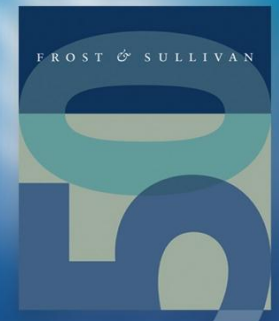


Energy Information Management—Practices and Technology Assessment

Integrating Energy Information Management Solutions in Buildings
for Improved Energy Efficiency and Optimal Performance

9835-19

November 2012



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Definitions



Definitions

Product Definition

- Energy information management refers to solutions that track and analyze energy consumption data in order to increase energy efficiency and ultimately reduce costs for end users.
- These solutions provide an interface with which users can perform calculations about the amount of energy that is being used, the building's performance, and how buildings and facilities can be managed better.
- Energy information management solutions are used for the ongoing monitoring of the building's energy usage over time. They offer analysis tools to convert large volumes of data into useful, actionable information.
- Energy information management systems have automated the data collection, analysis, and reporting tasks so that recommendations are the principal output.
- Although energy information management services are also often offered, this research is focused on the software solutions that are used in the management and tracking of energy consumption.

Source: Frost & Sullivan analysis.

Definitions (continued)

Geographic Scope

- This research covers the total North American market, including:
 - United States
 - Canada
- This research project excludes Mexico.



Source: Frost & Sullivan analysis.

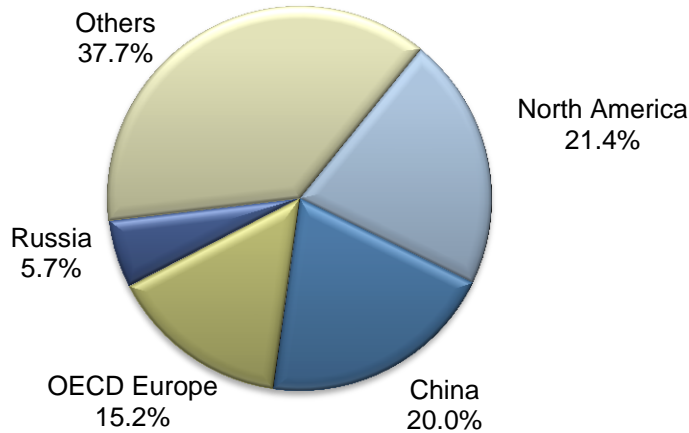
Introduction



North America—Largest Consumer of Energy

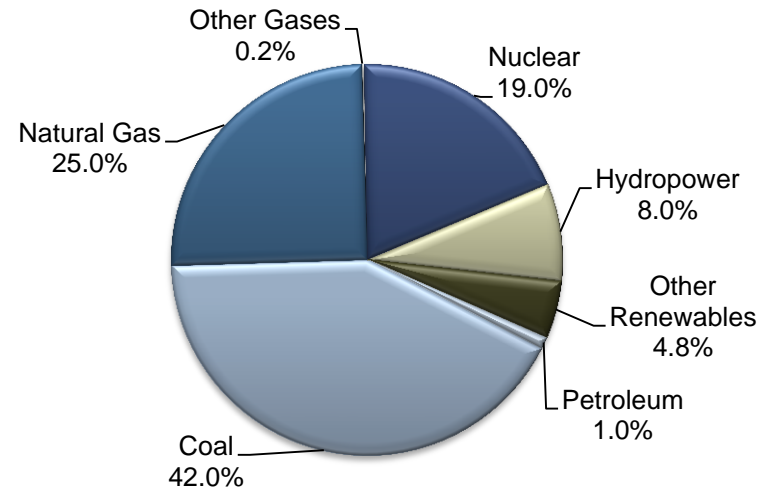
- The United States accounted for approximately 18.7 percent of global energy consumption in 2010, which is the second-largest share of world energy consumption by any country. Canada accounted for 2.7 percent of global energy consumption. Therefore, North America accounted for the largest share of global energy consumption.
- In the United States, coal is the most frequently used fuel source and the largest emitter of carbon dioxide, accounting for 80.0 percent of greenhouse gas emissions from the U.S. energy sector. During the last decade, policies have been more focused on reducing electricity use in order to minimize the U.S. contribution to climate change.

**Energy Information Management Market:
Energy Consumption, Global, 2010**



Note: Others include Latin America, Middle East, Rest of Asia, Rest of Europe, and Africa.

**Energy Information Management Market:
Electricity Generation, U.S., 2011**



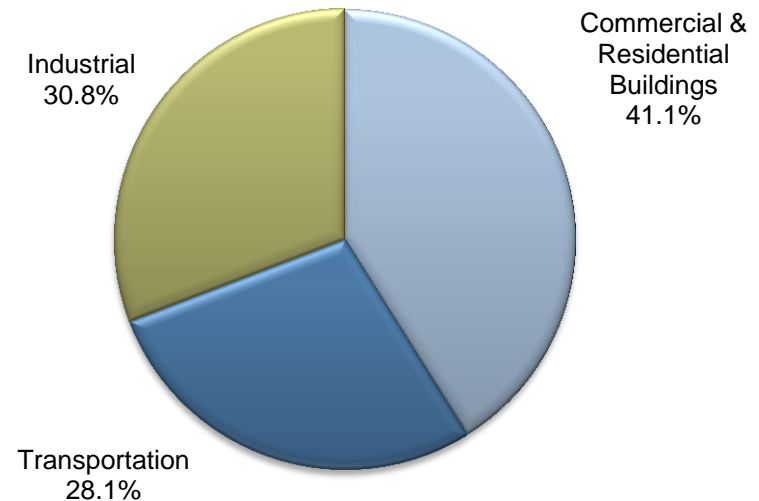
Note: Other Gases include coke-oven gas, blast-furnace gas, and refinery gas.

Source: U.S. Department of Energy (DOE); Frost & Sullivan analysis..

Why is it Important?

- Buildings account for 41.1 percent of all energy use in the United States, consuming more energy than the industrial or transportation sectors.
- Buildings' energy use is responsible for 7.4 percent of the world's carbon dioxide emissions. Furthermore, U.S. buildings represent an increasing portion of the country's carbon dioxide emissions.
- Although residential consumption currently exceeds that of commercial buildings in the United States, the share of energy use from commercial buildings has grown at a faster rate in recent years.
- The growing population in North America and improved economic conditions are likely to raise energy consumption during the next decade by an estimated 7.3 percent over 2010 consumption levels.

