TRANSFORMING THE MARKET THROUGH ENERGY MANAGEMENT INFORMATION SYSTEMS

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Acknowledgments

Introduction

For the commercial real estate market, tracking and managing building energy performance is important. Why? Because energy represents approximately one third of an office building's operating expenses, and active operational energy management can save thousands of dollars annually in individual buildings. Not only does smart energy management lower utilities, it can also improve net operating income and asset value while making it more probable to obtain a green certification to promote to investors.[1] Reaching this potential requires actionable building energy performance data, and today's market leaders are becoming more sophisticated in how they manage and measure performance through the use of energy management information systems (EMIS).

The U.S. Department of Energy (DOE) estimates that deployment of EMIS can be used to achieve building energy savings of 10 to 20 percent.[2] The Institute of Real Estate Management (IREM) further estimates that EMIS can yield savings of up to $0.47 per square foot.[3] Despite the overwhelming savings potential, many commercial real estate decision makers are still not taking advantage of the opportunities to adopt this technology.[4] Within the commercial real estate sector, lack of market awareness and understanding of the value of EMIS remain as hurdles and many professionals are unfamiliar with technologies beyond the common building automation system (BAS).

To fully unlock the energy savings potential through EMIS, commercial real estate professionals need better education on what the technology is and how to use it effectively. Today's EMIS market is also saturated with products, leaving potential adopters in a state of confusion about which product would work best for them. This confusion oftentimes leads to disinterest, thus impeding uptake. This IMT report analyzes these and other key barriers, while presenting current national trends and solutions for how commercial real estate professionals, EMIS vendors, utilities, and local government actors can spread the usage of EMIS and with it create lasting change in energy management. It is the hope that audiences will take the lessons presented here to create innovative solutions to reach all commercial real estate markets.

- Building owners and tenants should refer to the Selecting an EMIS section of this report when selecting an appropriate EMIS solution

- Service providers should refer to the EMIS Trends and Market Survey sections to see conclusions derived from a market survey that identifies new ways to address the commercial real estate market's needs and provides solutions to reach all target markets

- Implementers of utilities' energy efficiency programs, local governments, and service providers should review the Increasing Market Uptake section to find strategies to encourage uptake of EMIS technologies in their respective markets and jurisdictions

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[1] U.S. Environmental Protection Agency ENERGY STAR. "Commercial Real Estate: An Overview of Energy use and Energy Efficiency Opportunities. https://www.energystar.gov/sites/default/files/buildings/tools/CommercialRealEstate.pdf

[2] U.S. Department of Energy Better Buildings. "A Primer on Organizational Use of Energy Management and Information Systems (EMIS)", 2015.

[3] Institute of Real Estate Management. 2015 Income & Expense Analysis Report. https://www.irem.org/resources/income-expense-analysis-reports

[4] For the purposes of this paper, the commercial real estate market includes several sectors of building owners interviewed during the survey process, including commercial office, multifamily, hospital, higher education, senior living, industrial, and retail.

Background

EMIS broadly describes the tools and services that help to manage commercial building energy use by giving building-level decision-makers access to information on the energy performance of their buildings. EMIS vary in granularity of information (whole-building, tenant-level, system-level, or equipment-level data), in frequency of information (monthly, hourly, sub-hourly), and in functionality of the system (data management, advanced analytics, and diagnostics). These tools and services are used by building owners, facility managers, energy and sustainability managers, and commercial property management companies—and all building types can benefit from the information they provide. Depending on the specific system, EMIS can help track energy performance, develop demand response sequences, identify and measure environmental conservation measures (ECMs), optimize building settings, automate utility billing to tenants, and detect system faults.

EMIS Types

There are several EMIS products available to meet the commercial real estate community's needs, and a crowded market means that owners, facility managers, and tenants often have difficulty identifying what qualifies as an EMIS, let alone which product is right for their buildings. Building owners and operators care about actionable information to reduce energy and resource consumption in their buildings, and EMIS help translate building performance data into actions that can be taken to make their operations more efficient. EMIS are often comprised of software and hardware components that work together to provide building decision makers with information that allows them to manage and improve building energy performance.
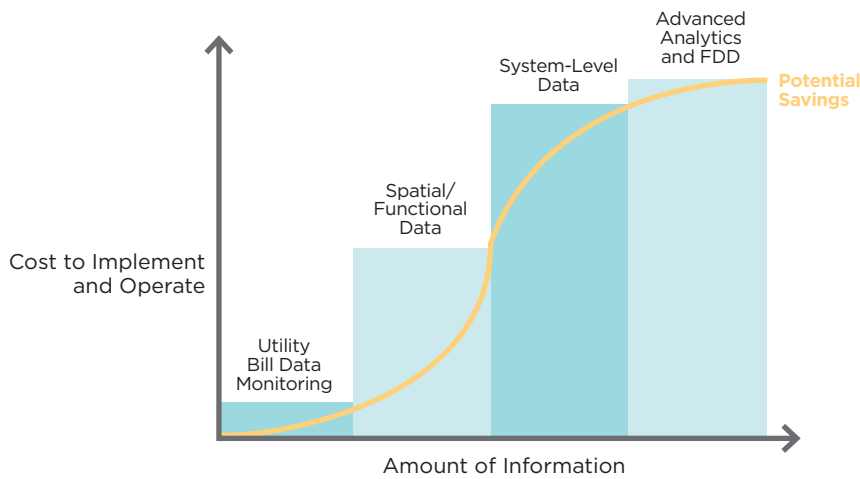
- EMIS are categorized as either building-level or system-level products. As their names suggest, building-level systems focus on whole-building energy use and commonly incorporate features such as utility bill analysis and benchmarking, while system-level EMIS are technologies that focus on optimizing segments of the building such as lighting or heating, ventilation, and air conditioning (HVAC). Figure 1 broadly summarizes EMIS tools currently in the market. A full description of EMIS tools can be found in Appendix 1.

