Future of Energy Efficiency in Buildings: Drivers and Market Expectations

Future of Energy Efficiency in Buildings: Drivers and Market Expectations

Presentation By:

Steve Schiller, Affiliate and Senior Advisor

Electricity Markets and Policy Department, Lawrence Berkeley National Laboratory

June 30, 2022

Berkeley Lab – Electricity Markets and Policy Department

Informing public and private decision-making through through independent, interdisciplinary analysis of critical electricity policy and market issues

Technical Assistance to State, Local, and Tribal Governments

- With funding from the U.S. Department of Energy, the Berkeley Lab provides provides technical and policy support to public regulatory commissions and energy offices on a wide range of topics.
- For more information, contact:
  - Natalie Frick: nfrick@lbl.gov
  - Pete Cappers: pacappers@lbl.gov
  - Lisa Schwartz: lcschwartz@lbl.gov

Acknowledgements

This work was funded by the U.S. Department of Energy's Building Technologies Office, under Contract No. DE-AC02-05CH11231.

We would like to especially thank DOE's David Nemtzow and Monica Neukomm for their support of this work.

And the reports co-authors: Jeff Deason, Kelly Parmenter, Greg Leventis and Lisa Schwartz

We also thank our interviewees and questionnaire respondents and E9 Insight for their research assistance.

Topics for Todays Webinar

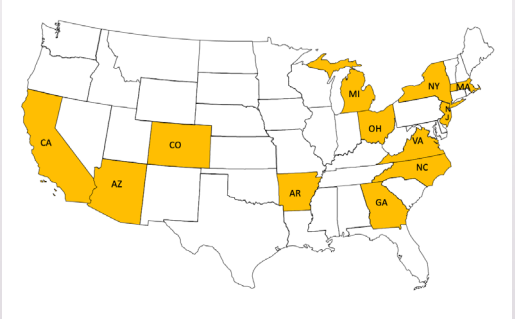
- Project Scope and Approach
- Drivers of Energy Efficiency in Buildings
- Energy Efficiency in Buildings: Future Expectations
- Implications and Use of This Research

Project Scope and Approach

Scope

- Identify and describe drivers that have the potential to define the future of energy efficiency markets for U.S. buildings over the next decade
- Provide heuristic descriptions of possible future attributes of efficiency markets
- No specific predictions of the future, such as what will be the newest and best technologies or business models

Approach



- Review of recent demand-side management actions in twelve states
- Literature review
- Interviews of 21 experts in efficiency and energy markets from industry, utilities, research groups and academia
- Questionnaire completed by 41 efficiency practitioners
- Review and analysis of collected information

