The Key to Cost-Effective and Sustainable Buildings: Intelligent Energy
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### ABOUT FROST & SULLIVAN

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The Rapid Emergence of the Intelligent Energy Concept

For several years now, energy demand has been growing faster than supply, which means that for any level of sustainability to be achieved, there is a clear need for more efficient generation, delivery, and consumption of energy. Put simply, the world is using too much energy and using it inefficiently.

The leading-edge energy solutions of today combine additional generating capacity – including from new and renewable sources – with better efficiency of usage. Digital intelligence, commonly referred to as smart technology, has an enormous role to play in nearly all elements of this solution. On the supply side, the challenge is to efficiently modernize supply networks while incorporating a more diverse portfolio of energy generating technologies; while on the demand side, there is a huge opportunity to optimize consumption at the point-of-use. With today’s technology, the world could operate with the same level of functionality and comfort using 30% less energy.

The energy industry has woken up to the fact that intelligent digital technology can improve energy efficiency throughout the chain from the point of generation to the point of consumption. In a smart solution, digital intelligence overlays the electricity generation, transmission, distribution, and management infrastructure with communication and computing infrastructure that enables data collection and device control for energy measurement and management, efficiency, reliability, safety, and cost control.

Buildings are responsible for more than 40% of the world’s total energy, with heating, cooling, and lighting being the largest energy users, and account for approximately 25% of the world’s CO₂ emissions. New buildings that use more energy than necessary are being built every day and millions of today’s inefficient buildings will remain standing in 2050.
The innovators in the market are bringing practical solutions to everything from smart grids and industrial processes, to building management systems, to smart meters and sensors for the home. All of this will create savings for customers from the largest utilities to the smallest consumers.

But above all, enormous improvements can be made rapidly, using technology and expertise that already exists today.

We believe that the world today is on the cusp of moving into the era where intelligent energy use becomes the focus of energy efficiency from the utility plant to the plug. The technology to do so already exists and will make a rapid and significant impact on the way global energy is managed.

Global Energy Consumption at Point-of-Use (World), 2010

- Transport 26%
- Households 29%
- Ind & Comm 33%
- Services 9%
- Other 3%

Spend Segments:
- Water Heating 13
- Ventilation 8
- Heating 20
- Lighting 32
- AC & Cooling 12
- IT Equipment 4
- Other Equipment 2

Note: 'Other' includes construction, agriculture (including greenhouses), and fishing;
'Services' include leisure, commercial services, and data centres.

Source: Frost & Sullivan
Customer Challenges and Market Drivers

Everyone knows the saying that if something cannot be measured, it cannot be managed, and ultimately cannot be improved! By using better data collection to identify and manage performance improvement, Frost & Sullivan supports the notion that almost all commercial buildings and industrial processes have an average energy savings potential of 20-30%. If one can access, monitor, and control data and equipment, the benefits are numerous. The more information one has, the easier it becomes to problem solve, optimize energy, and enhance our comfort levels.

With core building functions representing approximately 40% of the global energy consumption, the opportunity for Internet connectivity of products that are able to enhance our degree of control, either remotely or at point-of-use, is massive.

Investments in generation, transmission, and distribution will be crucial when defining and upgrading the electricity supply systems of the future, but it is ultimately the intelligent management of energy consumption in smart buildings or smart homes that will allow the grid to make real savings.

With increasing energy prices and the growing pressure to become truly energy efficient, there comes an increasing demand for managing the entire building as an integrated system. A smart building allows owners and building managers to optimize the potential benefits and savings when equipment associated with different building systems (e.g. HVAC, fire, and security) and/or buildings are put together into one consistent automation and control system.