FIGURE 1: EMIS TYPES

ENERGY MANAGEMENT INFORMATION SYSTEMS (EMIS)	
Technology that uses a combination of hardware and/or software to help manage building energy use	
Building-Level EMIS: Focus on whole-building energy use	**System-Level EMIS:** Focus on optmizing segments of the building
• *Benchmarking and Utility Bill Analysis Tools*: Monthly energy data and/or utility bill reconciling tool • *Energy Information System (EIS) and Advanced EIS*: Hourly or more frequent interval energy data	• *Building Automation System (BAS)*: Control set-points for HVAC, lighting and security systems • *Fault Detection and Diagnostics (FDD)*: Identify faults at the system level via BAS data • *Automated System Optmization (ASO)*: Rewrites BAS setpoint for optimization

While circumstances vary broadly from building to building, Figure 2 represents the amount of information collected by various EMIS types, and the relative costs and savings of these systems when compared with one another. The potential savings line is not meant to be an exact measure, but rather an indicator of the level of granularity that each system allows, which theoretically corresponds to the granularity and specificity of ECMs that may be developed as a result.

Figure 2: Relative Relationship of Data Types to Costs and Savings Potential (Conceptual)

Selecting an EMIS

Using an EMIS is a key component of a strong energy management plan, which is a programmatic approach to reducing and optimizing energy use. Those in the commercial real estate industry should use the strategies discussed below when selecting an EMIS.

1. Set Goals
Building owners and facility managers should work together to identify their motivations for installing an EMIS. Building teams should identify whether they want to save on utility expenses, reduce greenhouse emissions, comply with local regulations, streamline utility billing, get actionable insight into building energy data, or some combination of these goals. Once underlying motivations are identified, ownership groups should focus on developing specific, measureable, achievable, realistic, and timely (SMART) goals for implementation. Refer to Figure 3 below for common EMIS applications and the associated technology suited for the task.

FIGURE 3: Common Features of Various Types of EMIS

Suitable EMIS technology

	Benchmarking Tool	Utility Billing Tool	Energy Information System	Advanced Energy Information System	Building Automation System	Fault Detection and Diagnostics	Automated System Optimization
Monthly Energy Data	▓	▓					
Hourly or 15-minute Interval Data			▓	▓	▓	▓	▓
Automated Benchmarking Reporting	▓						
Utility Bill Reconciliation		▓					
Energy Use and Cost-Tracking	▓	▓	▓	▓	▓		
Peer-to-Peer Building Comparisons	▓	▓	▓	▓	▓		
Energy Data Visualization	▓	▓	▓	▓	▓	▓	▓
Weather-Normalization			▓	▓	▓	▓	▓
Historical Analytics	▓	▓	▓	▓	▓	▓	▓
Integrates BAS Data				▓		▓	▓
System-level Control Points					▓	▓	▓
System Scheduling					▓	▓	▓
Automated Identification of Faults						▓	
Re-writes Control Set-Points for Optimization							▓

2. Evaluate Current Building Infrastructure and Operations

Once an end goal is identified, facility teams should examine the current infrastructure in the building. Some questions to answer may include:

- Does the building have a building automation system (BAS)? Is it accessible remotely?
- Does the building team have access to whole-building data?
- Do tenants directly pay their own utility costs?
- How will an EMIS benefit tenants and other occupants?
- What is the current metering infrastructure in the building? Do the current whole-building meters and submeters give insight in the major energy end uses in the building?
- What is the historical utility spend for the building?

3. Develop a Business Case

Next, interested parties should investigate the total cost of an EMIS program by conducting a sensitivity analysis that runs best-case, likely-case, and worst-case performance scenarios that identify the installation and management fees, payback period, energy savings,

and return on investment (ROI) to confirm that EMIS implementation will align with organizational priorities.

4. Get Buy-In From Key Stakeholders

Present the business case to key stakeholders, which may include asset managers, building engineers, tenants, occupants, executives, and finance teams. When getting buy-in from stakeholders, stress the financial benefits, while also focusing on non-energy benefits such as improved occupant comfort, productivity gains, and other benefits subject to organizational priorities.

5. Ensure Adequate Capacity of Relevant Staff

When considering EMIS tools, building teams should allocate additional training time through their service providers. Evaluate the building engineers' familiarity with different EMIS products. Define roles and responsibilities for building engineers, property managers, energy managers, asset managers, and finance teams.