**Energy Information Management Market:
Energy Consumption, U.S., 2010**



- Due to the potential to reduce energy consumption, decrease greenhouse gas emissions, and add to the building value, energy information management solutions have seen increasing demand.

Source: U.S. DOE and Frost & Sullivan analysis.

Need for Energy Information Management and Real-world Examples

- According to the United States Environmental Protection Agency (EPA), the average building wastes 30.0 percent of the energy it consumes due to inefficiencies.
- Currently, utilities gather large amounts of energy information, but they are not sharing detailed or real-time usage information with end users.
- This detailed information is needed to be able to make better decisions about energy usage.
- With nearly 5.0 million commercial buildings in the United States alone, the opportunity to conserve energy in the building segment is tremendous.
- The key to energy conservation is to be aware of how and where the energy is being used and to identify the greatest opportunities to save energy.
- By deploying an energy information management solution and committing to make changes to address energy inefficiency issues, users can achieve energy savings of up to 30.0 percent.

Source: Frost & Sullivan analysis.

Need for Energy Information Management and Real-world Examples (continued)

- For example, Kwantlen Polytechnic University was able to minimize wasted energy at its new campus by using information and energy management strategies.
- The university increased efficiencies in energy and resource consumption to lower its costs and reduce its impact on the environment by cutting its green house gas (GHG) emissions.
- The Ave Maria University campus achieved significant efficiencies in utility usage with annual savings of about \$600,000 by monitoring utility usage and expenses and avoiding power spikes and excess supply issues.
- Due to rising energy costs and an aging infrastructure, Providence Health System decided to invest in building a new medical center.
- By combining software to enable building load and energy analysis with energy-efficient technology, the Providence Health System was able to achieve ongoing annual energy cost savings and reduce GHG emissions. As a result, the facility's carbon dioxide footprint decreased.

Source: Frost & Sullivan analysis.

Need for Energy Information Management and Real-world Examples (continued)

- The implementation of an energy management system and an addressable lighting control system was expected to generate a 76.0 percent savings, in terms of lighting expenses, at the Rogers Centre.
- The State of Missouri developed a plan to reduce statewide energy consumption by 15.0 percent by 2010.
- By integrating existing and new systems, implementing a real-time communications infrastructure, and using dashboard, analytics, and control technology as part of its plan, the State of Missouri achieved annual savings of over \$35.0 million per year.
- In addition, the expected payback on the investment was about one year and the state's carbon footprint was reduced by 205,210,232 pounds of carbon dioxide.

Source: Frost & Sullivan analysis.

Benefits of the Solutions

Benefits of Energy Information Management Solutions include:

- Energy information management solutions reduce energy costs by providing a structured approach to classifying, measuring, and managing energy consumption.
- These solutions enable buildings to detect their operational effectiveness and to make autonomous adjustments.
- Energy information management solutions provide savings both in capital and operational expenditures.
- These solutions promote a more efficient operation and maintenance process.
- Energy information management solutions help the commissioning process and ongoing quality assurance of building functions.
- These solutions help to meet current or future mandatory energy efficiency targets and satisfy the requirements of GHG emission reduction legislation.
- These solutions can also bring higher resale values or lease rates, as well as help building owners to obtain LEED certification or an Energy Star rating.

Improved Energy Efficiency

Optimal Building Performance

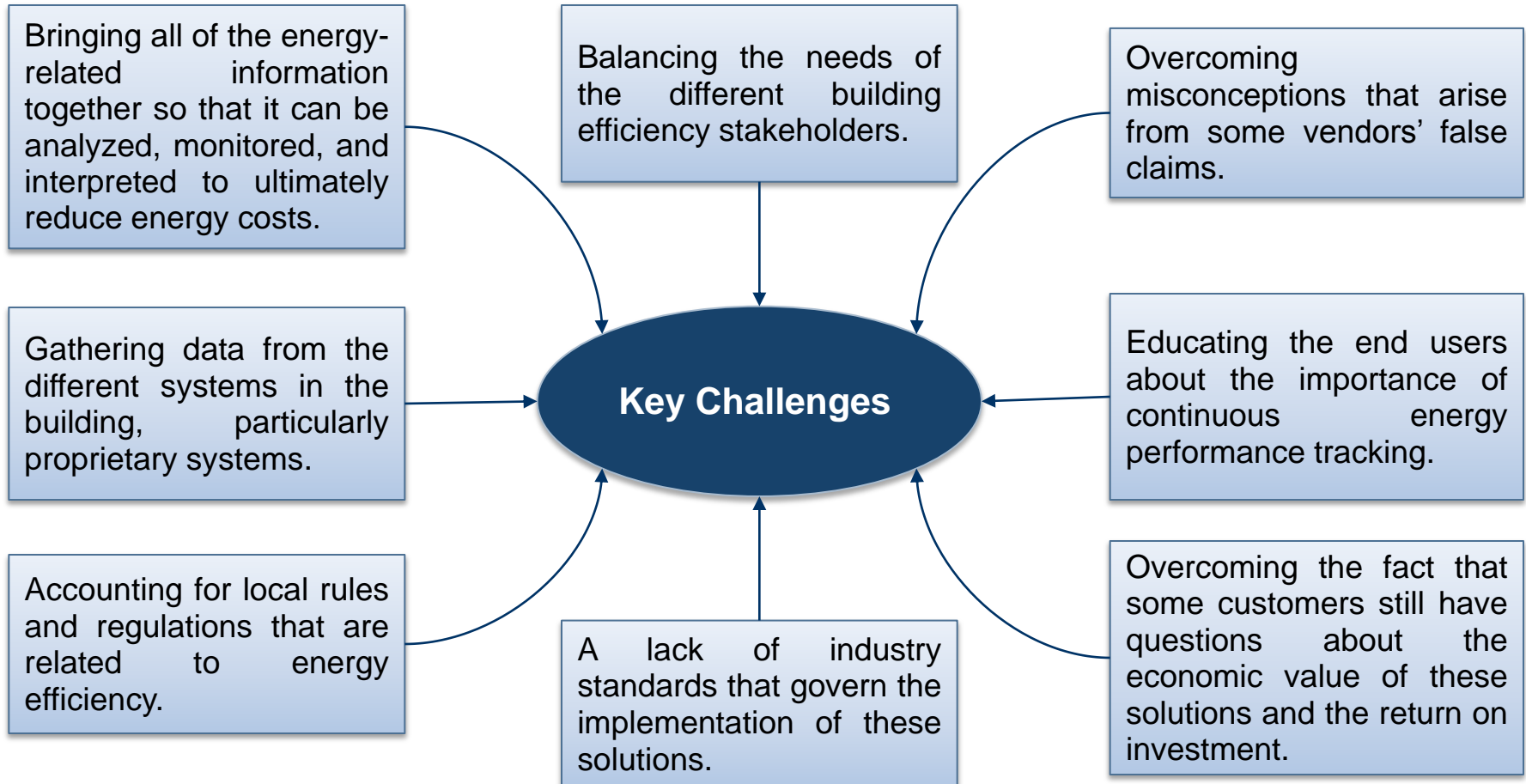
Improved Economic Performance

Protection of the Environment

Source: Frost & Sullivan analysis.

