



Activate an Efficient &
Sustainable Future

Life Is On

Schneider
Electric

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Life Is On





Executive Summary

The days of a procurement officer working alone to sign long-term energy contracts are drawing to a close. Same with an operations manager deciding to pursue an LED lighting retrofit project. Or a sustainability director who enters into a power purchase agreement (PPA) with a wind developer.

And it's not because there's no value in these pursuits. They each have immense worth. But they can be so much more transformative when they are managed as a cohesive strategy.

In fact, the returns are greatest when the procurement officer, operations manager and sustainability director collaborate. Together, they may decide on-site generation with storage, critical infrastructure upgrades and a multi-faceted efficiency program will drive the greatest savings and operational resiliency while helping the company make significant strides toward its climate commitments. Procurement also gets an option of energy sources and flexibility, and can make buying decisions based on price- and carbon dioxide (CO₂)-reduction targets.

The Challenge

As energy-related concerns grow, leading companies are changing how they buy, sell, use and track electricity, natural gas and other resources. Combined management of these activities gives companies a holistic view of their performance — and access to the data they need to refine their strategies to drive innovation.

By reducing energy consumption and environmental impact, these companies create real-time and long-term savings, as well as a competitive advantage in the marketplace.

Creating New Opportunities with Integrated Decision-Making

Given increasing regulatory and competitive pressures, and calls from shareholders, customers, and employees to operate with a lighter environmental touch, many companies are at a crossroads. They must re-evaluate their strategies and develop new operating models. It is not enough to plan and complete a few projects to reduce energy costs, consumption and carbon emissions.

Though these initiatives must be considered together to deliver maximum benefit, they often are managed independently due to departmental divisions. These barriers often promote inefficiencies and yield missed opportunities. And they are often fueled by inconsistent data and poor visibility across the organization.

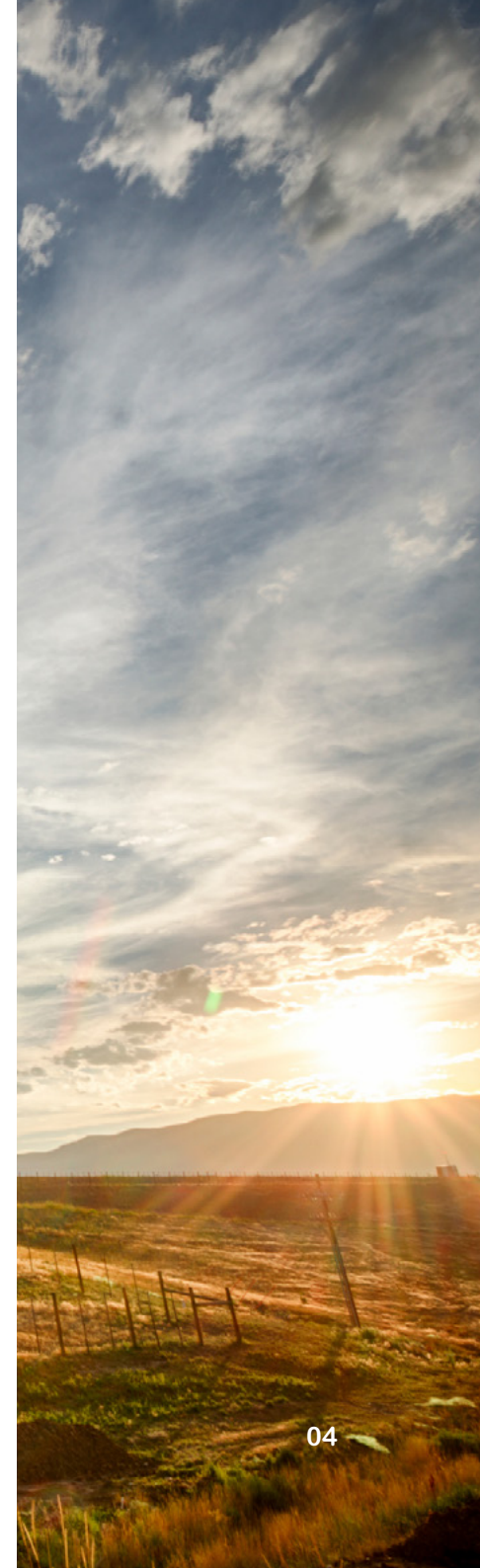
Energy and sustainability initiatives must be considered together to deliver maximum benefit

In leading companies, these departments are becoming tightly integrated, and work together to support the company's strategic goals and initiatives. It's an era when organizations are discovering new efficiencies and finding new energy management and sustainability opportunities.