6. Explore Opportunities for Improvement to Inform Future Selection

For decisions regarding renewing subscriptions or changing services providers, building teams should continually explore improvements in efficiency. To do this, it is necessary

LIBERTY PROPERTY TRUST Liberty Property Trust, a real estate investment trust (REIT) based outside of Philadelphia, is committed to the sustainable design, development, and operation of its office and industrial portfolio. To that end, the 2016 Energy Star Partner of the Year sought out EMIS to reduce their portfolio's environmental impact as part of their sustainability goals. Specifically, Liberty wanted to benchmark their entire portfolio to track energy use and to comply with energy benchmarking regulations. The REIT uses Goby SeaSuite for demand response, benchmarking, and fault detection at approximately 500 buildings that can support the technology. In 2015, Liberty achieved 3.8 percent year-over-year savings compared with 2014. To date, their office portfolio is on track to meet their organizational goal, while their industrial buildings will become the next target focus.

FIGURE 4: 150 Rouse Boulevard, Philadelphia, PA

Organizational Savings Progress:
3.8 percent more savings in 2015 compared with 2014

EMIS Service Provider:
Goby SeaSuite

Number of Buildings in EMIS:
500 buildings

Company website:
https://www.libertyproperty.com/

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to revisit goals and stakeholder feedback periodically. Schedule recurring meetings with key stakeholders to present and receive feedback on progress towards energy- and cost-saving goals, ROI, and feedback relayed by building occupants regarding improvements in comfort or productivity. Use this information and the feedback of stakeholders to fine tune EMIS tasks with EMIS vendors.

7. Recognize and Reward Success

It is likely that an EMIS will enable better results when operated by a professional who is actively using the system and the tools it offers. Use gatherings as an opportunity to recognize building operators or managers who have achieved goals. Find ways to facilitate the mentoring of building managers and operators who are receiving sub-optimal results by those who have had more success.

▲ BOZZUTO

Bozzuto is a diversified real estate company with expertise in multifamily development, construction, and management, as well as homebuilding. Bozzuto views environmental stewardship as its responsibility and continually evolves its energy management program. To continue the program's advancement, the company uses Bright Power to track and benchmark its entire portfolio's energy use. The company chose this platform for a number of reasons, including accurate and efficient data upload and consolidated dashboards with monthly alerts, which cut down on labor hours needed to maintain the EMIS. As a third-party manager in many of its portfolio's buildings, Bozzuto positions itself as an influencer rather than a decision maker. In this capacity, Bozzuto leaders work with their property teams and senior-level staff to educate clients on how their properties and portfolios are using energy. The Bright Power platform also provides Bozzuto with up-to-date monthly utility data, which gives Bozzuto further insight into how its buildings are using energy and where there is the most opportunity for savings. And, perhaps most importantly, it automatically populates ENERGY STAR Portfolio Manager—the industry standard benchmarking tool that is also a critical piece of mandatory jurisdictional benchmarking ordinances across the country, as well as portfolio-specific reporting such as GRESB and ULI Greenprint. This auto-populating feature ensures accuracy, as it pulls data from the source and is a continual time-savings.

Organizational Savings Goal and Progress:
3 percent annually, on target to achieve for 2016

EMIS Service Provider:
Bright Power

Number of Buildings and Square Footage in EMIS:
157 Properties (some of which have multiple buildings), representing 49,524,647 square feet

Company website:
https://www.bozzuto.com/

FIGURE 5: Bozzuto's Cathedral Commons Apartments Development in Cathedral Heights, Washington DC

Transforming the Market through Energy Management Information Systems

EMIS Trends

Energy efficiency is increasingly a top-of-mind concern for those in the commercial real estate field and EMIS investments are predominantly motivated by energy cost savings. A forthcoming survey called *Financial Analysis of Building Energy Efficiency: Insights from Investment Real Estate Professionals* by the Institute of Real Estate Management (IREM) of 307 commercial real estate professionals demonstrated that 73 percent of the respondents have some type of corporate energy efficiency program. These same respondents are motivated to pursue energy efficiency as a way to control expenses (88 percent) and to maintain tenant comfort and retention (47 percent). Of the major barriers to energy efficiency, the respondents say that lack of staff training is the biggest impediment to energy efficiency activities (18 percent), followed by decision makers not understanding the full value of energy efficiency benefits (13 percent).

EMIS purchases are on the rise and companies are looking to understand why. Two EMIS companies, MACH Energy and ECOVA, surveyed their customers to determine how the commercial real estate market responds to EMIS opportunities. MACH Energy found that there was a 23 percent increase in EMIS adoption from 2013 to 2015 among survey respondents. Like the IREM survey mentioned above, the biggest motivator for adopting EMIS was to reduce energy costs (67 percent). To save money, companies are using EMIS data to identify low-cost improvements (43 percent), and to guide capital improvements (22 percent).[5] The MACH Energy study found that 44 percent of responds had an EMIS solution other than a BAS.[6]

While EMIS adoption is increasing, lack of market awareness and understanding of the value of EMIS remain as hurdles. Of respondents that currently do not have an EMIS in place, 51 percent were unsure of whether they would adopt one in the near future, while 25 percent were not likely to adopt one at all.[7] Many in the commercial real estate field are unfamiliar with technologies beyond the common BAS. Interestingly, of the survey respondents that have both a BAS and another EMIS, many still rely on the BAS alone to make most energy decisions. Of those that did implement an EMIS, 23 percent of building owners are changing their operations based on the energy insight the EMIS gives them.[8]

