OAK RIDGE NATIONAL LABORATORY FACT SHEET
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

Building Technologies Research and Integration Center

Reducing the energy consumption of the nation's buildings is essential for achieving a sustainable clean energy future and will be an enormous challenge. Buildings account for 40% of the nation's carbon emissions and the consumption of 40% of our primary energy, 73% of our electricity, and 34% of our natural gas (55% counting natural gas used to generate electricity consumed in buildings). The importance of buildings is amplified because some renewable energy technologies are most economical when using buildings as their deployment platforms—for example, generating power with building-integrated photovoltaic cells, lighting and heating water with direct sunlight, and space conditioning and water heating with energy from the ground.

The Building Technologies Research and Integration Center (BTRIC), in the Energy and Transportation Science Division (ETSD) of Oak Ridge National Laboratory (ORNL), focuses on research and development of new building technologies, whole-building and community integration, improved energy management in buildings and industrial facilities during their operational phase, and market transformations from old to new in all of these areas.

The DOE programs supported by BTRIC are primarily within the Office of Energy Efficiency and Renewable Energy (EERE), and include:

- Building Technologies Program (BTP),
- Federal Energy Management Program (FEMP),
- Industrial Technologies Program (ITP), and the
- Weatherization and Intergovernmental Program (WIP).

BTRIC also supports other DOE-EERE offices, other DOE programs, other federal agencies, state agencies, and the private sector through DOE's "work-for-others" and "user facility" programs.

ORNL's work in pursuit of energy and environmental sustainability of the built environment is broad-based, addressing residential, commercial, and industrial buildings that are new or existing. Organizationally, BTRIC consists of four groups:

- Building Envelope Research
- Building Equipment Research
- Whole-Building & Community Integration
- Residential, Commercial, and Industrial Energy Efficiency

Building Envelope Research Group

The envelope (the fabric separating indoor and outdoor environments) is the main determinant of the amount of energy required to heat, cool, and ventilate a building, and can significantly influence lighting energy needs in areas accessible to sunlight. The Building Envelope Research Group is devoted to developing affordable envelope technologies that improve the energy efficiency, durability, and environmental sustainability of residential, commercial, and industrial buildings. The research addresses: systems (walls, roofs and foundations), components (sheathings, membranes, and coatings), materials, and the fundamentals of heat, air, and moisture transfer. In addition to advancing performance, durability, and affordability of traditional envelope solutions (high-R, airtight), increasingly the group is focusing on multifunctional solutions. Here the envelope serves as a filter, selectively accepting or rejecting solar radiation and outdoor air, depending on the need for heating, cooling, ventilation and lighting at that time, and using the heat capacity of the building structure to minimize peak energy demands and overheating from solar gain.

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Building Equipment Research Group

The equipment in a building consumes energy to provide the amenities—heating, cooling, fresh ventilation air, humidity control, water heating, refrigeration, and appliances—so our indoor lives can be healthy and productive. The Building Equipment Research Group is devoted to developing affordable equipment technologies that improve the energy efficiency and environmental sustainability of residential, commercial, and industrial buildings. The research addresses: systems (supermarket refrigeration, ground-source, CHP, multi-zone HVAC, wireless and other communications, sensors and controls), components (packaged rooftop units, heat pumps, water heaters, display cases), cycles (vapor-compression, absorption, magnetocaloric), working fluids, and materials. The group is currently focused on a portfolio of activities that includes developing integrated styles of equipment that provide the same amenities as baseline equipment while consuming half the energy, helping chemical companies and equipment manufacturers transition to low global warming potential working fluids while simultaneously improving the efficiencies of the end-using devices, and achieving large efficiency improvements at the individual component level. Equipment energy savings come from a variety of sources: applying improved model-based design processes, recycling heat between end uses, and incorporating emerging materials.

Whole-Building and Community Integration Group

Energy efficient envelope and equipment technologies are necessary but not sufficient to achieve energy efficient retrofitted or newly constructed buildings. Further, buildings are not islands unto themselves but rather nodes on the nation's energy grids. The Whole-Building and Community Integration Group supports DOE's goal of maximizing the cost-effective energy efficiency of buildings through a research focus on sustainable whole-building and community integration, including the scanning of international technology developments and sustainability approaches, and cross-cut activities to use green buildings and communities as test-beds and seed markets for emerging deep-savings energy efficiency, solar and other renewable energy, sustainable transportation, distributed energy, and grid-integration technologies.

Residential, Commercial, and Industrial Energy Efficiency Group

The Residential, Commercial, and Industrial Energy Efficiency Group works to optimize the energy performance of buildings and industrial facilities through applications research, technical assistance, and technology deployment. The team's comprehensive knowledge of buildings and energy use spans multi-building sites, whole-building systems, system components, and multi-level interactions. The team helps federal and private-sector customers conserve energy through cost-effective energy-management best-practice tools and strategies such as planning, metering, benchmarking, assessments, retro- or continuous commissioning, implementing capital projects, and financing those projects when direct funding is not available (rather than waiting for direct funding).

Building Technologies Research and Integration Center
National User Facilities

Private sector laboratories are not available to conduct many of the tests and experiments possible using the BTRIC laboratories at ORNL, which have been designated as national user facilities. In these cases, the facilities at ORNL can be accessed by entering into a facilities user agreement. Such agreements can be proprietary or non-proprietary. Generally the user provides the test specimens (the materials or walls or roofs). Scheduling of user tests must not interfere with the DOE-sponsored research ORNL is conducting with use of these same experimental facilities.

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