Progressive companies are already laying the foundation for this reality and its subsequent rewards. It starts with smarter data collection and access to more real-time information. It's even growing to include on- and off-site renewable energy procurement, predictive analytics for greater efficiency, increased automation and control of facilities, microgrids for increased resiliency, and much more.

As energy prospects become more diverse, savvy companies have taken a different, more strategic approach to capitalize.

This is the Active Energy Management (AEM) movement. In fact, whether it's intentional or not, most organizations – even those with developing or more traditional programs – are already on this path. That's because the trends driving the evolution are universal, and impact business in all sectors.





Data is Key to Integrated Decision-Making

Leverage new active energy management opportunities with reliable data collected from across energy and sustainability departments, and integrated in a globally accessible platform.



Capture
Global data



Invoices

€/£/\$

Financial



Invoices



Business Metrics



Consumption



Market



Weather



Combine
Global data
single platform

- Existing data sources to maximize value
- Harmonize complex and differing data sets
- Translate and provide local context



Validate
Ensure data
Integrity

- Identify and resolve data gaps, peaks, anomalies
- Improve data quality and accuracy



**Analyze
& Act**
Facilitate
decisions
& actions

- Improve forecasting and purchasing decisions
- Benchmark performance
- Save money

Transforming the Energy Landscape

Transforming the Energy Landscape

Advances in energy markets and technologies have given companies more control in three ways:

- How they consume energy
- How much that energy costs
- How that energy is sourced

In the midst of this paradigm shift, energy demand continues to increase, with a notable shift towards electricity as the primary source.

In fact, electricity consumption is projected to grow twice as fast as all other forms of energy consumption. This rapidly rising demand applies pressure to many utilities and businesses to increase energy efficiency and self-generation initiatives.

As businesses embark on their individual journeys toward this new energy landscape, three powerful trends are worth a closer look.



Decarbonized

93% of CEOs see sustainability as important to future success



Decentralized

70% of new capacity additions will be renewables by 2040



Digitization

50 billion devices will be connected by 2020



Decarbonized

Pressures from consumers, investors, and regulators have caused companies across the globe to dedicate more time and resources to reduce their environmental impact. Further supporting this growth are regional and global regulatory initiatives such as the European Energy Directive (EED) and Paris Agreement. Perhaps more importantly, similar pressures have increased the desire for public disclosure of energy and sustainability practices to increase corporate transparency and accountability.

And, the results already are apparent as the renewable energy market is set to grow substantially over the next 15 years. Consider:

- The average cost of wind power has plummeted 60 percent since 2009, falling below \$20 per megawatt-hour in many markets.
- Four-fifths of companies are planning to build out their renewables portfolio with multiple types of transactions (e.g., off-site PPAs and on-site installations).
- By 2030, investment in renewable generation is expected to outpace fossil-fueled generation by 60 percent.

Declining renewable energy costs along with increasing outside pressure have created a unique opportunity: true collaboration between sustainability, energy efficiency, and energy procurement teams to develop an integrated renewable energy strategy.

Renewable capacity
expected to reach

60%

total investment by
2030



Decentralized

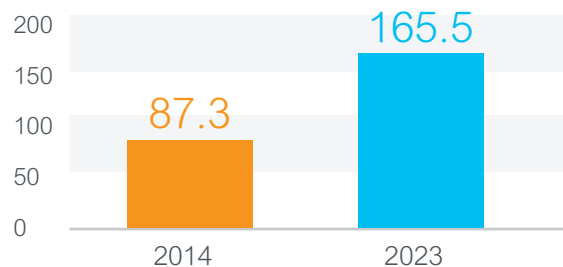
Right now, electricity is generated primarily by large power plants. These plants are owned and operated by utilities or other independent power producers. This centrally generated electricity is then distributed across country or state-wide grids of transmission and distribution lines, and substations. However, an increasing number of companies are taking advantage of distributed energy resources (DERs).