Market Survey

While the MACH Energy and ECOVA surveys provide insight into how their customers and affiliated vendors are using EMIS, the intent of IMT's survey described herein was to reach users from several stakeholder groups using a variety of EMIS platforms, in order to get varied responses and a broader picture of the market. The survey was designed to identify building owners and service providers with a nationwide presence, using interviews to see if

[5]   ECOVA. 2016 Energy and Sustainable Predictions: Findings from Leading Professionals, 2016.http://s3.amazonaws. com/uploads.ecova.com/2016/04/27220750/2016-Energy-and-Sustainability-Predictions-Report.pdf
[6]   MACH Energy. "2015 Industry Survey of Building Management Professionals".
[7]   MACH Energy.
[8]   ECOVA, 2016.

the trends identified in previous surveys are similar across sectors and EMIS solutions. IMT interviewed leaders and beginners in EMIS technology and energy management. In all:

- **15 interviews were conducted with owners**, representing 284 million square feet of office, retail, industrial, higher-education and healthcare properties and more than 313,000 residential units, which included energy efficiency leaders from large, nation-wide real estate companies such as ForestCity and Tishman Speyer;

- **13 interviews were conducted with EMIS providers** such as Goby and Urjanet, representing more than 550,000 accounts, which may include building and/or tenant spaces; and,

- One interview was conducted with a **design professional**.

For the survey, IMT approached 38 commercial real estate owners and 38 percent of those agreed to participate. The survey results may be influenced by self-selection, as the commercial real estate owners who agreed to participate tended to be owners that managed several high-performance buildings and had a general understanding of the importance of energy management. The interviews focused on how EMIS users are integrating EMIS platforms into their core operations, and any existing barriers preventing them from pursuing energy efficiency through EMIS solutions. The takeaways from the survey respondents will benefit EMIS providers and government officials in understanding the needs of the commercial real estate market.

Market Use of EMIS to Manage Energy

From the interviews, some trends began to emerge, as shown in Figure 6. Office buildings use the greatest variety of EMIS types with the most common products being benchmarking, BAS, and energy information systems (EIS). Owners with diverse portfolios noted that their office buildings are the easiest property type in which to implement new energy efficiency and EMIS upgrades because they have the most control over how energy is used in the building.

> "A dollar saved is a dollar saved. [Office tenants] tend to be more cutting edge. There is a lot demand on [office buildings] to be tech-oriented with internet of things (IoT) capability and it becomes an amenity."
> **COMMERCIAL OFFICE PORTFOLIO OWNER**

Office owners use EMIS technologies to track the success of installed ECMs and to make the case for additional improvements. The data from EIS and other advanced systems helps office owners develop internally consistent methodologies for deciding which new projects get approved. Some owners are using fault detection and diagnostic (FDD) systems to engage stakeholders (engineers, asset managers, and property managers) at multiple levels of their organization to identify anomalies and to discuss long-term solutions.

Other building types that rely heaviest on benchmarking solutions such as multifamily, industrial, retail, healthcare, and higher education use tools to get a big picture understanding of how their portfolio uses energy, while also pin-pointing buildings with the highest energy use intensity (EUI).

Multifamily and retail owners surveyed focus on tracking energy use and utility bill management. The interviewees in the industrial, higher-education, and healthcare sectors struggle with implementing and adapting to new EMIS. Few of these building owners are using more advanced technologies such as FDD or advanced EIS. Many were solely relying on outdated BAS to manage their energy.

From the survey respondents, a picture begins to emerge of where the sectors of the commercial real estate market are adopting complex EMIS and where other sectors are beginning their EMIS journey. EMIS service providers should read on to understand building-type barriers to EMIS adoption.

FIGURE 6: Use Trends for Various EMIS Types by Building Sector

Legend: ■ Commonly Used ■ Less Commonly Used

	Benchmarking Tool	Utility Billing Tool	BAS	EIS	Advanced EIS	FDD	Automated System Optimization
Office	Commonly Used	Less Commonly Used	Commonly Used	Commonly Used		Less Commonly Used	
Multi-Family Affordable	Commonly Used	Commonly Used					
Multi-Family Market Rate	Commonly Used	Commonly Used		Less Commonly Used			
Senior Living	Commonly Used	Commonly Used					
Retail	Commonly Used	Commonly Used		Less Commonly Used			
Higher-Education			Commonly Used				
Healthcare			Commonly Used				
Industrial			Commonly Used				

Barriers

To understand why the commercial real estate market has not moved into higher levels of adoption, the barriers need careful examination. These are summarized in Figure 7 below.

