

## Help Change the Behavior of Contractors to Increase High Performance Building Energy Technology Adoption

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# Problem Statement

Consumers, both residential and commercial, are not purchasing high-performance building energy technologies at the necessary speed and scale to meet decarbonization goals.

- Important innovations in energy efficiency, affordability and decarbonization of buildings technologies have occurred
- Gap in institutional understanding around market barriers impacting customer experience



*Photo by Werner Slocum / NREL*

# Session Goals

- Identify behaviors that need to be changed, based on pre-conference research and participants experiences.
- Identify challenges and corresponding needs of the current market that are faced by those supplying building energy technologies to potential customers.
- Identify what facilitators drive a market and what each of them can help achieve. This may include stakeholders already succeeding in the market.
- Identify the idea business model for different services or different communities either in the existing market or with market changes that could be the ideal model. This goal could be shared and replicated in local context.



*Photo by Werner Slocum / NREL*

# Barriers and Benefits for Customers

<b>Perceived Barriers to Purchasing High-Performance Building Energy Technologies</b>	<b>Perceived Benefits of Purchasing High-Performance Building Energy Technologies</b>
<ul style="list-style-type: none"><li>● Lack of Awareness</li><li>● Financial Constraints</li><li>● Resistance to Change or New Technology</li><li>● Market Fragmentation, No standardized process</li><li>● Regulatory and Policy Barriers</li><li>● Lack of impact</li></ul>	<ul style="list-style-type: none"><li>● Existing Incentive Structure</li><li>● Energy Cost Savings</li><li>● Sales through Improved Indoor Comfort and Health</li><li>● Enhanced Property Value</li><li>● Energy Resilience</li><li>● Market Competitiveness</li></ul>

Table 1. Perceived Barriers and Benefits of Purchasing High-Performance Building Energy Technologies

# Residential versus Commercial

## Residential

- Single-family detached
- Single-family attached (small multi-family)
- Large multi-family (apartments/flats/condos)

## Commercial

- Office
- Retail
- Non-profit spaces

Differences: investment, overarching goals, policy constraints, consumption patterns and different electricity rates or energy prices among other variations.

# Building Energy Technologies to Consider

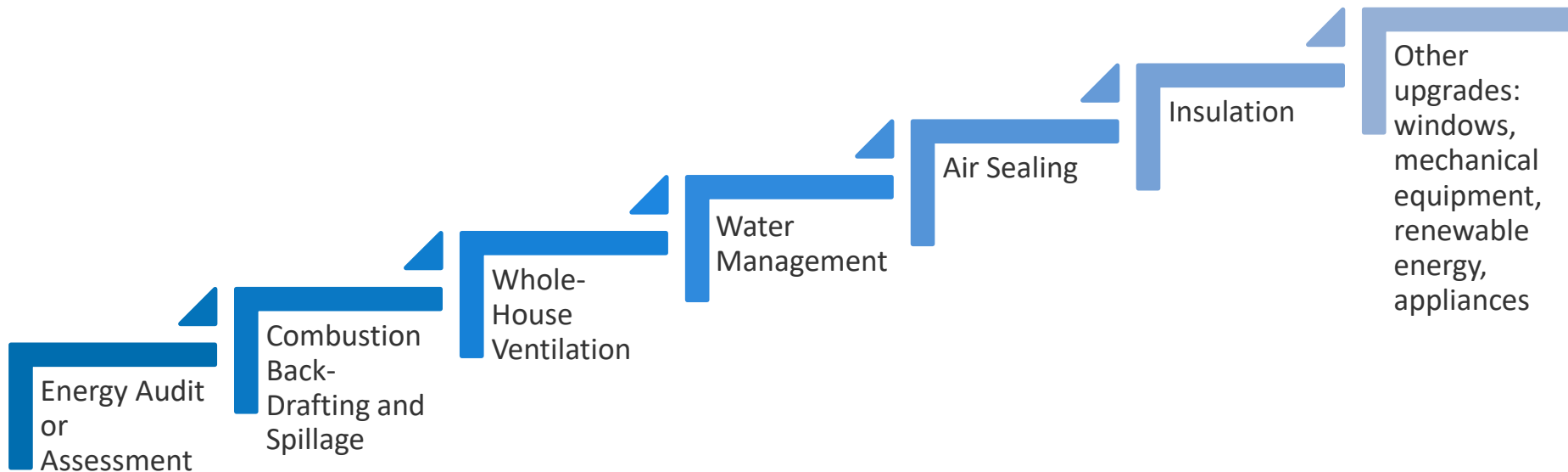
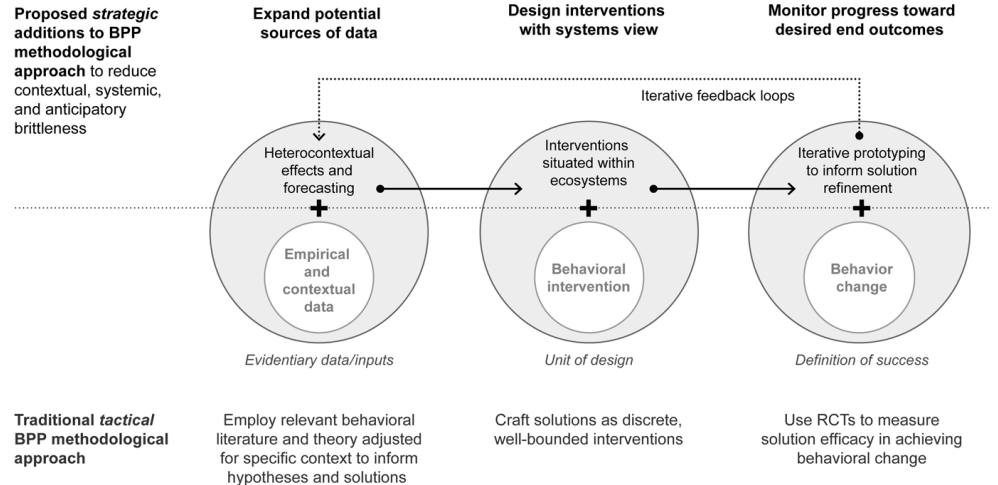


