

BUILDING ENERGY TECHNOLOGY RESEARCH



1 Fraunhofer CSE's Building Energy Technology group investigates the energy and long-term durability performance of building-integrated solar technologies, among others.

Fraunhofer Center for Sustainable Energy Systems CSE

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About Fraunhofer CSE

The Fraunhofer Center for Sustainable Energy Systems (CSE) is an applied research and development laboratory that provides R&D and related services for industry and government clients, with focus in solar photovoltaics, building technology, distributed electrical energy systems, and support for early start-ups.

Building Technology Research at CSE

Fraunhofer CSE's Building Energy Efficiency Group works to accelerate development, commercialization, and deployment of next-generation energy-saving building technologies and practices. We take an integrated systems approach to develop technologies that:

- Decrease primary energy consumption and CO₂ emissions
- Enhance the durability of the built environment
- Create a productive and healthy indoor environment

Research Expertise

The Fraunhofer CSE Building Energy Efficiency Group is an interdisciplinary team with expertise in several areas, including:

- Building Enclosures
- Data Acquisitions and Sensing
- Energy Consumption
- Characterization
- Energy Modeling
- Experimental Psychology
- Field Monitoring
- HVAC
- Signal Processing and Pattern Recognition
- Technology Assessment



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Building Enclosures

The Building Enclosures group evaluates the performance of building enclosures and their components. This research program tests and analyzes novel building materials, modern building envelope systems, and hybrid dynamic building enclosures with solar components in both small-scale laboratory and field conditions.

The Building Enclosures team works with major US and international building material manufacturers in the following areas:

- Applied R&D of novel energy-efficient materials and systems, including advanced thermal insulation and environmental barriers, phase change materials (PCMs), advanced ventilation strategies, and systems to control radiation heat transfer
- Deployment and integration of these technologies
- Development and testing of novel building-integrated solar systems
- Advanced thermal, hygrothermal modeling
- Whole building energy analysis
- Laboratory thermal / hygrothermal testing, monitoring and performance evaluation

Energy Management

New technologies that enable residents to manage their energy consumption have come to market, such as home energy displays (HEDs), residential automation systems, advanced thermostats, and smart electric meters.

Typically, these products and systems build upon the deployment of smart electric meters, combined with in-home sensors, computing capability, and data acquisition and communication systems. Very often, the real-world effectiveness and energy savings of these technologies is not well understood, foremost due to occupant behavior.

Our Energy Management works at the intersection of emerging technologies and occupant behavior to address the core challenges to realizing their energy savings potential. Focus areas include:

- Field and laboratory usability and user-acceptance evaluations
- In-house evaluation of energy savings
- Psychological experiments to optimize clients' energy-saving technologies, programs, and communications
- Design and evaluation of strategies to increase adoption of residential energy management technologies
- Development of non-intrusive load monitoring (NILM) systems

Policy and Technology Assessment

Fraunhofer performs technology assessment projects for government and industry to help them accurately evaluate the full potential of new or emerging building technologies. We evaluate the energy savings potential, technical maturity, commercialization drivers and barriers, and research needs and priorities.

Examples of technologies assessed by members of the Fraunhofer staff include:

- Building Enclosures
- Controls and Diagnostics
- Consumer Electronics / Information & Communication
- HVAC
- Miscellaneous and Electronic Loads
- Medical Equipment

The Fraunhofer team also has extensive experience characterizing energy consumption for building end use.

2 Fraunhofer CSE's Building

Enclosures team studies the benefits of advanced insulation technologies such as vacuum insulated panels (VIPs).

3 CSE works with local and federal governments on questions of technology and policy.