FIGURE 7: Common Barriers to Using EMIS by Building Sector

Legend:
- Very Common (dark navy)
- Common (medium blue)
- Less Common (light blue)

	Split Incentive	Weak Business Case	EMIS Upfront Costs	Gaps in EMIS Management	Whole Building Data	Education
Office	Common	Very Common	Less Common	Less Common		
Multi-Family Affordable	Less Common		Very Common		Very Common	Very Common
Multi-Family Market Rate	Less Common			Common	Very Common	Common
Senior Living	Less Common			Common		Common
Retail	Very Common	Less Common				
Higher-Education	Less Common	Common	Very Common		Less Common	Very Common
Healthcare			Very Common	Common		Common
Industrial	Very Common	Less Common	Less Common			

When the common barriers identified by survey participants are placed side-by-side, themes begin to emerge:

- **The split incentive**, or the disconnect in lease structure which discourages landlords and tenants from pursuing energy efficiency, is the most common barrier across building types. In the case of triple-net leases, landlords have no incentive to improve the energy efficiency of their building and the tenant bears the brunt of installing and maintaining energy efficiency improvements. The split incentive problem is strongest in retail and industrial properties. At these properties, the tenants have the most control over energy use, the common area EUI is relatively low compared to leased space, and owners are hesitant to explore EMIS solutions beyond benchmarking and utility bill automation.

> "[In] retail, we can't control how energy is used. The spaces are already built out. Many of the stores don't care or have the capabilities to manage their utilities. Retail energy management relies on the businesses to change."
> MIXED-USE SUSTAINABILITY MANAGER

- **Awareness & Education:** Awareness, especially around EMIS tool selection and best management practices, affected many survey respondents. Owners noted difficulty in selecting an appropriate EMIS for their building type. Some owners were unaware of more advanced EMIS, while others felt overwhelmed with the variety of options available. Another issue was staff education and time constraints. Owners, especially in the multifamily sector, lack specialized staff that has the time and expertise to manage a more hands-on EMIS. They desired solutions that are hands-off and provide clear actionable feedback based on energy data.

- **Costs** were another significant concern. EMIS, especially EIS, FDD, and automated system optimization, can be expensive to install, often requiring an updated BAS. The additional information provided in these systems yields greater energy savings (on average of 10 percent), but due to cost hurdles and a modest business case, EMIS solutions are often pursued by respondents only after low-hanging energy efficiency options are pursued. Other respondents noted that energy efficiency improvements like EMIS were pursued after aesthetic building upgrades.

For EMIS service providers, the information uncovered by the interviewees should identify new ways to meet the commercial real estate market's many unique needs.
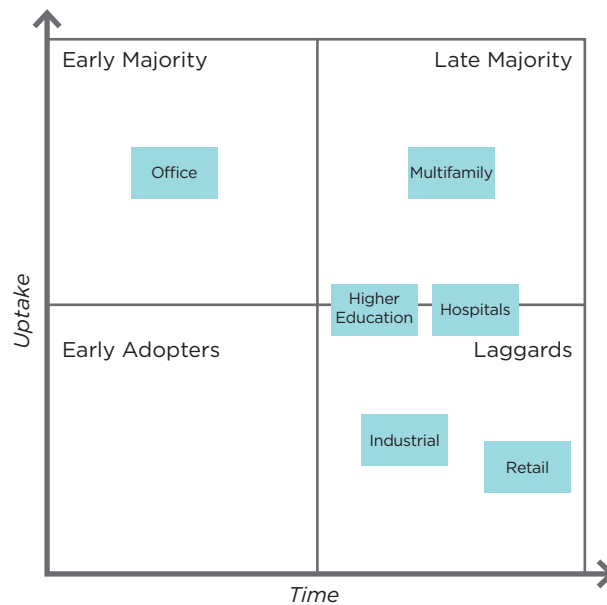
EMIS Technology Adoption Cycle

Based on the interviews with owners and service providers, an adoption lifecycle begins to emerge, summarized below and in Figure 8:

- **Office (Early Majority):** Commercial office owners are employing the widest variety of EMIS solutions. Office decision makers, especially large office portfolio owners with many Class A properties, are knowledgeable of EMIS offerings, have dedicated staff to investigate and to learn new technologies, see energy efficiency as a key component of good operational management, align energy efficiency to their corporate social responsibility goals (CSR), and are open to integrating advanced solutions into their operations.

- **Multifamily (Late Majority):** Multifamily owners see value in some technologies, namely benchmarking with real-time capabilities and utility billing automation. The owners in the market-rate sector are more eager to adopt newer products, presumably because they are less resource constrained, while affordable and senior-living owners are planning their long-term energy management needs. The multifamily property representatives interviewed expressed having few dedicated staff to monitor software platforms.

- **Higher-Education & Healthcare (Late Majority/Laggards):** These building sectors are in the beginning stages of developing comprehensive energy management plans. Hospitals and universities are increasingly hiring specialized energy management

staff to mitigate their significant and rising energy costs. These specialized staff members are largely focused on updating their BAS, lighting, and submeters. Many are relying on manual utility bill data entry to track the energy use of their buildings.

- **Retail & Industrial (Laggards):** Due to many unique market barriers, such as the split incentive and whole-building data access, retail and industrial owners surveyed see little to no value in implementing the more advanced EMIS technologies. Industrial owners see immediate value in investing in a sophisticated BAS, but are hesitant to engage EMIS solutions that extend beyond benchmarking tools. Because of triple-net leases, most retail and industrial owners have little control over how energy is used in their properties and little incentive to change the status quo.