However, despite compelling business cases and available technology, the move toward converged intelligent solutions among energy users on a large scale has often created challenges for customers seeking flexibility, independence, and a truly integrated solution.
Regulation is Pushing Energy Efficiency Worldwide

Globally, several forces are at work to increase the energy efficiency of buildings and industry. Legislation will oblige businesses and individuals to implement minimum levels of good practice or face penalties. Investing in energy-efficient equipment and energy efficiency improvement plans is becoming an obligation, not an option, as countries implement regulations and incentive plans with financial impacts that cannot be ignored.

Both government and non-government organizations are working toward the goal of reducing energy use, pollution, and greenhouse gases. They are creating programmes that support these efforts by providing information, incentive proposals, and resources to help push companies toward an overall reduction of energy-related operating expenses.

All sectors recognize that regulations will impact not only new construction and installation, but existing buildings, industry, and infrastructure as well.

Frost & Sullivan research on customer behaviour related to energy efficiency has confirmed that the issues are primarily around human behaviour, finance, personal motivation, and knowledge about the opportunities that exist. Legislation and education can play an important role in influencing any energy efficiency related upgrade process. However, no piece of legislation on its own is yet capable of driving market conditions.

1. Open Architecture: The Crucial Growth Enabler

An intelligent energy network borrows concepts from the Internet such as the linking of products and systems to create a web of components that communicate with each other in real time.

The solution for achieving a genuinely energy-efficient enterprise is interoperability, which is developed when the components associated with the variety of systems, regardless of manufacturer, 'speak to each other' and work together flawlessly toward complete operational efficiency.

However, throughout the last decade, the prevalence of proprietary protocols has failed to provide the desired openness and slowed down market development. Open architecture is a key enabler for the adoption of the smart building models, which, in turn, is essential for the link and creation of the smart grid.
An open architecture sets communication protocols that allow building control systems from various vendors to exchange information, synchronize equipment, and achieve optimum building performance. While in the past all protocols were proprietary, nowadays an open protocol is turning into the technology of choice, offering a high level of energy management and efficiency potential. Open architecture enhances control and simplifies everything!

Traditionally, the downstream energy-consuming devices such as HVAC, lighting, or access control operate separately. When systems from different manufacturers are not compatible, facility owners face a difficult task if they want to improve the performance of their premises. When equipment from different vendors needs to share information, gateways are required. This also creates a need for customized software and hardware with a considerable cost and time investment for installation and maintenance.

The synergies possible with integrating isolated systems increase the number of strategies available for managing disparate products and reducing energy consumption. End-users can choose the best available options in terms of investments and functionalities, and get the most out of their control systems to achieve a more energy-efficient, cost-efficient, and greener building. Additional benefits include single-user interface, reduced training and maintenance costs, and having a future-proof system with more flexibility for planning as the organization grows over time. Systems based on open communication standards add genuine value to the building and the enterprise.

2. Changing Customer Behaviour: The Key to Real Efficiency

The most successful energy management solutions are designed to create real changes in the way that energy is managed and consumed by facilities. This requires genuine behavioural shifts and a clear understanding of the actual investment necessary to move away from long-established practices.

The challenge for vendors in this market is to bring a solution to the customer that they can quickly relate to and that enables them to easily change their behaviour and attitude to energy management. Without the need of major investments, an intelligent energy management system turns passive energy use into active energy optimization by offering customers the control they desire and the savings they require.

At the downstream end of the energy cycle, the critical point is the convergence between the automation system, the digital intelligence, and the energy infrastructure.
While traditionally installed systems allow for enhanced interoperability and control at point-of-use, end-users are not always aware of their system capabilities and tend to make choices based upon outdated solutions. Frost & Sullivan research has shown that in the office sector less than 30% of offices are planning to invest in energy efficiency solutions in the near future because they feel they will not realize direct benefits in terms of saving potential.

In smart buildings, intelligent management and control solutions include the convergence of building and energy management with security, fire and life safety, communication systems, IT server rooms, machine automation, and vertical specific applications to create a highly adaptable, sustainable, and cost-effective building.

Today, energy management remains a passive activity in many instances, restraining the large-scale engagement of intelligent solutions.

