

Building Retrofit Industry and Market (BRIM) Market Research Scan

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PROJECT BACKGROUND

The report provides an executive summary of market research conducted on multiple sub-segments of the building retrofit market. It represents Phase II of a broader Building Retrofit Industry and Market Development Project (BRIM-DP) launched in early 2010 to inform philanthropic investments in building energy retrofits (i.e., the application of energy efficient or clean generation measures to existing building stock). BRIM-DP was designed in three phases:

Phase I – Develop a Framework for Market Development

Phase II – Create a Detailed Market Segmentation and Summarize Existing Market Research on Each Segment

Phase III – Develop Detailed Segment-Specific Strategies and Organize Key Stakeholders to Collaborate on National Investment Strategies

Phase I created a broad framework for a coordinated national strategy to develop the building retrofit market. Specifically, it:

- Created a framework for thinking about how public and philanthropic funders can participate in the building of self-sustaining private markets.
- Identified twelve different market development opportunities in the building retrofit market and described several current projects in those 12 areas.
- Developed a detailed inventory of organizations that are providing technical assistance to the building retrofit market.
- Made recommendations on how funders could collaborate on retrofit market development.

These results were delivered to a group of 13 national funders at a meeting at the Rockefeller Foundation in New York City on December 13, 2010. These deliverables created enthusiasm about pursuing a national strategy across multiple players to support development of the building retrofit industry and market (what we refer to as “BRIM”).

What became clear, however, is that the building retrofit market is not one market, but actually multiple related but independent markets with different building stock, different retrofit economics, different owners, different regulatory requirements, and different building uses. Therefore, while some strategies will cut across multiple building segments, most retrofit development strategies will have to be customized to individual building segments.

Before beginning the difficult work of creating these segment-specific strategies, it was decided that we needed to first understand what is currently known about these individual building segments. This second phase of the project was designed to

develop this additional level of detail. It seeks to support coordinated national efforts to develop this market by:

- Creating a shared taxonomy of building market segments.
- Comparing the market conditions and retrofit potential of each segment.
- Recommending priority segments and a process for developing segment-specific strategies.

Drawing primarily on secondary research sources, Phase II research, the focus of this summary, addresses the following questions:

- What are the different market segments, how are they defined and what are their energy efficiency characteristics?
- How large is each market segment?
- What is the potential for impact in each market segment?
- Who are the industry participants in each market segment?
- What are the investment opportunities in each market segment?

In conducting the research, the O-H Community Partners research team reviewed 311 separate research reports and conducted 10 one-on-one interviews with field experts.

SUMMARY OF RECOMMENDED NEXT STEPS

Organize funder-led investment collaboratives around 2-4 specific BRIM market segments. These collaboratives would:

- *Create the next level of detailed information on the specific building segment, including further sub-segmentation if needed.*
- *Identify at a higher level of detail the existing strategies that are already in play within the sector, including specific funder projects and initiatives.*
- *Identify the key sector partners who have leverage in the sector.*
- *Develop a proposed high-level sector development strategy.*
- *Organize a set of segment players who are willing to work collaboratively over time on achieving retrofit performance gains in that sector.*
- *Organize these players into an on-going collaborative team.*
- *Provide segment-specific staffing for this team.*

STRUCTURE OF THE PROJECT DELIVERABLES

There are two key deliverables from this research project. These deliverables contain an enormous amount of information. To make sure that potential users can effectively navigate through this material, the structure of each file is summarized in some detail below.