FIGURE 8: EMIS Adoption Life Cycle

Increasing Market Uptake

To increase market uptake, EMIS service providers, local governments, and utility efficiency program implementers should examine how they can remedy the barriers that real estate owners experience in using EMIS. In the survey, IMT asked participants how utility and government authorities in their communities could steer them toward using EMIS and more actively managing their energy consumption. From a utility and local government perspective, promoting energy efficiency can save millions for the local economy, create jobs, conserve natural resources, and spur technological innovation. Promoting EMIS technologies can also help utilities and local government meet greenhouse gas emission reduction goals. For service providers, increasing market awareness and working toward eliminating barriers will lead to more sales and revenue. From the survey respondents, three needs were stressed: education, incentives, and regulation.

Education

One common refrain from owners and service providers was that multiple levels of stakeholders lack a clear understanding of how to unlock the value of EMIS. Below are a number of strategies that EMIS providers with support from utilities efficiency program implementers and local governments can use to educate a variety of commercial real estate professionals:

- **Communicate the Business Case to the C-Suite and Investors:** Owners need help creating the business case for EMIS to their executives and investors. Stakeholders with vested interests should develop case studies of EMIS users who have found implementation success in their jurisdiction. The case studies should include key financial metrics like ROI, payback, internal rate of return (IRR), and net present value (NPV). EMIS service providers, utility efficiency program implementers, and local governments should publish case studies on how EMIS can give owners a competitive edge over others in the market, improve occupant comfort, and can improve the net operating income of the building, thereby yielding a higher asset value.

- **Communicate the Definition of EMIS:** Based on conversations, many commercial real estate professions lack clarity on the variety of EMIS types. Many EMIS vendors focus on what EMIS technology can do, but there is little understanding of what the product actually is, the infrastructure needed to unlock certain features, or how it works. EMIS service providers should work to eliminate this gap. This study includes an overview of the most common EMIS types and which tools to use for specific applications in Appendix 1. Interested parties should take this information and distribute it to commercial real estate professionals—especially property managers, asset managers, and building engineers.

- **Create Working Groups and Specialized Trainings:** Utility efficiency program implementers, EMIS service providers, and local governments can all work together to create working groups with EMIS real estate champions. The working group panels can discuss best practices with asset and property managers that are interested in incorporating EMIS into their operations.

- **Promote Training on How to Overcome Split Incentives:** Green leasing focuses on eliminating the split incentive by modifying a lease to benefit both tenant and owners. The split incentive is a major energy efficiency barrier, especially for retail and industrial owners. Utilities and local governments can refer interested parties to many green leasing resources curated by IMT and the DOE on the Green Lease Library website.[9]

- **Provide Technical Guidance:** Many energy managers and building engineers are unclear on how to make the best use of EMIS data. To remedy this problem, utilities and local governments can position themselves as a strong intermediary by connecting building managers to EMIS providers and consultants who can help users act on the data received through their EMIS services.

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[9] http://www.greenleaselibrary.com/

Incentives

Owners listed overcoming financial hurdles as a major barrier to EMIS implementation. To solve this barrier, incentives are typically mentioned first when approaching this issue. However, the effectiveness of incentives received mixed reviews from commercial real estate professionals. Many see incentives as only solving the first initial cost barrier. Incentives are not a "one-size-fits-all" solution. From the survey feedback, incentives are best when paired with education and long-term reporting.

- **Education and Incentives:** As noted above, commercial real estate owners have trouble developing the business case for EMIS. Users need help understanding the full costs, including maintenance, training, and installation costs for EMIS adoption. Interested utilities and local governments can use demonstration projects to illustrate how an incentive can yield higher ROIs and quicker paybacks. Interested parties should make sure incentives are communicated to all levels of the market, especially retail and local-ownership groups.

- **Long-Term Reporting:** When creating potential EMIS incentives, they should be prescriptive and based on building size, building type, and savings potential. By tying an incentive to long-term reporting, all stakeholders (utilities, governments, and owners) can track the progress of the savings over time. With snapshots of EMIS performance, owners will be incentivized to better manage their EMIS to achieve the highest possible savings.

Regulation

In most cases, incentives are the carrot and government regulation is the stick. With regards to encouraging uptake of EMIS, regulation was not a popular concept for most owners, but it was popular with EMIS providers. For example, benchmarking ordinances have positively influenced commercial real estate to adopt EMIS technology. Of the service providers interviewed, 41 percent have noticed increased interest in their products due to benchmarking ordinances. Two providers found sales and outreach efforts to be more productive in jurisdictions where an ordinance had passed and building owners were actively looking for ways to measure and manage their energy use. This impact has been most noticeable with late majority and laggard businesses as early adopters and the early majority had already incorporated EMIS into core operations. Owners that use automated benchmarking tools to meet ordinances mentioned that it streamlined their business practices and cut down on staff hours. Others were using tools that required the hardcoding of utilities bills and noted that it created some administrative drain. As a result of benchmarking, owners with large portfolio in several markets have actually required all of their buildings benchmark using EMIS regardless of local ordinance requirements.