Figure 1. Order of remodeling activities to reduce risk, sequencing for remodeling. (Huelman 2014)

# A Structural Behavior Change

- In this session we want to identify structural changes to result in behavioral change
- We want to expand the scope of design intervention from traditional behavioral interventions and expands to the ecosystems (i.e., business models)



# Current Business Model Approaches

Business Model	Description
Leasing technology	Leasing equipment to stretch the payment over several years
Lifecycle contracting	Incorporate long-term investment and management as part of infrastructure services over lifecycle of building or equipment
Community based business models	Community driven energy projects or management of multiple buildings and energy systems located in the same community
Public-Private Partnership (PPP)	Mechanism for governments to procure and implement public infrastructure with expertise/resources of private sector
Energy as a Service (EaaS)	Customers pay for an energy service without having to make an upfront capital investment
Concierge Service (i.e. one-stop-shop)	One person or entity services as a reliable guide for those interested in energy retrofits, providing turnkey solutions
Energy Saving Performance Contracting (ESPC) and Energy Services Company (ESCO) Models	ESCOs develop, design, build and arrange financing for projects at customers facilities, generally use a performance-based contracting method which is sometimes guaranteed
Enterprise Energy Management	Experts consult or play a more active role in management of a system, using data through tools, models or analytics
Aggregator Services	Centralized platforms that bring together a range of energy saving solutions, middleman simplifying the process
Pay-per-X Models	Service-oriented model where customer pays for usage or outcome of the equipment without ownership
Retail Sales	Directly purchasing a piece of equipment from a manufacturer or retail store

Table 2. Current business model approaches for energy efficiency

Key: For the typical customer column, I = industrial building owners, C = Commercial building owners, R = residential building owners, G = government customers



# Presentation QR Code



*Note: Slides 22 and 23 provide more in depth information about current business model approaches and a strawman business model for additional reference during this session*

# Market Attribute Exercise

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Group and Individual Brainstorming  
(20 minutes)

# Market Attributes

- ‘Market Attributes’ are broad categories of product and service benefits that the market should be able to deliver in order to increase the diffusion of energy efficient technologies
- **Question: “What Market Attributes enable the diffusion of energy efficient technology (including new technology, innovative solutions, services etcetera)?”**

## *Exercise:*

- Brainstorm and collect ideas on the sticky notes provided
- Post sticky notes on the mural to create a representation of the ecosystem



Photo by Werner Slocum / NREL

# Solution Brainstorming

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Individual reflection (5 minutes)

Group reflection (20 minutes)

# Session Question

**What behavior-informed business models are best for encouraging adoption in which conditions, and how can contractors be encouraged to adopt these models ?**

*(Focus on either Commercial or Residential)*

*Exercise:*

- With a small group identify if you are going to focus on either commercial or residential business models
- Design a business model using the template on the next slide
- After 5 minutes of individual brainstorming and 20 minutes of group brainstorming, we'll have a period at the end for groups to present their solutions



*Photo by Dennis Schroeder / NREL*

# Business Model Template

**What behavior-informed business models are best for encouraging adoption in which conditions, and how can contractors be encouraged to adopt these models ?**  
*(Focus on either Commercial or Residential)*