Document 1: Summary of Key Findings by Segment (79 pp PPT)

This file provides:

- A **taxonomy** of building market segments. This taxonomy groups buildings into three broad **categories** (Residential; Commercial; and Institutional), and 17 more detailed **segments**.¹ The segments are the following:

Residential:

1. Single Family
2. 2-4 Unit Building
3. 5+ Unit Building
4. Mobile Home

Commercial

5. Food Sales
6. Food Service
7. Lodging
8. Mercantile
9. Office
10. Public Assembly
11. Service
12. Warehouse/Storage
13. Other

Institutional

14. Education
15. Health Care
16. Public Order and Safety
17. Worship

- An analysis of the **impact** that retrofitting all the pre-1980 building stock in each segment would have in terms of:
 - Energy savings
 - Total investment
 - Jobs created
 - Greenhouse Gas reductions
- A summary of **key findings** by each of the 15 building segments.² These findings are categorized under the following points of inquiry:
 - Key Takeaways
 - What is the potential for impact in this segment?

¹ A fourth category, Industrial, was left out of the analysis because the vast majority of energy use in the industrial sector is related to the industrial processes that take place in the buildings, not the operations of the buildings themselves. Energy conservation in this sector is very process-specific and therefore was not considered appropriate to the focus of this research.

² There is no summary included for two (2) of the 17 buildings segments: (1) The Multi-Unit (2- 4 unit) segment was combined with the Multi-family segment summary and (2) The information available for the Other segment was too sparse and diffuse to capture with a summary.

- How large is the segment and what are its energy efficiency characteristics?
 - What are the motivators that inspire action?
 - What are the key barriers to market development?
 - Who are the decision makers and key influencers?
 - What are the market development investment opportunities?
- A summary of secondary market research on **philanthropic investments** in BRIM development.
- Examples of a format for **coordinated national strategies** focused on a particular building segment.
- A **research index** listing the important research reports by category and segment.

Document 2: Supplementary Data and Analysis by Segment (200 pp PPT)

This file provides an additional level of detailed analysis for the three market categories and each of the 15 building segments.³

- At the level of the **three market categories** (Residential, Commercial, Institutional) this analysis covers:
 - Each category's share of total building stock and energy consumption
 - Total share of energy spending
 - Energy use characteristics by segment (percent of energy used in each segment for each of 10 different purposes, e.g. space heating, air conditioning, water heating, refrigeration, etc.)
 - Tenant characteristics
 - Category-wide market barriers
 - Category-wide decision makers and influencers
 - Category-wide investment opportunities
- At the level of the **17 building segments**, this analysis covers:
 - Key findings (repeated from the summary)
 - Typical retrofit requirements for each segment
 - Segment motivators and barriers
 - Key decision makers and influencers
 - Examples of specific actions taken by key decision makers and influencers
 - Examples of market development opportunities

³ As a result of information constraints and the highly diffuse mix of property types in the Other segment, detailed analysis of this segment is limited throughout the report.

KEY FINDINGS

It is useful to remember that the purpose of this project was not to create a strategy, but rather to inventory and summarize what is known about key building segments as a tool to support strategy development on a segment by segment basis.

That said, there are some important high level findings that are worth highlighting.

Segments Matter and Most Strategies Have to Be Segment Specific

- There is enormous variation on a segment by segment basis – reinforcing the need to continue to effectively differentiate between market segments in strategy development. These variations cover the full range of market characteristics, including:
 - Energy intensity
 - Energy uses
 - Owners and tenants
 - Motivators and barriers
 - Decision makers and influencers
 - Investment opportunities
- Even after segmenting the market into 17 different segments, there is often still a deeper level of segmentation that is needed to differentiate market development strategies. For instance, in this analysis, the “education” segment is still treated as a single segment, whereas in fact it has at least three very distinct sub-segments, each with their own market dynamics: K-12 schools, higher education, and preschool and day care. Each of these education sub-segments has different ownership characteristics, different building stock, different funding sources and different motivators.