Outside of benchmarking, other energy-focused ordinances such as the lighting and submetering requirements under the *Greener, Greater Buildings Plan* in New York City compel owners to seek technological solutions to comply with local regulations.[10] It stands to reason that if more such regulations were passed, demand for EMIS solutions would rise.

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[10]   http://www.nyc.gov/html/gbee/html/plan/plan.shtml

Conclusion

EMIS are a great resource solution to reducing whole-building energy usage; however, there is still confusion in the market about what EMIS are, what they do, and what technologies exist beyond the BAS. Many still see BAS as the only answer to the automated management of building energy systems. As discussed in this study, EMIS applications have expanded their capabilities to include real-time energy data, fault detection analysis, demand response, and energy procurement. While these new and advanced applications are designed to give detailed insights into the inner workings of buildings to yield higher energy savings, many building-specific barriers exist that prevent the commercial real estate community from realizing the savings potential.

To understand how the market is using EMIS technology and where the adoption disconnect lies, this study surveyed 29 EMIS service providers and commercial real estate professionals and analyzed trends from other publicized surveys. The survey conducted as part of this study included EMIS service providers that represent 550,000 accounts, commercial real estate owners that represent 284 million square feet of space, and multifamily owners that own or manage 313,000 units.

The survey found that EMIS is permeating parts of the commercial office market but adoption has fallen short elsewhere. Upon closer examination, Class A office has moved into the early majority phase while Class B office, multifamily, healthcare, higher education, retail, and industrial are lagging behind in technology adoption. IMT hopes that audiences including real estate owners, service providers, and utility efficiency program implementers will take the lessons from the survey participants to invest in appropriate EMIS platforms, design more accessible EMIS, and develop effective end-user outreach programs.

- For commercial real estate professionals for which energy-savings are a priority, the information herein could be used to develop a business case for EMIS, select appropriate EMIS technologies, identify demonstration projects and investigate available local incentives.

- EMIS providers should aim to reach underserved target markets such as retail, industrial, healthcare, higher-education, and multifamily through engaging stakeholders at all levels - owners, utility implementers, local government, and occupants to remove market barriers.

- Governments and utility efficiency program implementers should develop incentives to remove financial barriers for owners, while also educating the market on EMIS best practices. To make incentives more effective, utility implementers and local governments should tie incentives to long-term reporting.

U.S. buildings use more energy than most countries, and Americans spend more than $400 billion to heat, cool, and power the places where they live and work. To achieve energy savings and reduce the U.S. carbon footprint, EMIS technology is a critical tool in the energy management arsenal. Transforming the U.S. commercial real estate market to be more energy efficient through wider use of EMIS is only achievable by addressing the existing market gaps laid out in this report. This includes but is not limited to: clear definitions for and technical guidance on various EMIS; providing education for leadership on the strong business case for EMIS; spreading the adoption of green or energy-aligned leasing practices to remove split incentives; providing better access to whole-building utility data; implementing effective building performance policies; and providing incentives and financing options to remove upfront costs. This type of transformation will require involvement from stakeholders that range from utility efficiency program implementers and EMIS service providers to state and local governments.

Appendix 1: Energy Management Systems

The following is an overview of categories of EMIS offerings in the market. The U.S. Department of Energy's Better Buildings Initiative has developed a guide that explores the differences in the tools. Summary information, typical energy savings, and cost data included below are pulled from that guide.[11]
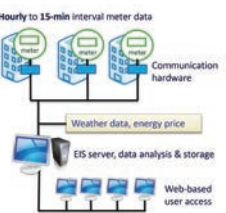
Building-Level EMIS

Benchmarking and Monthly Utility Bill Analysis Tools

These tools are suited for those in the commercial real estate community who are looking for simple, low-cost tools that track whole-building energy data on a monthly basis. These are ideal for those looking to comply with local benchmarking ordinances, automate billing practices, or those that want a quick snapshot of their portfolio's energy usage to compare their buildings' performance to one another.

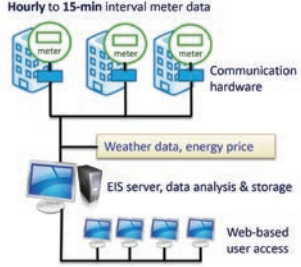|	Description	Benefits	Typical Energy Savings	Cost
	Tools that track monthly whole-building energy data, benchmark energy performance and/or reconcile and manage utility bill-pay. and manage utility bills	• Helps users set energy goals • Automates bill-pay and energy reporting • Identifies whole-scale needs for improvement	2.4% annually	Free or $

Energy Information Systems (EIS)

EIS provide in-depth, often real-time visibility into how energy is being consumed in the building. These tools are best suited for those looking to move beyond a basic energy management system and seek to identify energy use trends within individual buildings.

	Description	Benefits	Typical Energy Savings	Cost
	Web-based software, data acquisition hardware that displays building energy performance on an at least an hourly interval basis	• Granular energy consumption data • Weather-normalized data • Demand response capabilities • Alarm setting capabilities	8% annual median savings, ranges from 0–33%	$$–$$$

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[11] U.S. Department of Energy Better Buildings. "A Primer on Organizational Use of Energy Management and Information Systems (EMIS)", 2015.
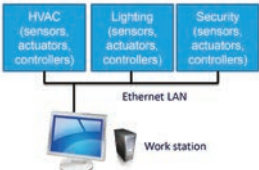
Advanced EIS

Advanced EIS tools include EIS, but also include advanced controls with detailed baseline models that can be used to identify unusual energy trends, verify ECM success, and connect to the BAS. Buildings that use these tools are looking for touch points to make informed energy management decisions.