Key Challenges













Energy Information Management Market: Key Challenges, North America, 2012-2016



Source: Frost & Sullivan analysis.

Key Challenges (continued)

Energy Information Management Market: Impact of Top 4 Challenges, North America, 2012–2016

	Impact		
	1-2 Years	3-4 Years	5 Years
Balancing the needs of the different building efficiency stakeholders			
Overcoming misconceptions that arise from some vendors' false claims			
Educating the end users about the importance of continuous energy performance tracking			
Overcoming the fact that some customers still have questions about the economic value of these solutions and return on investment			

Impact



High

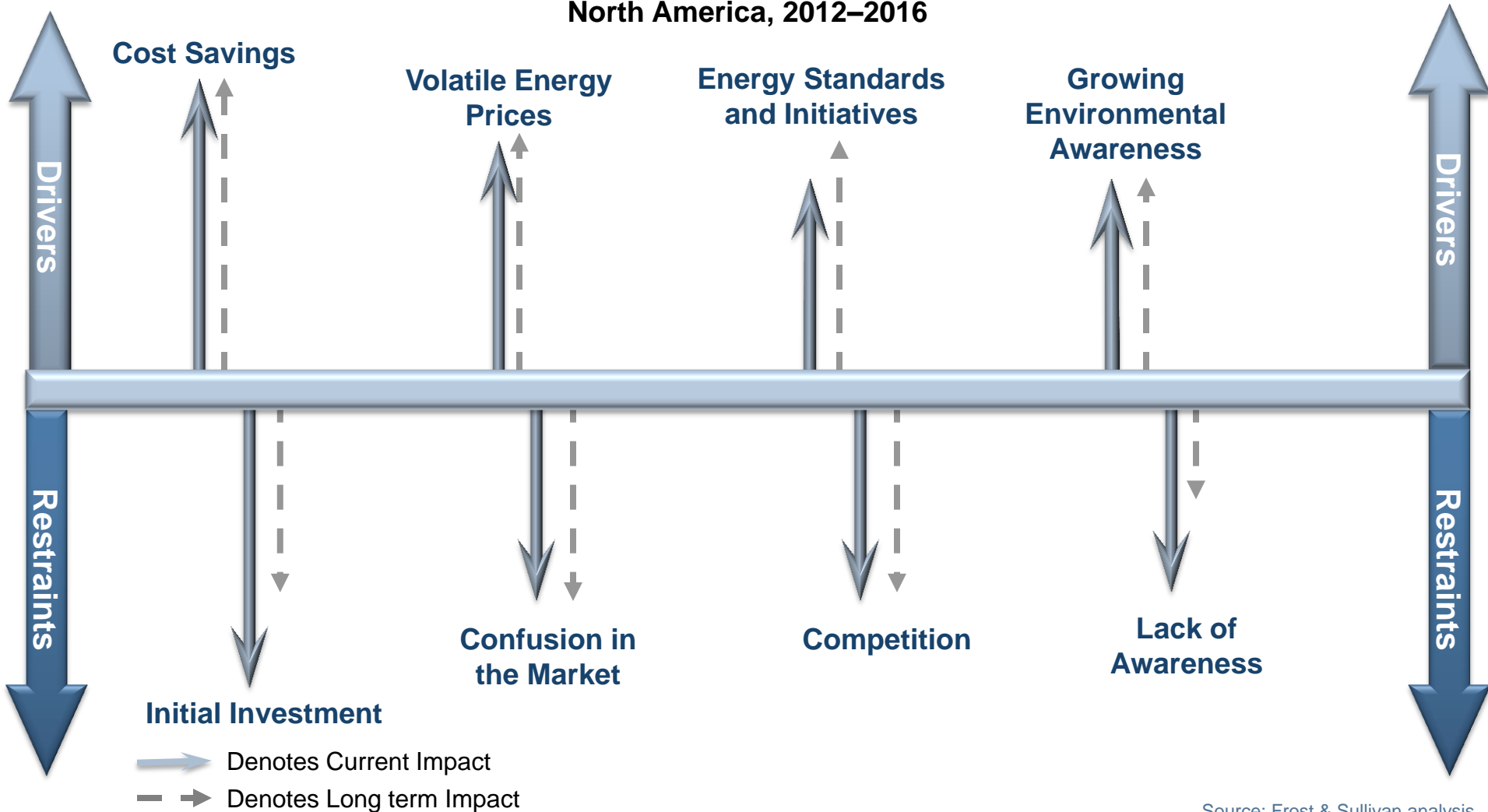
Medium

Low

Source: Frost & Sullivan analysis.

Market Drivers and Restraints

Energy Information Management Market: Market Drivers and Restraints, North America, 2012–2016



Source: Frost & Sullivan analysis.

Market Drivers

Energy Information Management Market: Market Drivers Ranked in Order of Impact, North America, 2012–2016

Rank	Driver	1–2 Years	3–4 Years	5th Year
1	Cost Savings	H	H	H
2	Volatile Energy Prices	H/M	H/M	H/M
3	Energy Standards and Initiatives	M	H/M	H/M
4	Growing Environmental Awareness	M	M	M

Impact Ratings: H = High, M = Medium, L = Low

Source: Frost & Sullivan analysis.

Market Drivers Explained

1. Cost Savings

Due to the economic conditions and unpredictable energy prices, building owners and facility managers are looking for ways to save on energy costs. The ability to reduce energy consumption and, therefore, lower energy bills by using energy information management solutions is one of the key drivers for growth in the market.