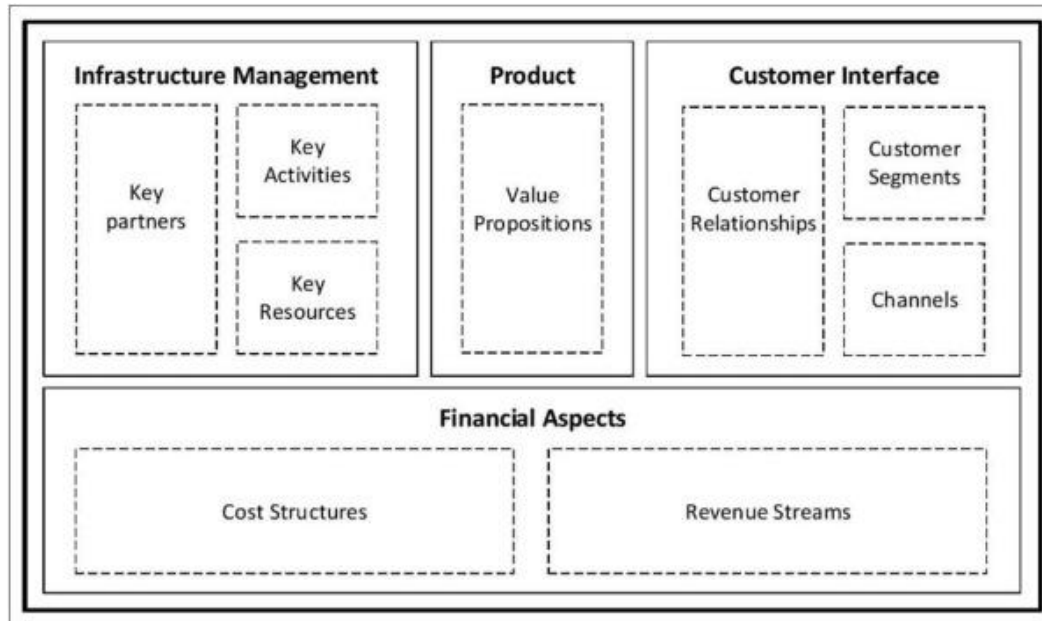


Figure 2. General business model canvas . Source (Xue, Temeljotov-Salaj, Lindkvist 2022)

# Present Solutions

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(20 minutes)

# Present Solutions

**What behavior-informed business models are best for encouraging adoption in which conditions, and how can contractors be encouraged to adopt these models ?**

*(Focus on either Commercial or Residential)*

*Exercise:*

- A couple of groups can present their solutions with the full group
- Please present your proposed business model in ~2-4 min
- The full group, in response, may then ask 1-2 questions in response



Photo by Werner Slocum / NREL



# Conclusion

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Building Energy Innovation Network  
(BEIN)

# Building Energy Innovation Network (BIEN)

- **Market-first approach** to addressing business model weaknesses (not technology-first)
- Way that building energy technologies are **marketed, bought, sold and ultimately adopted**
- Increase **consumer confidence** in purchasing technologies
- Encourage adoption through **market-first methods** and communication
- **Replication** across various communities
- **Advance** energy efficiency and building decarbonization in their communities



*Photo by Dennis Schroeder / NREL*

# BEIN Program Goals



Photo by Dennis Schroeder / NREL

- ✓ Enhance market intelligence and business model innovation
- ✓ Increase the speed and scale of adoption of high-performance buildings technologies
- ✓ Meet buildings stock decarbonization goals

# Objectives

## Increase Consumer Confidence

- Build consumer confidence around building technology adoption
- Conduct collaborative in-market research on existing and novel business models for building energy technologies

## Explore Current Landscape

- Explore barriers, facilitators, and best practices around existing business models
- Seek to accelerate the speed and scale of building technology adoption

## Identify Opportunities

- Identify existing and new business models
- Opportunities include envelope upgrades, space conditioning, water heating, etc.
- Identify what works best for communities and/or households

# Thank you!

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# Current Business Model Approaches