Also, although environmental concerns such as the reduction of carbon footprint are gaining importance as a driver to energy efficiency upgrades, the main reason customers are making changes is still cost reduction. Reduced life cycle costs and a relatively short payback period are a must.

Most important, industry leaders are those that are proactive and ahead of the curve by optimizing their efficiency, rather than waiting for regulations or extreme energy costs to force the issue.
Overcoming the Challenges: Schneider Electric from Power Plant to Plug

In direct response to the massive potential for efficiency improvements throughout the energy cycle, Schneider Electric has created a solution through the use of intelligent energy management. The Schneider Electric approach is built on the convergence of digital intelligence with the products, technologies, and expertise from across the company focused on applications in utilities, industry, buildings, data centres, networks, and residential homes.

Designed around an open architecture to facilitate systems integration and interoperability, the company has expanded during a period of targeted, strategic acquisitions and a historically strong product range to become The Global Specialist in Energy Management™. Schneider Electric uses the term from Power Plant to Plug to define its comprehensive solutions package that covers the entire energy cycle from the point of power generation to the point-of-use. The results of this strategic transformation have clearly demonstrated that the company has made the right decisions. Schneider Electric revenues have continued to increase through a period of financial crisis. They believe that new market opportunities will ultimately create a category of technologies and services that deliver intelligent energy.

EcoStruxure: The Active Energy Management Architecture for Integrated Systems

On the premise that you can’t manage what you can’t measure, Schneider Electric has developed its own architectural approach to deliver actionable data to drive energy efficiency, security, and improved business results. This approach is the foundation of the company’s intelligent energy management offering and is entirely scalable, as well as being appropriate for both new build applications and retrofits in all markets. Schneider Electric will accelerate its drive to address end-user needs for customized solutions with strong energy efficiency benefits.

EcoStruxure: Active Energy Management Architecture from Power Plant to Plug is the Schneider Electric integrated system solution – a suite of proven hardware and integrated software programmes that address the design and management of the energy systems. The EcoStruxure approach uses software to measure, control, aggregate, and animate the energy data flowing from all components within the architecture, displayed through one dashboard. As an umbrella platform, it is designed to support the convergence of Schneider Electric key domains of expertise: Power Management, Process and Machine Management, IT Room Management, Building Management, and Security Management. In all of these areas, the company is able to offer complete systems integration by providing solutions from complex enterprise level systems down to individual hardware components.

By recognizing the technology convergence in the industry, Schneider Electric has also recognized the convergence of competition and seeks a position of leadership at the very point of convergence. This necessitates demonstrable skills in the field of IT and communications as much as in Schneider Electric core fields of power and automation.

The launch of EcoStruxure in 2009, in the company of strategic partners such as Cisco®, IBM®, and Microsoft®, clearly demonstrates the Schneider Electric commitment to a converged solution.
Energy University: Thought Leadership and Customer Education

Although the technological capabilities are well established, awareness among customers about intelligent energy management remains relatively low. Schneider Electric created Energy University, an e-learning website, in response to the need for education and awareness on all levels of all organizations.

Using an e-learning platform to enable easy remote access, the Energy University site addresses the issues surrounding human behaviour, financial positioning, and personal motivation and knowledge of energy management and issues, and is intended to raise the capability of individuals regarding the energy efficiency topic. Promoting a vendor-agnostic approach, Energy University is not only focused on creating business opportunities for Schneider Electric, but also on raising global awareness of energy issues among users.

Energy University includes information about regulations and public policy, business collaborations, innovative technologies, and public education. Schneider Electric is on a quest to drive this change through education and services that will help you Make the Most of Your Energy®.

The Hive: Real-Time Energy Management in Action

The new Schneider Electric global headquarters in Paris, France is one of the best available case studies of intelligent energy in action. Demonstrating its commitment to thought leadership and energy efficiency, the company’s headquarters optimizes its energy consumption and choices while ensuring user comfort with the deployment of EcoStruxure architecture throughout the 35 000-square-meter building.