2. Unpredictable Energy Prices

Although energy prices have recently stabilized, they have been on the rise during the past few years. This trend is not expected to significantly reverse in the near future. Therefore, building owners are looking for ways to better manage their energy consumption in order to reduce usage. This drives growth in the market.

3. Energy Standards and Initiatives

Given the increasing focus that energy management has received, building owners are feeling pressure to comply with emerging standards for energy management. For example, the International Green Construction Code will set enforceable minimum standards for energy efficiency. These standards, as well as energy reduction initiatives and programs such as Energy Star, are expected to support demand for these solutions.

4. Growing Environmental Awareness

Building owners are concerned about reducing their energy bills and ways to minimize their impact on the environment. This concern is evident by the number of companies that have implemented sustainability and energy efficiency strategies. By reducing energy consumption, users can also reduce greenhouse gas emissions. Therefore, growing environmental awareness stimulates growth in the market.

Source: Frost & Sullivan analysis.

Market Restraints

Energy Information Management Market: Market Restraints Ranked in Order of Impact, North America, 2012-2016

Rank	Restraint	1–2 Years	3–4 Years	5th Year
1	Initial Investment	H/M	M	M
2	Confusion in the Market	M	M	M
3	Competition	M	M	M
4	Lack of Awareness	M	M/L	L

Impact Ratings: H = High, M = Medium, L = Low

Source: Frost & Sullivan analysis.

Market Restraints Explained

1. Initial Investment

Although energy information management solutions can help to lower energy costs, the initial investment remains a key restraint to the expansion of the market. Building owners are sometimes hesitant to make the investment, particularly in a difficult economic environment.

2. Confusion in the Market

A number of vendors, including software and specialized energy management solution providers, have entered the market. The variety of solutions available in the market and false claims are creating confusion among end users which, in turn, is slowing adoption of energy information management solutions.

3. Competition

Given the number of companies entering this market, competition has intensified. In addition, these solution providers have to compete with building automation solutions (BAS) manufacturers that are also offering energy information management platforms. Increasing competition is, therefore, impacting growth.

4. Lack of Awareness

Although awareness is increasing in North America, there is still some ignorance about the capabilities and benefits of these solutions. Thus, it has become very important to communicate the monetary impact of implementing these solutions so that a lack of awareness does not restrict market growth.

Source: Frost & Sullivan analysis.

Initiatives Driving Demand

Better Buildings Initiative

- Initiative to make commercial and industrial buildings 20.0 percent more energy efficient by 2020 and increase private-sector investment in energy efficiency.

Greener, Greater Buildings Plan

- A comprehensive set of efficiency laws in New York City that remove a loophole in the energy code to:
 - Ensure it applies to all construction projects.
 - Require annual energy efficiency benchmarking that will be disclosed to the public.
 - Mandate cost-effective energy efficiency upgrades and evaluations of the city's largest buildings.
- By focusing primarily on 16,000 of the city's largest buildings, the Greener Greater Buildings Plan will result in an emissions reduction of almost five percent and energy costs reductions of \$700.0 million annually by 2030.

Energy Star

- In order for buildings to earn the Energy Star label, they must be independently verified to perform among the top 25.0 percent of similar buildings nationwide.
- According to the EPA, on average, Energy Star-labeled buildings use 35.0 percent less energy and generate 35.0 percent fewer GHG emissions than other buildings.

Source: Frost & Sullivan analysis.

Initiatives Driving Demand (continued)

Commercial Building Initiative

- Initiative that works with commercial builders and owners to reduce energy use and improve building performance, comfort, and savings.

Building Technologies Program

- A U.S. Department of Energy (DOE) program whose goal is to develop technologies, methods, and tools for making buildings more energy efficient, productive, and affordable.
- The program increases the focus on reducing energy use in existing buildings, including details about health, safety, and comfort benefits.
- The main focus is on improving building components, energy modeling tools, building energy codes, and appliance standards.