DERs can include technologies such as:

- On-site solar panels
- Combined heat and power
- Fuel cells
- Batteries

As DER technologies improve and costs continue to decrease, the grid will evolve. The electricity grid of the future will be comprised of many small, decentralized microgrids that give customers greater control over the source of their electricity and greater reliability. In fact, 57 percent of consumers have considered becoming power self-sufficient and new distributed generational capacity will exceed new centralized capacity as early as 2018.

Global DERs Market (MW power/year)



Source: Navigant Research



"New distributed generation capacity expected to exceed new centralized capacity as early as 2018".



Digitized

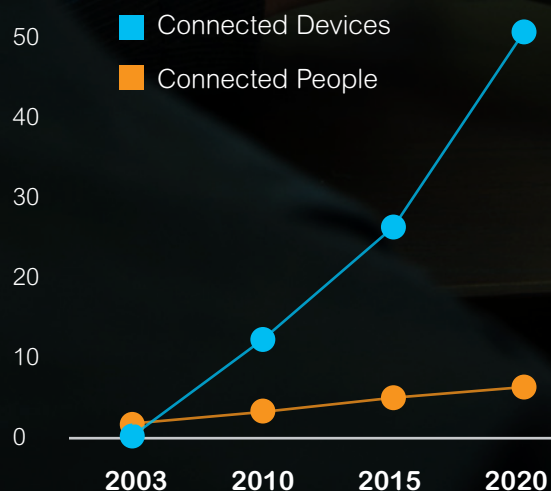
The Internet of Things (IoT) takes hold, will bring unprecedented interconnectivity to everything from the power plant to the plug and improve the generation-to-consumption value chain. And it is not only the number of connected devices that will increase, but also the granularity of the data, which means the volume of bits and bytes will skyrocket.

As a result, organizations will have access to more and increasingly precise data. Energy and sustainability teams will be able to:

- Plot and visualize the impact of energy utilization at a portfolio level.
- Make changes to loads in real time to avoid costly peaks.
- Make better use and purchasing decisions in response to real-time grid signals.
- Run simulations to understand the long-term impact of initiatives against targets.
- Improve efficiency by controlling consumption in real time in response to changes in weather, occupancy, and production scheduling.

A world that is more digitized, decentralized and decarbonized is pushing business toward true convergence and the reality of active energy management. The practical implications are significant. Companies can use data, technology, and innovation to develop new strategies to reduce CO₂ footprints, improve resiliency and create new cost-reduction opportunities.

Internet of Things will connect 50Bn devices by 2020



Source : Cisco, Internet World Statistics

A woman wearing a white hard hat and a red and black plaid shirt is working on a complex industrial system. She is adjusting a red-handled valve on a large, horizontal pipe. The system is composed of various pipes, valves, and large cylindrical components, some of which are painted blue and green. The background is dark and industrial, suggesting a factory or power plant setting.

Looking to the Future

So what might an active energy management future look like as businesses move closer to convergence across the domains of energy supply, energy efficiency and sustainability?

Here are four examples of the impact of the convergence of energy and sustainability

Looking to the Future

①

Energy Becomes an Asset, Not a Cost Center

Historically, many companies viewed energy as a fixed cost to maintain ongoing operations. However, as markets decentralize, organizations that tap into the grid can consider partnering with other participants. For example, one company buying energy from one utility isn't the only option.

Meanwhile, grid operators are looking to businesses to help maintain grid stability. These factors have caused new opportunities to emerge:

- New strategies that combine energy procurement, efficiency and load balancing reflect the idea that energy is a variable resource and thereby a valuable asset.
- Utilities incentivize companies to actively manage load with price and demand-response programs.
- Microgrids as a part of a company's energy portfolio can create revenue opportunities, as well as increase reliability by reducing risk and operational impacts tied to outages.



Price- and load-response mechanisms are well established in many global markets, and new markets for fast response frequency and voltage regulation are emerging. Such programs help operators maintain grid stability. "Regulation services" are required by grid operators to ensure a consistent grid frequency over very short time intervals. Companies with batteries or other types of responsive load can sell this service to grid operators to achieve a return. Forward-looking companies can adopt this new technology and capitalize on these emerging opportunities.



Ron Taglieri
Schneider Electric
Vice President of Americas Operation

Other trends suggest the era of energy as an asset is on the immediate horizon. The number of businesses that view reliability as a critical component of their risk management strategy is growing. North America, especially the U.S., is the center of a microgrid market expected to reach \$40 billion annually by 2020 with a capacity of 4.1 gigawatts.^[1] That's enough power to meet the peak demand of more the 2 million homes.

