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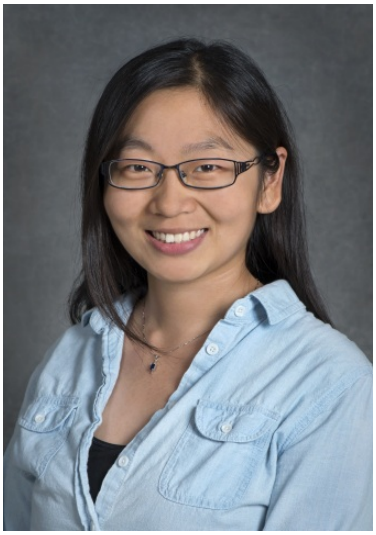


Technology Adoption, Driving Global Change

I am pleased to present to you the summer edition of our Building Technology & Urban Systems (BTUS) newsletter, an exciting compilation of achievements, events, and updates. In this issue, we highlight the exceptional work carried out by BTUS researchers, who are dedicated to promoting technology adoption.

Windows possess a huge potential in saving energy and improving thermal comfort, particularly within disadvantaged communities. Yet, there have been challenges in the wide adoption of efficient window technologies. Lawrence Berkeley National Laboratory (Berkeley Lab) is at the forefront of identifying and addressing these obstacles, by harnessing the insights from a diverse array of stakeholders.

Our vision and impact extend beyond U.S. borders, resonating on a global scale. Berkeley Lab's scientists contributed significantly to the United Nations' Sixth Assessment Report to fight global climate change. To reach the ambitious goal of limiting warming to 1.5-degrees Celsius, deep decarbonization across all sectors is imperative. This, in turn, hinges on the broad-scale adoption of energy efficiency and clean energy technologies.

At Berkeley Lab, our mission is to "bring science solutions to the world." Through these efforts, we aim to underscore the critical role of technology adoption in driving change, and the difference it can make for the future of our planet and its inhabitants. Our goal is to foster conversations, stimulate innovative thinking, and motivate actions that will bring about transformative change in our world.

Thank you for joining us on this journey!

Kaiyu Sun, Deputy Department Head, Building Technology, BTUS Division

NEWS

Berkeley Lab Hosts Summit

to Help Increase Adoption of Efficient Window Technology

Berkeley Lab recently hosted a summit to showcase the benefits of vacuum insulated glazing — a type of highly insulated window glazing that uses a vacuum as an insulating layer between window panes — and the likely challenges preventing its widespread adoption on the market. A wide cross-section of stakeholders attended the summit, consisting of industry, building professionals, practitioners, academia, researchers, and decision makers.

Berkeley Lab researcher **Charlie Curcija** helped organize the event, and he participated in a panel presentation and group discussion on current industry standards and the state of the art in development. Other presentations included highlights of the Department of Energy (DOE)-funded activities; updates on ongoing research featuring researchers from several national laboratories including Berkeley Lab, National Renewable Energy Lab, and American and Australian universities; and perspectives from manufacturers and industry practitioners.

Read the full report detailing the discussions **here.**

New UN Report: Limiting Global Warming to 1.5 Degrees Celsius Requires Deep Decarbonization Across All Sectors

Limiting global warming to 1.5 degrees Celsius above pre-industrial levels will require severely cutting greenhouse gas emissions by nearly 50% by 2030, according to the Sixth Assessment Report" recently released by the United Nations' Intergovernmental Panel on Climate Change. Doing so calls for the immediate, large-scale adoption of energy efficiency, renewable energy, electrified transportation, high-performance batteries, low-carbon grids, and carbon capture and storage technologies across all sectors globally.

"It will be challenging to limit global warming to 1.5 degrees Celsius without drastically changing how we consume energy across all sectors and switching to renewable or cleaner low-carbon technologies soon," said **Nan Zhou**, a senior scientist at Berkeley Lab.