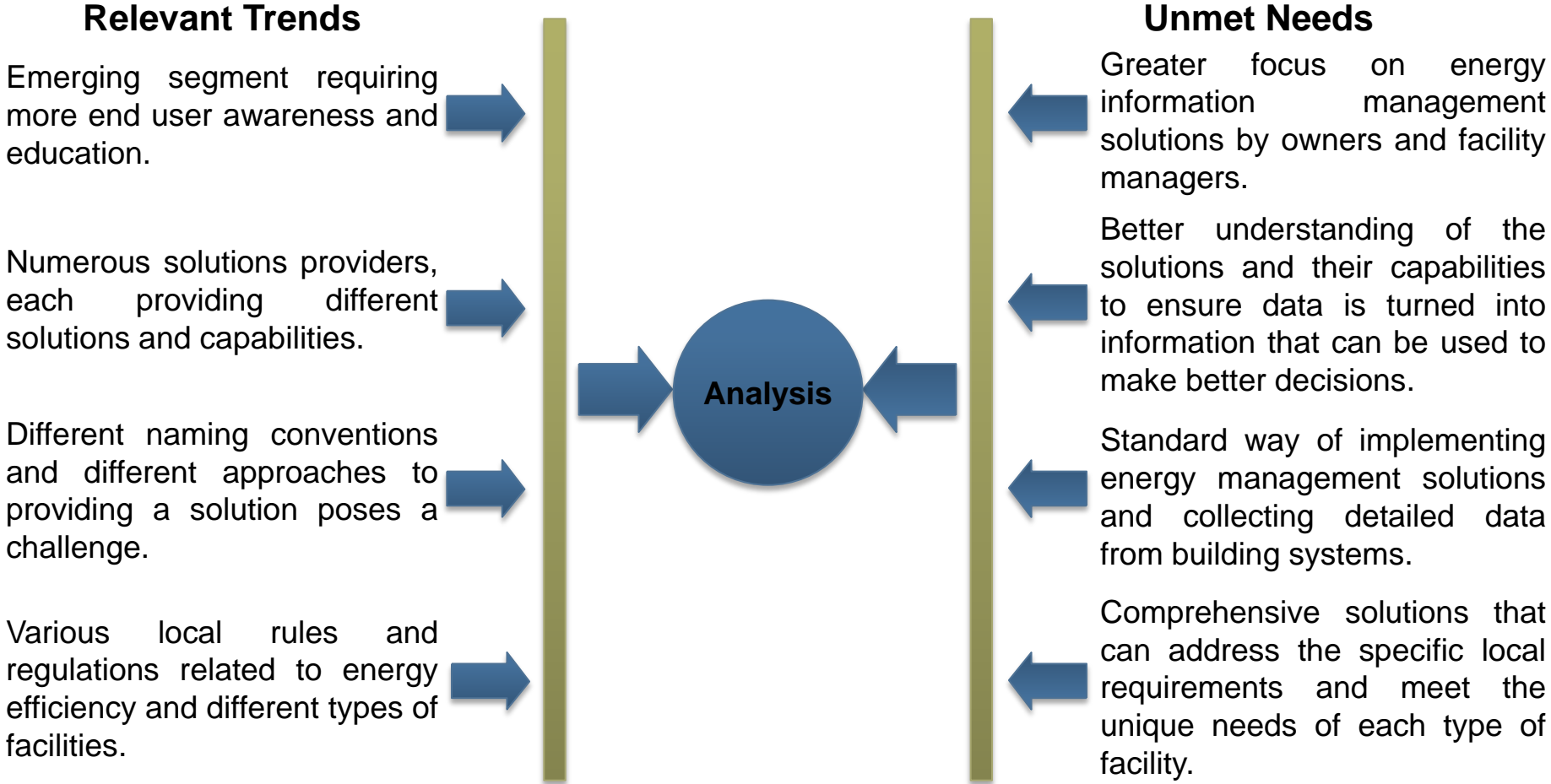
North American Goals

- The United States' goal is to reduce GHG emissions by 4.0 percent below 2005 levels by 2020, reduce carbon emissions by 83.0 percent by 2050, and use 19.0 percent less energy by 2050.
- States such as California mandate GHG reduction by 25.0 percent by 2020; other states mandate a 10.0 percent reduction by 2018.
- Canada seeks to reduce GHG emissions by 17.0 percent over 2005 levels by 2020.

Source: Frost & Sullivan analysis.

Trends and Unmet Needs

Energy Information Management Market: Trends and Unmet Needs, North America, 2011



Source: Frost & Sullivan analysis.

Current State of Energy Information Management



The Current State of the Market

- The energy information management market is a nascent and emerging sector that is constantly evolving.
- The need to reduce energy costs, the volatile energy prices, and the increasing attention given to energy efficiency are the key drivers in the North American market.
- The energy information management market is a fairly loosely defined; in fact, the term “energy information management” is a widely-used term that is interpreted in numerous and significantly different ways throughout the industry.
- For the purpose of this research, an energy information management solution has been defined as a software solution that tracks and analyzes energy data in order to increase energy efficiency and ultimately reduce costs for end users.
- Energy information management has emerged as an enormous untapped opportunity in part because it impacts the bottom line.
- An energy information management solution can help to reduce operating expenses, such as utilities and repair and maintenance expenses, therefore ultimately impacting the bottom line.

Source: Frost & Sullivan analysis.

The Current State of the Market (continued)

- Currently, only a small percentage of the buildings in North America have an energy information management solution that goes beyond meter reading and basic reporting.
- A very small minority of sites have basic interval data for energy usage; an even smaller percentage makes use of that information.
- Because buildings in North America are at various stages in the use of energy information management, companies in this space are taking a significantly different approach to the tracking and analysis of such data.
- Most companies in this space are still trying to pinpoint what the customers' needs really are and how to successfully meet those needs.
- The competitive landscape is also changing, with an increasing number of companies entering this space.
- Participants are all trying to claim their space in the market and differentiate themselves from competitors.
- However, some vendors are making claims that are not necessarily true, which is detrimental to the market and generates confusion among end users.

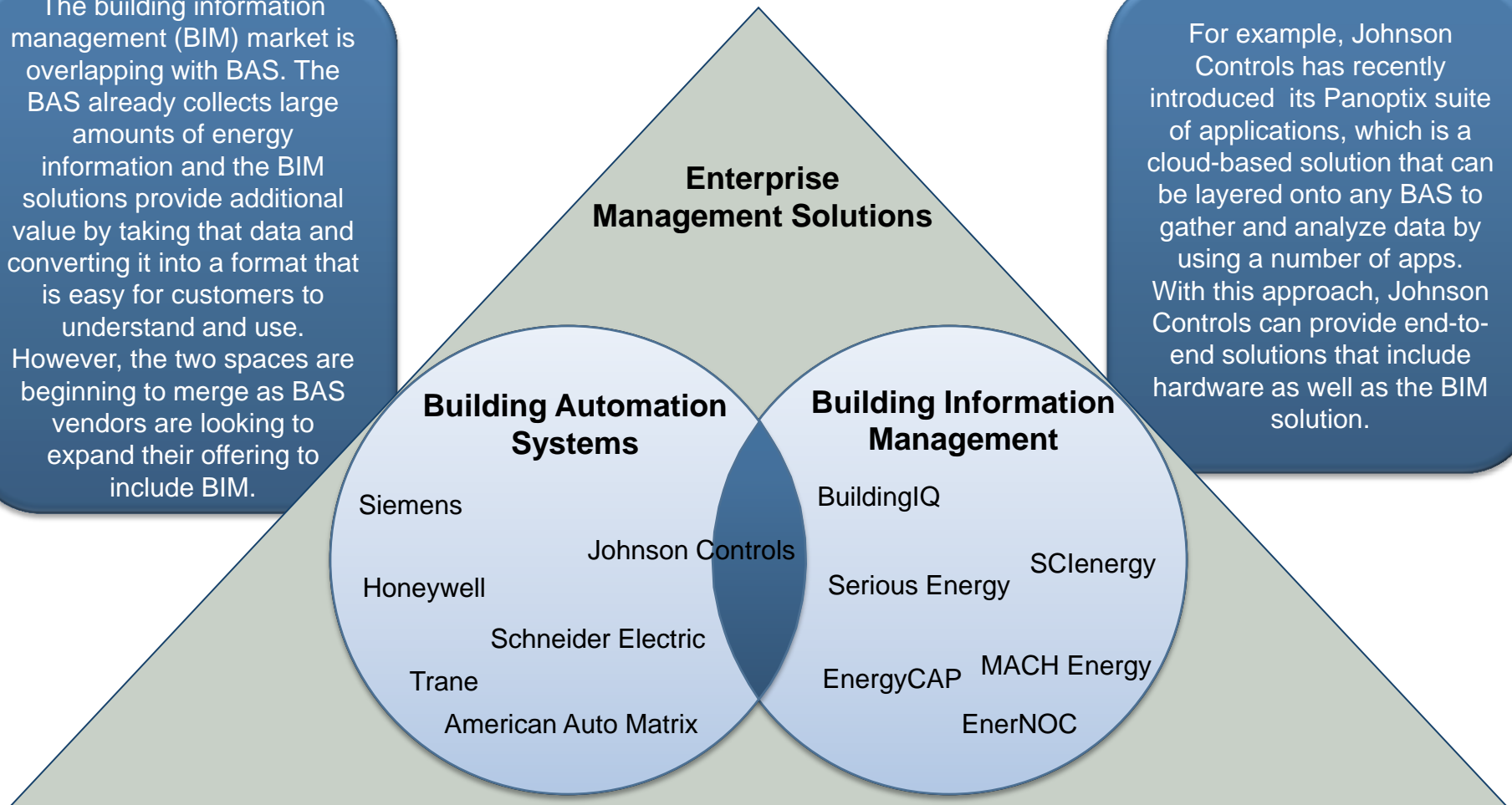
Source: Frost & Sullivan analysis.