The ability to generate revenue by responding to grid signals in real-time will become a competitive advantage.

"Companies that see energy as an asset can reduce their operating costs, and potentially create new sources of revenue that can positively impact profit margin."



The Future Is Now

Utility enables business to capitalize on energy investments

Non-Wires Alternatives, USA

Con Edison provides electric service in and around New York City and is a pioneer in pursuing non-traditional means to ease system overloads. Its "Non-Wires Alternatives" project has helped the utility avoid building substations and related infrastructure — upgrades priced at \$1 billion. Instead, Con Edison is solving grid stress issues by developing \$200 million in DERs with incentives for commercial and industrial customers. These incentives will help spur investments in new technologies, such as battery storage and renewable generation.

Campus leads the way in balancing energy production and consumption

IMT University, France

This French vocational school is an active energy management forerunner. The school has a microgrid connected to a local smart grid and monitors activity at a building level in real-time. The school has tested multiple energy management scenarios based on consumption, production and storage, which it can apply to optimize renewable energy supply and energy use in facilities.



The Future Is Now

Capacity costs make up approximately 25% of a customer's total energy spend. PJM and other independent system operators in the U.S. pay customers incentives to trim demand during their peak load contribution (PLC). This approach delivers benefits throughout the year by reducing the capacity line item on their monthly bills. Customers that monitor and control their load during specified intervals can significantly reduce their overall energy costs. For example, an industrial customer saved \$500,000 per year by reducing its PLC.

Blockchain (a distributed, digital ledger used to facilitate transactions without a governing authority) applications related to decentralized energy distribution are gaining traction. Thanks to this technology, in the future, it may be possible for companies to generate solar power and sell a certificate for that energy. This development may open up the renewable energy market and create grid independence.

All of these trends mean that, in the near future, companies will need to make decisions based on price to increase reliability, decrease spend, and create new revenue streams — or sacrifice competitiveness.

To do so, organizations will need to put new energy control systems in place.

- Enterprise-wide energy production, purchase, and consumption strategies need to be considered together in order to take advantage of new financial incentives.
- Businesses with on-site distributed generation will need to coordinate how much energy they purchase from the grid so they don't overbuy.
- Energy procurement teams need to ensure they have the data from operations teams to negotiate the right quantity, price, and contract structure for this supplemental energy.

A well-coordinated strategy between departments is essential before DERs are added to a corporate energy mix. This strategy must factor in energy procurement and reliability.

Today	Future	Benefit
Energy a fixed cost	Energy an asset	New revenue streams
Reliance on traditional grid	Microgrids and block chain technology enable grid independence	Competitive advantage through reduced costs, increased reliability
Historic tracking of missed financial incentive opportunities	Automated response to price signals	Reduced costs, additional revenue streams
Companies use renewables to meet public sustainability goals	Renewable energy enables energy as an asset	Reduced energy costs

2

IoT Drives Connection of Software and Devices

Digitization has created unprecedented global connectivity between companies' sites. Next comes the hard part:

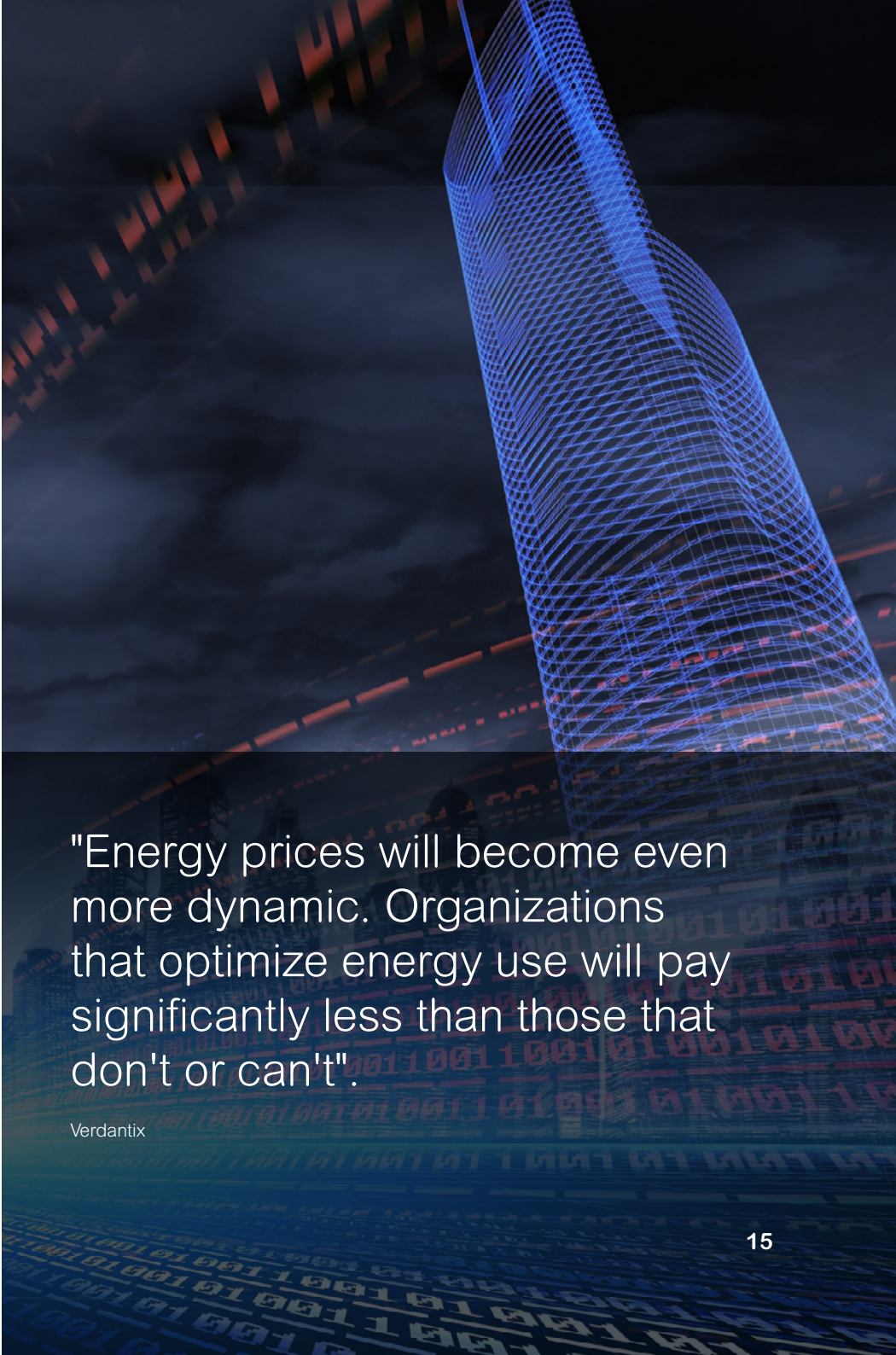
- Connecting vast amounts of data from each site in a global enterprise.
- Making it accessible and easy to understand.
- Using it to drive efficiency and savings.

The convergence of information technology and operational technology are advancing energy efficiency and sustainability. Forward-looking companies are already harvesting the data available at each layer of their organization.

Companies now have access to numerous smart devices for their facilities. And as the penetration of smart devices increases, so will the volume of data generated. That means more and more systems will be managed in the cloud, enabling customers to tap into the power of big data through remote analytics.

Along with the data richness of IoT, advanced analytics in energy management will allow companies to become less reactive and more proactive. Rather than monitoring then reacting to issues, analytics will give companies expanded scheduling, planning, and simulation capabilities, which will allow them to predict and prevent problems, reduce downtime, and increase reliability. While it may be possible to take a "wait and see" attitude for a short time, the advantages are already being realized.

Competitors embracing this technology have the opportunity to create a hard-to-replicate advantage and meet their profitability and environmental targets.



"Energy prices will become even more dynamic. Organizations that optimize energy use will pay significantly less than those that don't or can't".

