (BERG) has helped industry launch some of the most energy-efficient building equipment technologies on the market today. BERG collaborates with industry and academia to develop the next generation of building equipment technologies.

Oak Ridge National Laboratory

Contact: Brian Fricke
Group Leader, Building Equipment Research
865.576.0822
frickeba@ornl.gov

Building Envelope Materials Group

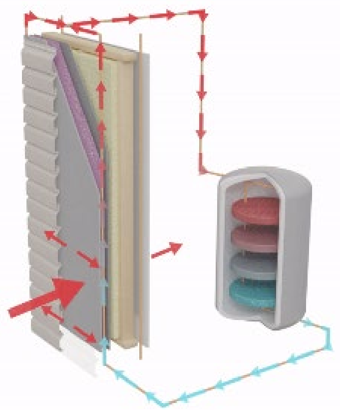
The Building Envelope Materials Research Group uses scientific expertise in heat, air, and moisture transport to develop and evaluate new building envelope materials and assemblies that reduce energy use, enhance occupant comfort, are moisture durable, and/or provide grid services. The group closely collaborates with ORNL researchers that specialize in material science, polymer chemistry, advanced manufacturing, imaging and machine learning, and advanced composites, among others.

Research focus areas include low-carbon materials, high-R insulation materials, self-healing materials, advanced building construction, thermal energy storage, active insulation materials and systems, envelope retrofits, moisture durability, grid services, highly insulated windows, and controls for shading systems.

OAK RIDGE National Laboratory

Cross-Laminated Timber Hotel in Columbia, SC

Thermally Anisotropic Building Envelope



Contact: Diana Hun
Group Leader, Building Envelope Materials
865.574.5139
hunde@ornl.gov

Integrated Building Deployment and Analysis

The Integrated Building Deployment and Analysis Group conducts research on integrated solutions for building energy efficiency and provides unique research to support the Department of Energy's programs. Research spans both residential and commercial/institutional building markets.

Building System Integration provides the means for our industry partners to work out the wrinkles in their new products in low-risk, realistic test bed environments before market introduction. In ORNL's residential and light commercial building test beds, in addition to natural exposure to weather, an average occupant effect on energy use is imposed using process control so that realistic loads, operating conditions, and interactive effects are provided for technology evaluation and physical validation of models. Some technologies, such as system- and building-level controls or fault detection and diagnostics systems, also benefit from use of test buildings during the development process. The facilities and expertise in this center are also well suited to address renewable energy and building-to-grid integration challenges with our industry partners.

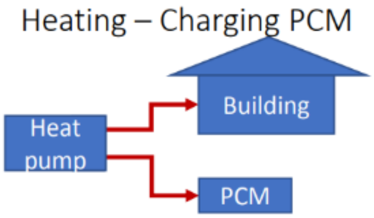
OAK RIDGE National Laboratory

Contact: Piljae Im
Group Leader, Integrated Building Deployment and Analysis
865.241.2312
imp1@ornl.gov

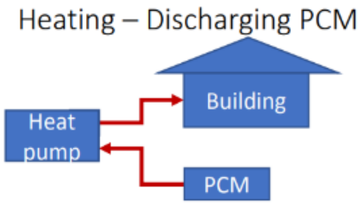
Multifunctional Equipment Integration Group

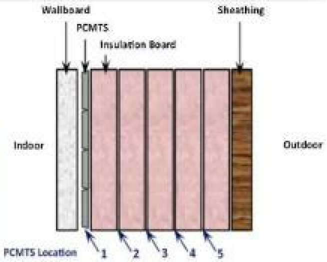
The Multifunctional Equipment Integration Group develops state-of-the-art energy-efficient and environmentally friendly solutions for building equipment and focuses on grid integration, advanced energy storage, and energy conversion systems. The group leverages novel thermodynamics processes, advanced materials and manufacturing, and process control to advance building equipment. Research conducted includes advanced dehumidification systems and indoor air quality; energy storage solutions integrated into applications such as air conditioning and water heating; low-cost phase change material solutions; advanced heat exchanger design for applications including heating, ventilation, air conditioning and refrigeration; modular power generation and desalination; energy efficient appliances; natural gas and hybrid fuel driven equipment and integrated solutions for direct carbon dioxide capture using air handling systems for buildings. The group has the unique ability to develop solutions for critical problems by utilizing advanced materials and manufacturing processes, and advanced computational and neutron resources.

Oak Ridge National Laboratory



Phase Change Materials Lab





Contact: Kashif Nawaz
Group Leader, Multifunctional Equipment Integration
865.241.0972
nawazk@ornl.gov

Technical Collaborations for U.S. Building Technologies Industries

The Department of Energy's Building Technologies Research and Integration Center (BTRIC) at ORNL offers technical collaboration opportunities for industry to leverage facilities, capabilities, and expertise to overcome technical challenges.