Emerging Competitive Environment

Energy Information Management Market: Emerging Competitive Environment, North America, 2011

The building information management (BIM) market is overlapping with BAS. The BAS already collects large amounts of energy information and the BIM solutions provide additional value by taking that data and converting it into a format that is easy for customers to understand and use. However, the two spaces are beginning to merge as BAS vendors are looking to expand their offering to include BIM.

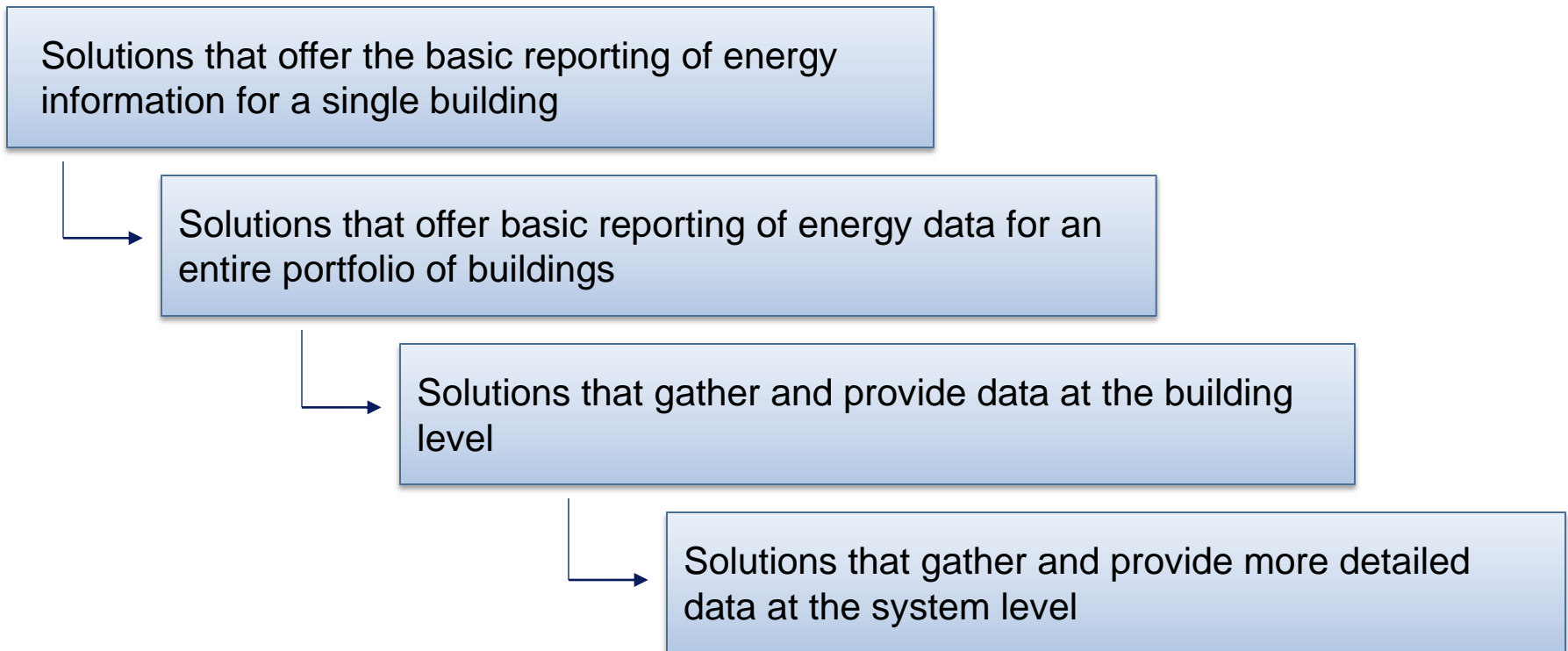
For example, Johnson Controls has recently introduced its Panoptix suite of applications, which is a cloud-based solution that can be layered onto any BAS to gather and analyze data by using a number of apps. With this approach, Johnson Controls can provide end-to-end solutions that include hardware as well as the BIM solution.



Source: Frost & Sullivan analysis.