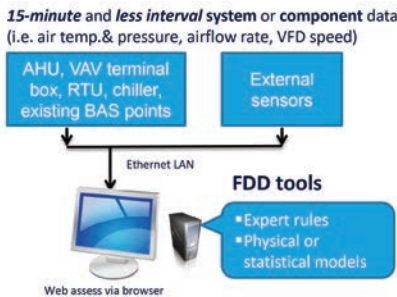|	Description	Benefits	Typical Energy Savings	Cost
	Higher degree of automated analytics based on historical trends and weather normalization. These tools may also integrate trend log data from BAS to provide insight into system operations	• Includes all of the benefits mentioned above • Granular energy consumption data • Connections to other platforms, such as a BAS, to provide more comprehensive insight • Data analysis can identify opportunities to improve building operational efficiency	8% annual median savings, ranges from 0–33%	$$–$$$

System-Level EMIS[12]

Building Automation System (BAS)

BAS is the most common EMIS tool. BAS is the automated brain of the building. It is used to alter set-points for various systems in the building including heating, ventilation, and air-conditioning (HVAC), lighting and security.

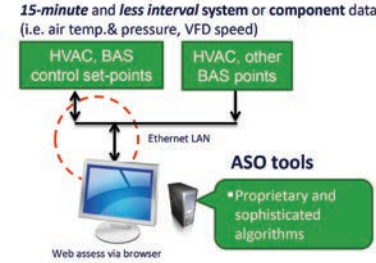|	Description	Benefits	Typical Energy Savings	Cost
	System for controlling building operations and indoor conditions	• Control indoor temperature, humidity, lighting based on operator input • Limited alarm and anomaly detection for operations that are out of range of the programmed set-points	10–15% when installing new	$$$$

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[12] U.S. Department of Energy Better Buildings. "A Primer on Organizational Use of Energy Management and Information Systems (EMIS)", 2015.

Fault Detection and Diagnostics (FDD)

Unlike the previously mentioned tools, FDD tools not only identify systemic issues in the building, but also offer solutions to fix the identified problems. This saves building teams time on troubleshooting.	Description	Benefits	Typical Energy Savings	Cost
	Tools that identify HVAC system or equipment-level performance issues and offer solutions to troubleshoot detected issues. These tools rely on data from the BAS, sub-meters and other whole-building energy data	• Automatically detect problems • Identifies solutions to system problems	2–11% whole building potential	$$$

Automated System Optimization

These are the newest tools in the EMIS family. These require connection to the building BAS and often whole-building and system-level sub-metering capabilities. Because these systems automatically re-write set points, the tools can save building teams time analyzing individual set-points on the BAS.

	Description	Benefits	Typical Energy Savings	Cost
	A two-way communication tool that interfaces with a BAS, whereby set-points are readjusted to optimize building-level services	• Automatically re-writes set-points to maintain occupant comfort and energy efficiency • Evaluates optimization settings based on indoor and outdoor conditions and energy prices	unknown	$$$

Appendix 2: Further Reading

Use these resources below to learn more about EMIS technologies and market adoption:

A Primer on Organizational Use of Energy Management and Information Systems (EMIS), Lawrence Berkeley National Laboratory, 2015, available at: http://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/A_Primer_on_Organizational_Use_of_EMIS_V1.1.pdf

- The resource gives a highly detailed overview of the different types of EMIS systems.

2016 Energy and Sustainable Predictions Findings from Leading Professionals, ECOVA, 2015, available at: http://s3.amazonaws.com/uploads.ecova.com/2016/04/27220750/2016-Energy-and-Sustainability-Predictions-Report.pdf

- Read about the energy and sustainability findings ECOVA, one of largest EMIS providers, uncovered by interviewing 700 real estate professionals.

2015 Industry Survey of Building Management Professionals, MACH Energy, 2015, available: http://contact.machenergy.com/whitepaper/

- MACH energy engaged 800 professionals to see how the commercial real estate market is using EMIS technologies.

EMIS Crash Course, Jessica Granderson et al., Lawrence Berkeley National Laboratory, 2013, available at: http://eis.lbl.gov/pubs/emis-crash-course.pdf.

- This slide deck gives a high-level overview of the state of the EMIS market and how to choose an appropriate EMIS.

Commercial Real Time Energy Management Program, New York State Energy Research & Development Authority (NYSERDA), available at: http://www.nyserda.ny.gov/RTEM

- Utility implementer, NYSERDA, has developed an incentive program in New York to increase uptake of EMIS technologies. Learn how their strategies may be applicable for the District of Columbia.

About the Institute for Market Transformation

The Institute for Market Transformation is a nonprofit organization that promotes energy efficiency in buildings in the United States and abroad. Through activities including technical and market research, policy and program development and deployment, and the promotion of best practices and knowledge exchange, IMT seeks to ignite greater investment in a better built environment. **www.imt.org**