Why This Work Is Important

Buildings Energy Use is a major part of US energy economy & emissions

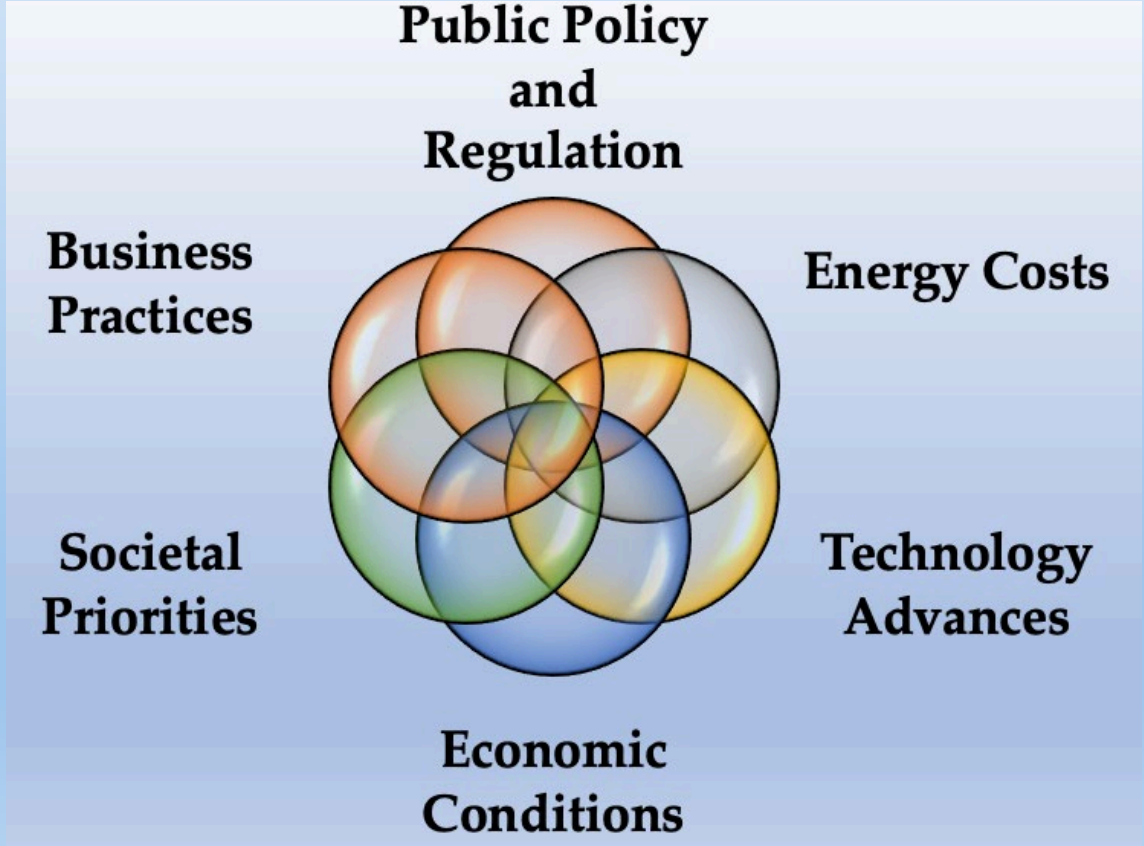
- U.S. consumers spend over $**400 billion each year** to energize homes and commercial buildings that account for **39% of the nation's energy use, 3/4 of electricity consumption** and account for **35% of U.S. CO_2 emissions**.
- **Much of this money and energy is wasted**.
- The energy efficiency market that addresses this waste supports **some 2 million jobs** across the country.

Understanding Drivers

- Understanding efficiency market drivers and possible future efficiency market attributes can help policy makers, regulators, gov't officials, utilities and the efficiency industry **make informed decisions**
- For example, how **best to design policies and investments** to support essential outcomes.

Six Identified Drivers of Energy Efficiency in Buildings

We identified six categories of interrelated and overlapping drivers (determinants) that influence the attributes of energy efficiency markets.