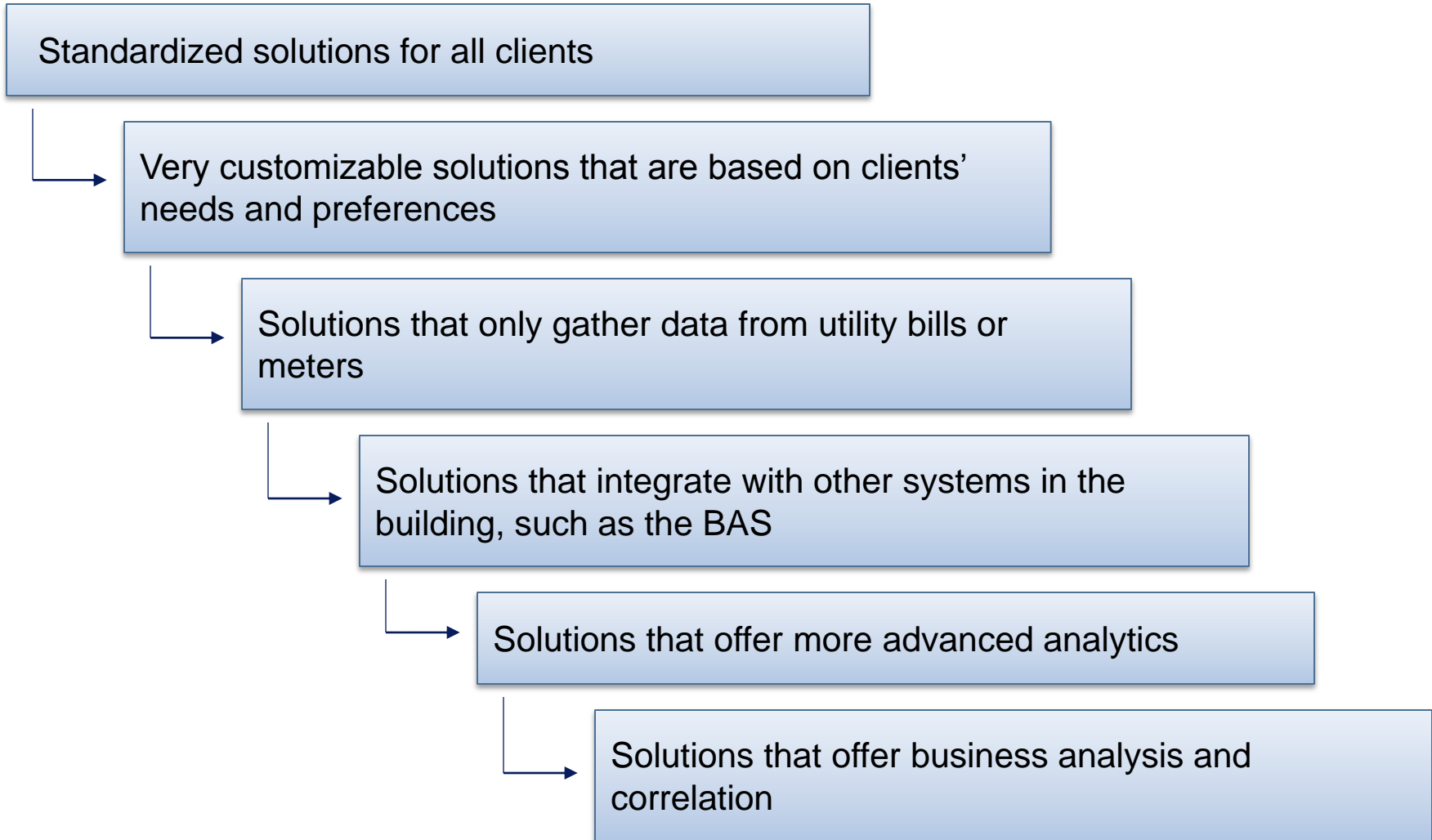
Energy Information Management Solutions

- The types of solutions that are currently available in the North American market vary widely, and range from:



Source: Frost & Sullivan analysis.

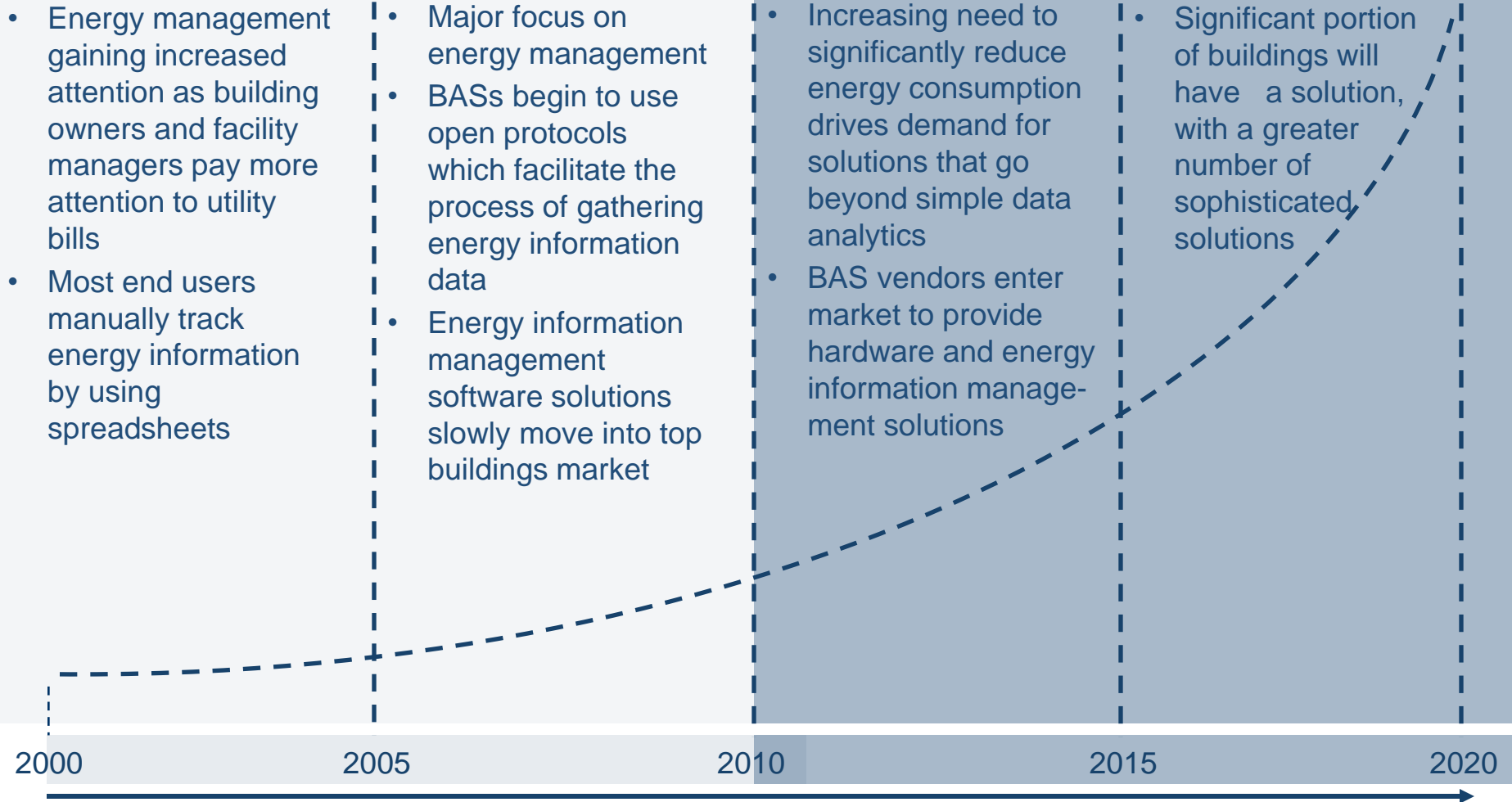
Energy Information Management Solutions (continued)



Source: Frost & Sullivan analysis.