Read the full details **here.**

Disseminating New Solutions to Improve Building Analytics and Control

Equipment faults and control problems drive up greenhouse gas emissions and energy bills to the tune of $17 billion and 90 million metric tons of CO_2 equivalent annually. These problems compromise occupant comfort and productivity, as well as equipment life, and they make it difficult to coordinate building power use with a clean energy grid. The National Laboratories and DOE are working with the industry to change the status quo, delivering new technologies and interoperability standards to enable automated configuration and self-correcting smart buildings. The latest developments for these solutions were presented at the 2023 Haystack Connect Conference, an annual event for professionals in building automation control and the internet of things to exchange new approaches for intelligent buildings. Berkeley Lab's **Jessica Granderson** shared new technologies and open-source specifications for **automated fault correction and optimal control**, the DOE's Amir Roth presented *The Department of Energy's View of Semantic Modeling and the Haystack/Brick/223P Relationship*, and Avijit Saha and Gabe Fierro of the National Renewable Energy Laboratory shared an ***Open-Source Tool for Haystack Model Validation and Harmonization with RDF-based Schemas***.

Net Zero World Climate Smart Women Energy Leaders Program Kicked Off at Berkeley Lab in May

Berkeley Lab proudly hosted the formal launch of the Climate Smart Women Energy Leaders program (CS-WEL) as part of the Net Zero World (NZW) Initiative launched by DOE Secretary Jennifer Granholm at the 27th Conference of the Parties (COP27). The program empowers women leaders in the energy sector from partner countries through intensive training, peer learning, and ongoing coaching. Leaders from seven partner countries joined the program.

The launch featured panel discussions on clean energy transitions and included leaders from DOE, Berkeley Lab, NZW, and CS-WEL. Women leaders also visited Berkeley Lab's facilities, received training and mentoring, and later met with Granholm at the National Renewable Energy Laboratory.

Check out Granholm's tweet about the program **here.**

AWARDS

The American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Recognizes Tianzhen Hong with Distinguished Service Award

Tianzhen Hong has received the Distinguished Service Award from ASHRAE. This award salutes members of any grade who have served the Society faithfully and with distinction and who have given freely of their time and talent in chapter, regional and Society

activities.

"We are thrilled to recognize and celebrate the exceptional achievements of this year's ASHRAE Honors and Awards recipients." said 2022-23 ASHRAE President Farooq Mehboob.

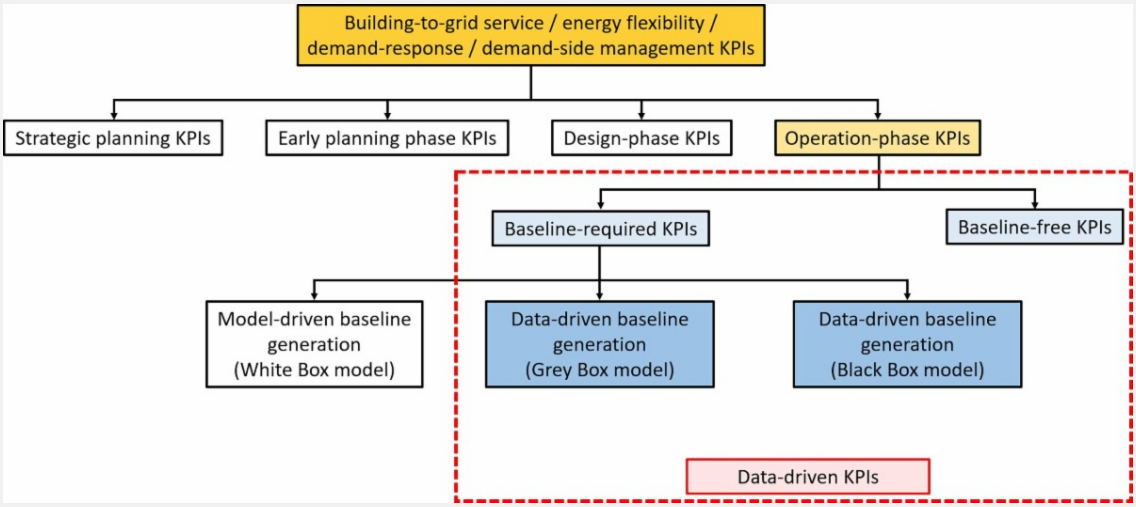
See the full list of award recipients here.