BTRIC's technical collaboration program provides a unique opportunity for U.S. building technology industries to gain access to ORNL's expertise through a publicly announced call for proposals. Proposals can be submitted at any time in response to a notice of opportunity announcement posted in Federal Business Opportunities, supported and in agreement with DOE's Building Technologies Office (BTO). Announcements will be issued annually and remain open for 12 months from the initial date of release, contingent upon funding. Collaborations are short-term (approximately 3-24 months) focused projects with industry providing at least 20 percent of the total project funding. The intent is to increase the in-kind cost share from 20% to 50% in the future, and the timing will be determined and approved by BTO.

Visit ORNL Tech Collaborations to learn more.

OAK RIDGE National Laboratory

One South First

First precast concrete façade manufactured with 3D printed molds that were developed at ORNL under a Tech Collaboration with Gate Precast.

Contact: Melissa Lapsa
Building Technologies Program Manager 865.576.8620
lapsamv@ornl.gov

Pacific Northwest National Laboratory Facilities

Pacific Northwest National Laboratory

Unique facilities at Pacific Northwest National Laboratory, including dedicated laboratories for power grid operations, marine sciences, data analytics, and atmospheric sciences, equip researchers to take on some of the most challenging questions, and expand the frontiers of scientific understanding and technological possibility.

Explore labs and testing capabilities:

- Lab Homes
- Environmental Chambers
- Lighting Science & Technology Lab
- Advanced Building Controls Lab

Pacific Northwest NATIONAL LABORATORY

Contact: Cheryn Metzger
Senior Advisor
Phone: 707-623-7091
Email: Cheryn.metzger@pnnl.gov

Lab Homes

The Lab Homes site currently includes two test homes – the “baseline home” and the “experimental home”. These homes are identical in nearly every respect except for the equipment being tested. They are typical of existing homes and, aside from experimental equipment, are equipped with appliances found in nearly every home: an electric stove, microwave, dishwasher, refrigerator, a washer and dryer, a water heater, and a heat pump HVAC system.

In all of our experiments, the baseline home serves as an un-altered control home, while the experimental home is equipped with energy-efficient technologies. Researchers closely monitor energy and water use, environmental conditions (humidity), and indoor environmental quality in each home to look for differences between the two homes during their experiments.

Pacific Northwest
NATIONAL LABORATORY

Contact: Cheryn Metzger
Senior Advisor
Phone: 707-623-7091
Email: Cheryn.metzger@pnnl.gov

Environmental Chambers

PNNL's two Environmental Chambers provide a simulation and testing capability to measure the performance of heating, ventilation, and air-conditioning (HVAC) systems and other building equipment. The chambers help advance new energy-efficient devices to the marketplace, update product standards, and develop building-grid integration strategies.

The two side-by-side units, also referred to as psychrometric chambers, can precisely control temperature and humidity. The chambers' controlled internal environments allow studies to be conducted at any time of the year, regardless of whether actual outdoor conditions are extremely hot or cold.

Download Environmental Chambers One-pager

Pacific Northwest NATIONAL LABORATORY

Contact: Andrew Costinett
Mechanical Engineer
Phone: (509) 375-2989
Email: andrew.costinett@pnnl.gov

Lighting Science & Technology Laboratory

PNNL's Lighting Science & Technology Lab enables research on data-driven lighting and controls technology, electrical immunity, connected equipment data retrieval and accuracy, fault detection, and other performance and maintenance attributes. The lab includes high-bay space with two moveable ceiling units for easy installation of LED connected lighting, sensors, and controls and can accommodate AC, DC and Power-over-Ethernet equipment.

The LSTL is also a center for human factors research evaluating visual perception and preferences of spectral tuning and color rendition, and lighting flicker, glare, brightness, uniformity, and comfort. Specialized research apparatuses are used to gather human visual response data to inform improved lighting metrics and industry consensus technical standards.

Pacific Northwest NATIONAL LABORATORY

Contact: Michael Poplawski
Senior Electrical Engineer
P: 503.417.7561
E: michael.poplawski@pnnl.gov

Advanced Building Controls Laboratory

The Advanced Building Controls Laboratory is helping researchers develop more effective and efficient heating, ventilation, and air conditioning (HVAC) units and systems.

The 600-square-foot test facility simulates real building conditions with a fully automated HVAC system. This includes a 10-ton chiller, an air-handling unit, four variable air volume zones, and a 7.5-ton rooftop HVAC unit.

With these capabilities, researchers conduct experiments and test HVAC control logic, fault detection and diagnostics, and cybersecurity protocols. Researchers also explore machine learning methods using real-time or historical building performance data.

Pacific Northwest
NATIONAL LABORATORY

Contact: : Andrew Costinett
Mechanical Engineer
Phone: (509) 375-2989
Email: andrew.costinett@pnnl.gov