Market Life Cycle for Energy Information Management

Energy Information Management Market: Market Life Cycle, North America, 2000–2020



Source: Frost & Sullivan analysis.

Profile of Select Energy Information Management Solutions



BuildingIQ

Description of the Solution

- The BuildingIQ solution provides a complete platform for monitoring, integrating, and managing traditionally disparate applications and control functions, providing end users with visibility over operational data from multiple locations.
- Using a sophisticated thermal model that automatically learns the building's energy performance and then adapts to changes in internal or external conditions, the BuildingIQ system also predicts energy demand and directly adjusts HVAC system parameters to continuously optimize energy use.
- BuildingIQ has the ability to communicate with the building management system (BMS) and automates control of the BMS without any requirement for continuous supervision or manual intervention.
- The BuildingIQ system can be used in both new and existing buildings and requires no capital expenditures or upgrades within the existing building infrastructure. The product is delivered as a software solution.
- By using BuildingIQ, end users can reduce energy costs and emissions by 10.0 to 30.0 percent without sacrificing occupant comfort.

Source: Frost & Sullivan analysis.

Description of the Solution

- SClenergy cloud™ is a cloud-based energy management platform that is able to process the volume of data that is generated by many buildings to provide actionable insights on a near-real time basis.
- SClwatch® is a predictive diagnostics and analytics platform that acquires data from the BAS at the sensor level and uses engineering calculations and artificial intelligence to offer early detection of system faults, reducing energy consumption and preventing damage to the building's critical equipment.
- SCltrack™ is a real-time demand and consumption tracking tool that uses model-based analytics to compare historical energy consumption and employs statistical techniques to provide actionable recommendations on energy use.
- Intelligent Retro-commissioning™ (iRCx) starts with an assessment of the building and uses the other solutions to identify energy efficiency projects. A combination of SCltrack™ and iRCx™ provides electronic measurement and verification to confirm savings and ensure accountability for energy conservation measures.
- By using SClenergy solutions, end users can reduce energy costs by an average of 10.0 to 20.0 percent.

Source: Frost & Sullivan analysis.

EfficiencySMART

Description of the Solution

- EnerNOC's EfficiencySMART Plan helps users to define and achieve energy-saving goals, improve the building's footprint, or meet short-term goals that address critical energy needs.
- An EfficiencySMART Audit helps users identify measures to reduce energy use and operating costs across a campus or a specific building.
- EfficiencySMART Assessment provides users detailed recommendations for energy savings, reductions in demand, reductions in energy intensity through operation and maintenance activities, equipment upgrades, change of behaviors, and use of new technologies.
- EfficiencySMART Commissioning services ensure that buildings are running at maximum efficiency by conducting full site reviews, identifying main sources of energy consumption, and analyzing equipment performance.
- EfficiencySMART Insight offers rich functionality for energy profiling, benchmarking, and fault detection, and presents information in easy-to-use dashboards, reports, and alerts. It can be deployed at the meter level or integrated with the BMS. By deploying EnerNOC's entire enterprise solutions, end users can obtain energy savings of over 25.0 percent.

Source: Frost & Sullivan analysis.

SeriousEnergy Manager

Description of the Solution

- SeriousEnergy Manager is a Web-based, software-as-a-service (SaaS) platform that results in a lower capital investment because there are no software and servers to install, manage, or maintain.
- It offers advanced analytics that identify any variances in energy usage over time and detects and controls equipment performance in real time.
- SeriousEnergy Manager also provides users with actionable data to continuously optimize the overall building energy performance, as well as measure and verify the impact of energy efficiency improvements.
- Its dashboard provides real-time information and can be customized for an unlimited number of users according to their specific preferences in order to display the information they need the most.
- The solution allows users to set a budget for an entire building, a specific area, or an entire portfolio, and easily track budget vs. actual vs. forecasted energy usage over time.
- By using SeriousEnergy Manager, end users can reduce energy consumption by 5.0 to 20.0 percent.

Source: Frost & Sullivan analysis.

Conclusion



Conclusion

1

The energy information management market is an emerging sector that is constantly evolving.

2

The potential cost savings that these solutions can provide, the volatile energy prices, and the need to comply with emerging standards for energy management, as well as growing concerns about protecting the environment, are the key drivers.

3

However, the initial investment, the confusion in the market caused by the wide range of solutions and the false claims that have been made by some vendors, increasing competition, and the lack of awareness about the capabilities and benefits of these solutions are limiting growth in the market.

4

Because buildings account for a large share of all energy use in the United States and buildings' energy use is responsible for 8.0 percent of the world's carbon dioxide emissions, energy conservation in buildings has become a priority.

Source: Frost & Sullivan analysis.

Conclusion (continued)

5

The key to energy conservation is to be aware of how and where the energy is being used, as well as identifying the greatest opportunities to save energy.

6

The main benefits of energy information management solutions include improved energy efficiency, optimal building performance, operational savings, and reduced impact on the environment.

7

The main challenge that energy information management solutions must address is the ability to bring all of the energy-related information together so that it can be analyzed, monitored, and interpreted to ultimately enable users to make decisions about their energy consumption.

8

Efforts such as the Better Buildings Initiative, the Greener, Greater Buildings Plan, and Energy Star are likely to continue to drive demand for energy information management solutions.

Source: Frost & Sullivan analysis.

Conclusion (continued)

9

Currently, only a small percentage of the buildings in North America have an energy information management solution that goes beyond meter reading and basic reporting.

10

However, the number of buildings that are using energy information management solutions is expected to increase in the next few years as the analytics improve and the need to conserve energy continues.

11

As numerous companies, including BAS vendors, continue to enter this market, adoption is expected to rapidly increase. By 2020, a significant percentage of facilities are expected to have an energy information management solution, with 15.0 to 20.0 percent of them having a more sophisticated solution.

12

By using an energy information management solution and implementing changes to address energy efficiency issues, facilities can expect to achieve savings of 30.0 percent or higher.

Source: Frost & Sullivan analysis.

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The Frost & Sullivan Story



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