Overall, the Building Retrofit Market Represents an Opportunity to Have Large Economic, Social and Environmental Impact

The research analyzed the economic (total investment), social (jobs created) and environmental (energy savings and greenhouse gas reductions) impact of retrofitting all pre-1980 buildings stock with retrofit strategies capable of achieving an average efficiency improvement of 30%. The impact of such an investment would be enormous:

- \$280 billion in investment
- 4.7 million years of employment generated
- 3,081 trillion BTUs of energy saved, or about 3 percent of annual US consumption, and 18% of total annual energy consumption from non-industrial buildings⁴

⁴ Total energy consumed by residential, commercial, institutional, and industrial buildings according to the EIA Energy Consumption Surveys is 38,118 trillion BTUs (10,550 trillion BTUs by residential buildings according to 2005 RECS; 4,767 trillion BTUs by commercial buildings and 1,703 trillion BTUs by

- 616 million metric tons of CO₂e saved per year, or about 10 percent of total US emissions

NOTE: This high-level analysis of potential impact was largely developed using data from EIA's Energy Consumption Surveys and McKinsey & Company's study on energy savings potential, Unlocking Energy Efficiency in the U.S. Economy (2009).⁵ Our analysis was undertaken in large part because no consistent analysis across the 17 segments and using the targeted triple bottom line metrics was available in existing studies. Our approach was heavily dependent on a variety of core assumptions, including the goal of 30% energy savings, the estimate of pre-1980 buildings and the estimated average cost per retrofit. In particular, our estimates for the average costs of retrofit measures were likely low because they were based on the cost of technology and did not necessarily account for contractor/intermediary overhead, contractor/intermediary profits, and other unpredictable costs associated with geography, climate, building condition, and the physical complexities of individual projects.

Six Segments Offer the Overall Highest Opportunity for Impact; Four More Segments Represent a Second Tier of Opportunity

- In terms of overall potential impact, the **single family residential** segment is by far the biggest opportunity – offering over six times the potential impact of the next largest segment. This is because it represents such a large percentage of the total building stock square footage (even though the energy use per square foot is less than many other segments.) The challenge with developing the single family residential market segment is two-fold: 1) the market is massively fragmented and dispersed with very few opportunities for demand aggregation, making the “cost of sales” very high on a per unit basis; and 2) effective demand still does not exist and is unlikely to develop without strong regulatory requirements.
- The other segments with the highest individual impact opportunities include:
 - 2-4 Unit Buildings
 - 5+ Unit Buildings

institutional buildings according to 2003 CBECS; and 21,098 trillion BTUs by industrial buildings according to 2006 MECS). Residential, commercial and institutional energy consumption is delivered consumption and excludes primary (off-site) consumption; industrial energy consumption is the total amount of first use of energy sources and excludes shipments of energy sources produced onsite.

⁴ The McKinsey study used the EIA's *Annual Energy Outlook 2008* as the foundation for industrial potential analysis, and data sources for the National Energy Modeling System (NEMS) as the foundation for residential and commercial potential analysis. NEMS is a computer-based, energy-economy modeling system of the U.S. designed and implemented by EIA. McKinsey further drew upon public and private sources to supplement the NEMS database where insufficient data was available.

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- Mercantile
 - Office
 - Education
- The second tier of opportunity includes:
 - Lodging
 - Health Care
 - Public Assembly
 - Food Service
- While it is difficult to discern the segment focus of most philanthropic investments in this market from secondary sources, the most frequently mentioned segments include:
 - Single family residential
 - Multi-family, with a focus on affordable housing
 - Commercial office

Some Market Development Investment Opportunities Cut Across Multiple Segments

While many elements of market development strategy are segment specific, there are also many opportunities that cut across segments. For example:

- Principles for energy efficiency **asset valuation** can be similar across many segments, even though the methodologies and specific measures will vary.
- Many energy efficiency and renewable energy **technologies** are common across building types.
- The **marketing and demand drivers** are very common across segments within each category level (residential, commercial, institutional), although they vary a lot between categories.
- **Financing tools** tend to be applicable to multiple segments within a category, even when they vary significantly between categories.
- While **information requirements** tend to be very segment specific, there are some tools (like Portfolio Manager) that have broad applicability across many segments.
- Many **policy tools**, such as mandatory building benchmarking, labeling, and efficiency upgrading are applied at the category level (e.g. residential or commercial), not at the segment level.⁶

⁶ As an example, many building labeling and benchmarking ordinances apply to buildings of specific size (e.g. more than 50,000 square feet), regardless of the sector that are used in.