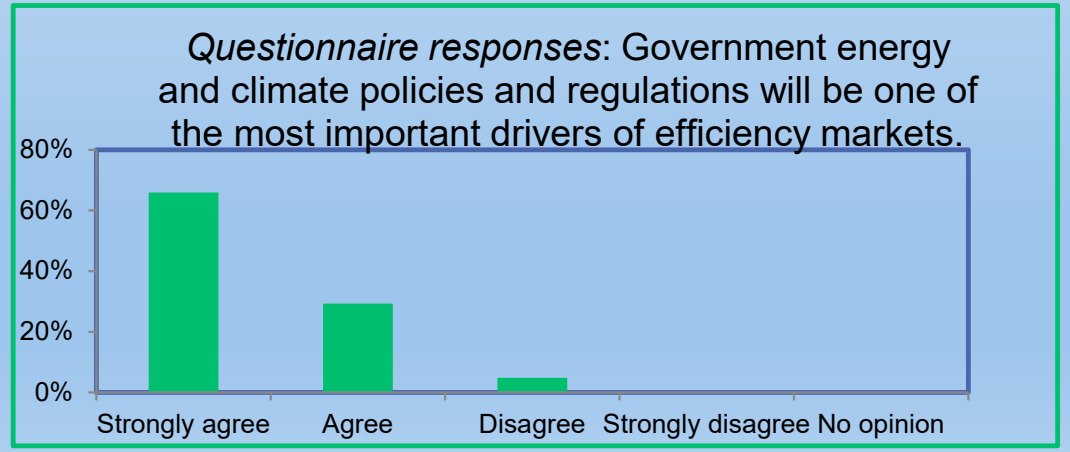


Two Major Driver Categories: Policy and Energy Costs

1. Public Policy and Regulation

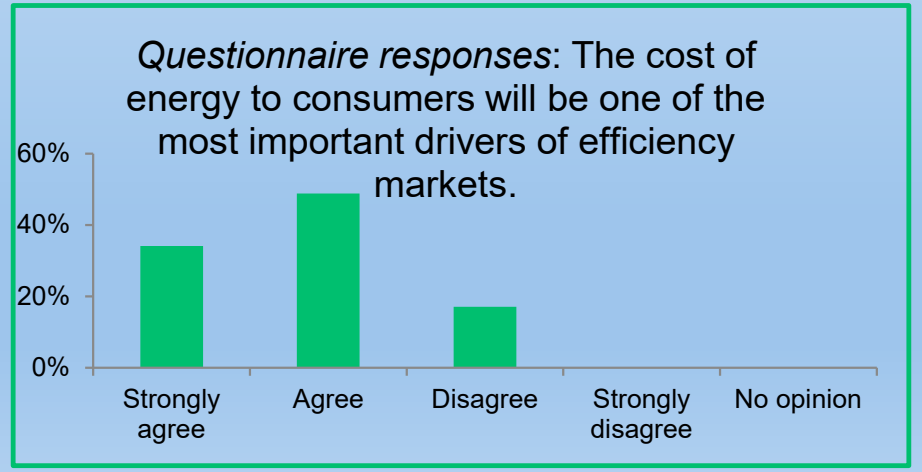
- Federal, regional, state, and local policies and regulation— *examples:* GHG policies, building energy codes, appliance standards, efficiency incentives or mandates, and performance-based ratemaking

- Literature review, interviews and questionnaires show near-universal agreement that energy and climate policies and regulations have and will continue to be the most important driver of efficiency investments.



2. Energy Costs

- Cost of energy and the dost of implementing energy efficiency for reducing the energy cost burden of buildings
- Basic economics matter. Higher energy prices (more expensive energy bills) lead to reduced consumption, potentially in part due to efficiency actions.
- However, direct consumer non-energy benefits, NEBs, continue to rise in importance.



Four Other Important Drivers: Technology Advances, Economic Conditions, Social Priorities, Business Practices

3. **Technology Advances** – Incremental and disruptive technology change, including:
   - Technologies *intrinsic* to efficiency—*examples:* efficient motors, LEDs, control systems, and commissioning
   - Technologies *extrinsic* to efficiency—*examples:* data access and data science, universal internet access, renewable energy resources, and energy storage

4. **Economic Conditions**
   - Status of the U.S. economy
   - Demographic changes

5. **Societal Priorities –** Societal practices and norms and valuation of efficiency energy and non-energy benefits for society as a whole and individuals - *examples:* increasing use of air conditioning and interest in ESG priorities

6. **Business Practices** – Means for providing and maintaining products and services and providing information - *examples:* performance contracting, utility business models, market consolidation, behavior-based programs, and workforce resources and training.

The Efficiency Market: Future Expectations

"It's tough to make predictions, especially about the future." Danish Proverb

Based on concepts and expectations deduced from this project's research, we developed:

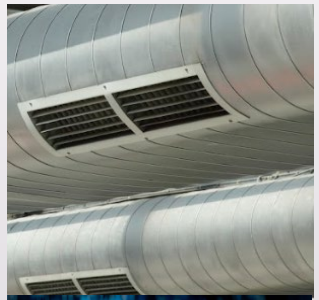
- Two potential scenarios that summarize the market expectations found via our research
- Some specific expectations
- Some specific unknowns

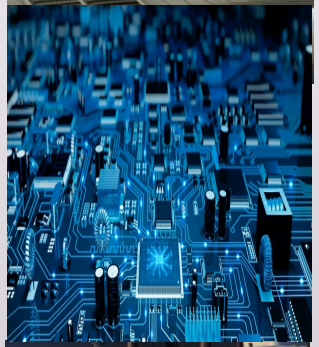
Bottom Line: Overarching expectations for energy efficiency in buildings:

- No singular future. Attributes will vary by market sector, jurisdiction and geography. Attributes defined by:
  - The six categories of interrelated and overlapping drivers
  - Divergent characteristics of each market sector, e.g., residential, low-income, commercial, urban, rural
- Overall, state and local governments will increase their efficiency achievements:
  - Low-to-moderate national growth in efficiency-based energy savings …unless
  - Public policy mandates ramp up requirements, particularly with respect to GHG emission reductions---- yielding moderate-to-high growth for efficiency-based impacts.