The company has boldly set out its vision for technology leadership by naming its headquarters the Hive (Hall de l’Innovation et Vitrine de l’Energie).

The Hive has High Environmental Quality (HQE) and High Energy Performance (HPE) certification.
As a case study in Schneider Electric innovation for both its customers and its own staff, the Hive has several hundred dual presence and luminosity sensors so that lighting, shutters, and air conditioning in each office can be regulated as efficiently as possible, as well as shut off in case of absence. Individual employees are made more responsible for energy use by means of a computerized system that displays actual performance of the building in real time.

The Hive had an energy consumption (at RT standard perimeter) per square meter per year of 121 kWh in its first year of operation (2009) and the company is targeting 80 kWh per square meter in 2010. This sharp reduction is made possible through the analysis of data brought by the pervasive submetering throughout the building. More than 150 submeters have indeed been installed at the origin, all connected to the advanced building management system. This is to be compared with the company’s previous home (set across seven buildings) which had a consumption of 320 to 350 kWh per square meter per year. Furthermore, the advanced automation system has allowed the company to reduce maintenance by 30%.

The quest for lower energy consumption is not finished. Several steps are further planned:

- installation of 400m² of photovoltaic panels on the roof
- individualized energy dashboards for occupants, with choice of scenarios
- fine-tuning of air conditioning operation, taking into account weather forecast

With 1700 people working at the Hive, it is an example of what can be achieved with intelligent digital technology to raise the level of automation in a commercial building, as well as a view of what more and more offices will look like in the future.

By applying the four-step process of measuring, fixing the basics, automation, and monitoring, Schneider Electric ensures that there is an efficient use of natural resources, which is not only profitable, but also better for the environment. It is set to be the first commercial building in France to reach all three following standards by Q3 2010:

- HQE – exploitation (HQE in operation)
- ISO 16001, the newly published (July 2009) standard
- ISO 14001
Conclusion

Global growth in energy demand needs more than just extra capacity. It will require more efficient usage and a rethinking of the way energy is managed.

Intelligent energy management offers today’s greatest opportunity for energy efficiency. From the point-of-use, intelligent demand systems will be a significant enabler to allowing the smart grid to make real energy savings throughout the network.

Schneider Electric has created a Power Plant to Plug solution to enable customers to rapidly realize marked improvements in energy efficiency in terms of usage, cost, safety, and environmental impact. With the EcoStruxure Active Energy Management offering, the company has directly tackled one of the most important challenges in the market by delivering a platform for driving systems integration. The interoperability allows customers to obtain actionable data from any point in an energy network. This enables the sharing of operating data between systems and the measurement of the energy use throughout a facility.

The company’s unique approach confronts both optimized energy management and the long-term changes in customer behaviour that are required to make any outcome effective and sustainable. The dedication to customer education, support, and thought leadership is evident in the Schneider Electric Energy University programme, which has the specific goal of helping you as a customer Make the Most of Your Energy through education.

The Schneider Electric intelligent energy management solution is a truly integrated approach based on real technological expertise and leadership. The company maintains a leading reputation in the industry across the entire energy cycle.

The company’s unparalleled portfolio includes a broad, synergistic lineup of products, systems, and services and its solutions help customers reduce costs, stay connected, and tap into a secure and uninterrupted power supply. With its repositioned business portfolio, Schneider Electric is well positioned to respond to the 21st century’s challenges of producing more energy, more efficiently.
ABOUT FROST & SULLIVAN

Based in Mountain View, California, Frost & Sullivan is a global leader in strategic growth consulting. This white paper is based on Frost & Sullivan’s ongoing strategic research into the Energy and Power Supplies industry. Frost & Sullivan regularly publishes strategic analyses of many markets related to products and services in the field of energy production, distribution, and management. Frost & Sullivan also provides custom growth consulting to a variety of national and international companies.

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