It is Plausible to Imagine Coordinated National Investment Strategies on a Segment by Segment Basis, and Such Coordination Would Likely Increase Impact

Phase I and Phase II of the BRIM development project have teased out a high enough level of strategic differentiation to now make it plausible to develop truly coordinated national market development strategies at the multi-segment; segment and sub-segment level. While this work is still difficult work and requires a sophisticated and long-term approach to investments there is now enough structure to our understanding of this market for it to feel like a reasonable task to take on. We now have the following tools at our disposal:

- A framework for thinking about market development and its various components
- A segmentation of the market at a high enough level of differentiation to make meaningful strategic distinctions
- A framework for impact analysis and data to use to measure impact
- Broad knowledge of the key stakeholders that would need to be involved in a segment strategy⁷
- The ability to quickly organize information about what is currently in play in a sector
- An emerging set of self-identified funders with a long-term interest in this market

RECOMMENDED NEXT STEPS

The BRIM development project has been conceptualized from the beginning as a three-phase project:

Phase I – Develop a Framework for Market Development

Phase II – Create a Detailed Market Segmentation and Summarize Existing Market Research on Each Segment

Phase III – Develop Detailed Segment-Specific Strategies and Organize Key Stakeholders to Collaborate on National Investment Strategies

The BRIM-DP team believes this market research summary creates the foundation for the next step of national-level coordination on segment-specific strategies. **Our recommendation is to organize funder-led investment collaboratives around 2-4 specific BRIM market segments.** These collaboratives would:

- Create the next level of detailed information on the specific building segment, including further sub-segmentation if needed.
- Identify at a higher level of detail the existing strategies that are already in play within the sector, including specific funder projects and initiatives.

⁷ It should be noted, however, that this level of knowledge is generally not yet sufficient to frame a sector-specific market building strategy.

- Identify the key sector partners who have leverage in the sector.
- Develop a proposed high-level sector development strategy.
- Organize a set of segment players who are willing to work collaboratively over time on achieving retrofit performance gains in that sector.
- Organize these players into an on-going collaborative team.
- Provide segment-specific staffing for this team.

The segments of focus will need to be selected by the funders who are interested in this approach. However, based on opportunities for impact, as well as what is already known about funder interests, we recommend the following segments for initial focus:

Segment	Rationale
Multi-family affordable housing	<ul style="list-style-type: none"> • Segment of interest to many philanthropic funders because of its low income population impact • Several players are already making key investments in this segment • High impact opportunity • Some demand aggregation opportunities because of existing segment organizational infrastructure • In public housing, guarantees of equity effects on both sides of efficiency-improving equation
Commercial Office	<ul style="list-style-type: none"> • High owner value proposition and ROI • Highly concentrated ownership • Opportunities for leverage through investment portfolios • Government and public sector tenants/owners have a longer occupancy period, making life cycle costing more compelling • Emerging sector organizing around energy efficiency • Emerging market and segment scaling efforts led by utilities • Affects many other sectors through land-lord tenant relationships
Higher Education	<ul style="list-style-type: none"> • Sector well organized around sustainability initiatives • Concentrated ownership of large real estate holdings – often in a campus environment • Owners typically hold buildings over the full life cycle, making life cycle costing more compelling • Students are a major demand driver • Opportunities for public funding leverage
Health Care	<ul style="list-style-type: none"> • Well developed sector sustainability infrastructure • Compelling value proposition and ROI • Good opportunities for distributed generation and on-site renewable energy because of thermal load characteristics • Owners typically hold buildings over the full life cycle, making life cycle costing more compelling • Motivation for implementation of retrofit measures is connected to health mission
Other Possibilities	<ul style="list-style-type: none"> • Government-owned buildings