FEATURED PUBLICATIONS

Data-Driven Key Performance Indicators and Datasets for Building Energy Flexibility: A Review and Perspectives

Energy flexibility, achieved by utilizing demand-side management and energy storage technologies, plays a vital role in aligning fluctuating energy supply in various grids with building energy demand. As one of the latest outcomes from the Annex 81 international collaboration, this paper comprehensively reviews: (1) data-driven key performance indicators (KPIs) for measuring energy flexibility in operational buildings and (2) available open datasets for testing energy flexibility KPIs. It highlights the recent advancements and future research opportunities in data-driven building energy flexibility quantification.

Read the full article **here.**



New Evidence From U.S. Manufacturing: Saving Water Beats New Sources for Economics and the Environment

Water is a critical resource for the manufacturing sector, but water shortages and climate change threaten its availability. Despite this, water efficiency as a method of water conservation has gained limited traction within the manufacturing sector. In a new paper, BTUS researchers **Unique "Nick" Karki** and **Prakash Rao** quantify water withdrawals by manufacturing sub-sectors and end uses and explore the potential benefits of implementing water efficiency measures. They examined the impacts on water withdrawal, energy consumption, and greenhouse gas emissions. They also paid close

attention to costs. Examining those impacts is vital as manufacturers increasingly adopt sustainability goals across all three areas, and a reduction in one area may come at the sacrifice or benefit of the other.

On average, the team found, water efficiency measures are 10 times less costly per unit of water than switching to alternative water supplies, such as desalination or water reclamation. Water efficiency measures thus can play a crucial role in reducing overall water withdrawals, preparing for water stress-induced risks, and contributing to the sustainable management of both water and energy.

Read the full paper **here.**

PUBLICATIONS

Recent Publications

Granderson,J., Lin,G., Chen,Y., Casillas,A., Wen,J., & Huang,S. (2023) "A labeled dataset for building HVAC systems operating in faulted and fault-free states." **DOI**
buildings.lbl.gov/publications/labeled-dataset-building-hvac-systems

Fitzgerald, P., Therkelsen, P., Sheaffer, P., & Rao, P. (2023) "Deeper and persistent energy savings and carbon dioxide reductions achieved through ISO 50001 in the manufacturing sector." **DOI**
buildings.lbl.gov/publications/deeper-and-persistent-energy-savings

Shan, H., Zhou, Z., Yan ,D., Guo, F., Hong, T., & Jiang,Y. (2023) "A systematic review of building energy sufficiency towards energy and climate targets." **DOI**
buildings.lbl.gov/publications/systematic-review-building-energy

Building Technology & Urban Systems | Energy Technologies Area | Berkeley Lab

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See also: Department of Energy Building Technologies Office

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Lawrence Berkeley National Laboratory (Berkeley Lab) is located in the Berkeley Hills near University of California (UC) Berkeley and conducts scientific research on behalf of the United States Department of Energy (DOE). The Laboratory overlooks the UC Berkeley.

Berkeley Lab addresses the world's most urgent scientific challenges by advancing sustainable energy, protecting human health, creating new materials, and revealing the origin and fate of the universe. Founded in 1931, Berkeley Lab's scientific expertise has been recognized with 14 Nobel prizes. The University of California manages Berkeley Lab for the U.S. Department of Energy's Office of Science. For more information, visit www.lbl.gov.

DOE's Office of Science is the single largest supporter of basic research in the physical sciences in the United States, and is working to address some of the most pressing challenges of our time. For more information, see ***science.energy.gov****.*