Additional Expectations for Future of Energy Efficiency in Buildings

- Efficiency investments will continue to consist of a mix of incentive-supported actions, adoption driven by codes and standards, and routine market adoption.
- Electricity efficiency actions will become more focused on demand flexibility and time and locational value of energy use
- Efficiency improvements in some technologies will result in greater impacts—for example, heat pumps for space and water heating, building energy controls, and building shell components
- However, for some end-uses and technologies (e.g., lighting, motors and boilers), we will not see efficiency advances at the rate they have occurred in the past given existing high efficiency levels





- Technological advances that support efficiency, such as in interoperability , AI, and universal internet access, will improve the efficacy of efficiency
- Efficiency marketing will increasingly focus on:
  - Grid services and demand flexibility
  - Building decarbonization
  - Efficiency's non-energy benefits
  - Efficiency in a package of other DERs
- Low-income programs will see increased investment with a focus on energy-burdened communities and households. These programs will increasingly emphasize social benefits of reducing energy bills, the value of improving health, safety and comfort, and the importance of addressing historic discrimination and lack of attention to such communities.

Discussion – Some Unknowns for the Future of Energy Efficiency

- Will there be a greater emphasis on **deep, comprehensive efficiency retrofits**? Or will the **emphasis be on more focused retrofits** of just the high value component/system efficiency opportunities,
- How will the **role of utilities** change with respect to administering and implementing efficiency actions?
- Will existing constraints in the **availability of skilled energy efficiency workers**, and workers in related fields, limit the future success of energy efficiency markets?
- Will there be further **consolidation among companies** offering efficiency services and products?
- Will governments and utilities actively encourage consumers to **shift from using natural gas** in buildings in favor of non-fossil fuel based technologies?
- What **black swans** will impact building efficiency?
  - Changing perception of the role of government in directing energy markets through efficiency and other energy or environmental mandates
  - Supply chain issues (including severe energy shortages) that are human-caused or natural

Implications and Applications of this Report

Implications for the Future of Efficiency

- Over the next decade, as in the last 50 years, building efficiency markets will likely see significant swings in investment and uncertainty.
- The rate of progress toward building decarbonization and grid integration of renewables will significantly impact the pace of efficiency actions.
- Achieving large efficiency impacts requires supportive policies and regulations, as well as their effective implementation. Thus, meaningful stakeholder engagement is critical both for development and implementation of effective policies and regulations.
- As energy transitions occur, increased support is needed for those with the heaviest energy burdens, and the fewest resources to address them, through public and ratepayer efficiency investments.

Using This Research to Support Efficiency's Preferred Future

Among the areas to focus support on are benefits of and opportunities for:

- Technical assistance for local, state, regional and federal decision makers
- Intrinsic and extrinsic (to efficiency) technological developments
- Building decarbonization strategies
- Tariff designs
- Market transformation, including via, for example, building energy disclosure and benchmarking
- Innovative business practice experimentation, including demand flexibility and DER integration, system/community approaches, and financing options
- Labor force development

FUTURE OF ENERGY EFFICIENCY IN BUILDINGS

Thank You

Contacts

Steve Schiller, srschiller@lbl.gov
Lisa Schwartz, lcschwartz@lbl.gov
Jeff Deason, jadeason@lbl.gov

For more information on Electricity Markets and Policy:
https://emp.lbl.gov/

***Download* our publications:**
https://emp.lbl.gov/publications

***Sign up* for our email list: https://emp.lbl.gov/mailing-list**

***Follow* us on Twitter: @BerkeleyLabEMP**

Full report available at:

https://emp.lbl.gov/publications/future-energy-efficiency-buildings

FUTURE OF ENERGY EFFICIENCY IN BUILDINGS

Our Panelists:

- Jennifer Chamberlin, Executive Director, Market Development at CPower
- Andrew deLaski, Executive Director, Appliance Standards Awareness Project
- Chandra Farley, CEO, ReSolve
- Megan Gilman, Commissioner, Colorado Public Utilities Commission
- David Nemtzow, Senior Advisor for the U.S. Department of Energy's Loan Programs Office
- Mary Ann Piette, Director, Berkeley Lab Building Technology and Urban Systems Division
- Kenneth Shiver, Chief Economist, Director of Planning, Regulatory & Strategy Support at Southern Company

- And our question moderator: Jeff Deason, Program Manager, Berkeley Lab Electricity Markets and Policy Department