Business Model	Description	Value Proposition	Typical Customers
Leasing technology	Leasing equipment to stretch the payment over several years	Avoidance of investment costs, stable price, service	I, C, R
Lifecycle contracting	Incorporate long-term investment and management as part of infrastructure services over lifecycle of building or equipment	Holistic approach, one point of contact	I, C, M
Community based business models	Community driven energy projects or management of multiple buildings and energy systems located in the same community	Lower cost, co-creation and community informed decisions, optimizing infrastructure via sharing of assets	R
Public-Private Partnership (PPP)	Mechanism for governments to procure and implement public infrastructure with expertise/resources of private sector	Outsourcing of risks of energy efficiency improvement, long term relationship	G
Energy as a Service (EaaS)	Customers pay for an energy service without having to make an upfront capital investment	Reduced costs, improved operational quality, increased sustainability, risk management	I, C
Concierge Service (i.e. one-stop-shop)	One person or entity services as a reliable guide for those interested in energy retrofits, providing turnkey solutions	One point of contact towards the consumer, long-term management, decision making assistance	I, C, R
Energy Saving Performance Contracting (ESPC) and Energy Services Company (ESCO) Models	ESCOs develop, design, build and arrange financing for projects at customers facilities, generally use a performance-based contracting method which is sometimes guaranteed	Outsourcing of risks of energy efficiency improvement, one point of contact	C, G
Enterprise Energy Management	Experts consult or play a more active role in management of a system, using data through tools, models or analytics	Optimized energy demand and supply, more holistic view of energy system, data-driven decision making	I, C, G
Aggregator Services	Centralized platforms that bring together a range of energy saving solutions, middleman simplifying the process	Simplicity of one platform, identify cost savings, data-driven decision making, convenience	I, C, R
Pay-per-X Models	Service-oriented model where customer pays for usage or outcome of the equipment without ownership	Only pay for use or outcome, eliminates management/ownership responsibilities	I, C
Retail Sales	Directly purchasing a piece of equipment from a manufacturer or retail store	No middleman, retail staff may be able to provide no-cost guidance	C, R

Table 2. Current business model approaches for energy efficiency

Key: For the typical customer column, I = industrial building owners, C = Commercial building owners, R = residential building owners, G = government customers

# Strawman Business Model

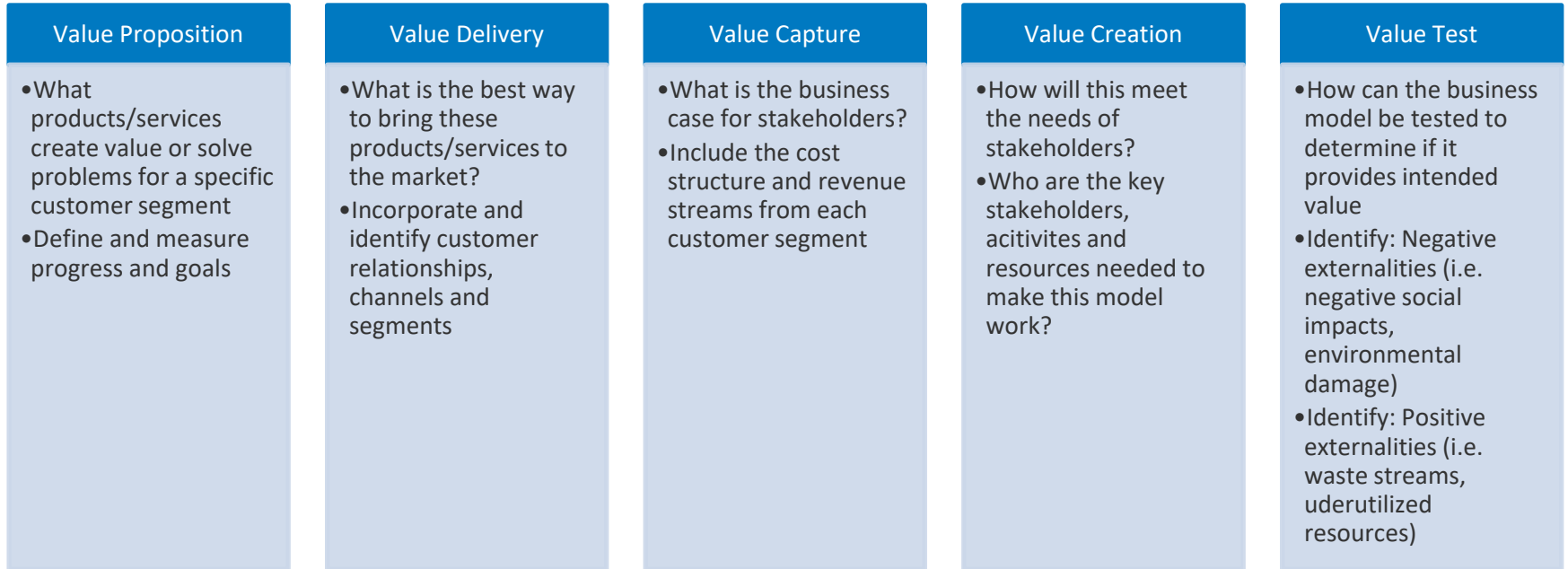


Figure 2. Business model canvas for innovation. (Adapted from Munaro et al 2021)