Verdantix



70%

of business decision-makers see value in IoT and believe it will have a profound impact on their companies

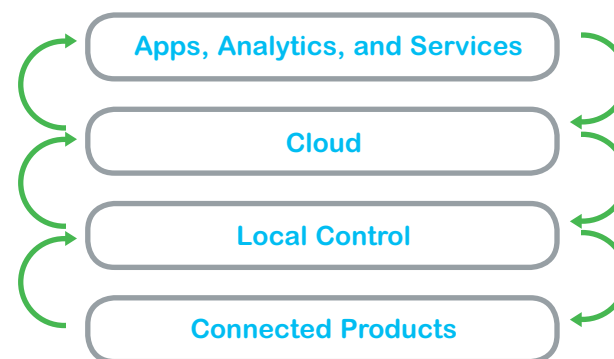
Schneider Electric IoT Survey

Looking to the Future

The potential use cases for IoT within corporate energy and sustainability management is almost limitless. Layering advanced analytics on top of data captured will enable firms to:

- Optimize energy consumption at facilities based on occupancy, production scheduling, weather forecasts, and other factors.
- Reduce costs by predicting peak demand periods and activating demand-reduction strategies during those periods.
- Deploy predictive asset management strategies that reduce equipment downtime and the total cost of asset ownership.
- Incorporate more data within cost and consumption forecasts, and facilitate scenario planning based on conditions that impact operational costs and investment decisions.
- Increase revenue from energy generating assets by selling excess capacity back to the grid or by using back-up generation as reserve capacity with no risk to business continuity.

IoT in Action: Internet-connected products and devices are controlled at the local facility level and send data to the cloud where real-time data is available for analytics.





The Future Is Now

Smart thermostats and smart-plug devices in small commercial sites can provide load control capabilities enabling demand response.

Connected lighting systems can be configured and set to dim automatically in response to real-time price signals from the grid, delivering savings back to customers such as hotels, or retail and office buildings. Connected systems can be controlled remotely allowing unlimited flexibility.

Sensors, actuators and other control devices in process lines can detect anomalies and signal preventative maintenance, helping avoid catastrophic and costly failures. These same sensors and control devices can be used to modify process lines in response grid signals.

IoT-enabled battery storage or plug-in electric vehicles can be configured to charge when grid prices are low, and sell energy to the grid when prices are high.

Today	Future	Benefit
Some devices send data	Many more devices, new data types, more data granularity	Uncover new opportunities to save resources and costs
On-site siloed software systems	Single source of data across enterprise, data connected at every level of the organization	Better benchmarking, accuracy, and visibility
Resource constraints limit ability to analyze and get value from data	Software alleviates data processing burden from humans allowing them to focus on particular analysis or alerts	Humans can better use their time to focus on top priorities, filtered by machines

3

Strategic Sustainability Delivers Value

Technology drives ROI of sustainability initiatives

Thanks to maturing technology, companies' can buy utility-scale green energy at a lower price than ever before. With the ability to access an eager commercial market, renewable developers are driving new capacity additions to meet consumer demand. In a recent survey, 76 percent of respondents said "an attractive ROI" and 59 percent said "limited exposure to energy price variability" drove their investment in renewable energy ^[2].

As more companies seek renewable options, prices will continue to drop, becoming competitive to, or more attractive than traditional brown power.

Eco-systems and supply chains come together to form sustainable partnerships

As larger firms deploy coordinated strategies and see the business benefits of active energy management, they are turning attention to their supply chains. By supporting suppliers to help mitigate risks and improve resiliency, suppliers can then reduce costs and pass through the savings from improved efficiency.



Taking Active Energy Management to the Supply Chain

A leading life sciences client is taking active energy management to its supply chain, spearheading initiatives to create more synergies between energy supply, demand and sustainability. 40 percent of its key suppliers and partners carbon footprint comes from their supply chain. By helping its supply chain improve, the client hopes to meet its goal of reducing carbon emissions in the value chain 25 percent by 2020, and become carbon neutral by 2050.

40% of the company's carbon
footprint comes from its
supply chain



For example, Walmart, Apple and other prominent brands are moving from reactive to proactive energy management models, and putting more pressure on their supply chains in the process. Walmart developed a sustainability index to collaborate up and down its supply chain on projects that improve Index scores to address key hot spots, and have eliminated an estimated 18 million metric tons of greenhouse gas emissions through the initiative. Apple has worked with its suppliers to divert more than 73,000 metric tons of waste from landfills and save more than 3.8 billion gallons of freshwater, preventing more than 13,800 metric tons of carbon emissions.

And this trend isn't limited to the Apples and Walmarts of the world. The entire retail industry is under intense scrutiny and organizations such as the Sustainable Apparel Coalition provide tools to help the retailers improve supply chain transparency.

"Today's culture of quarterly earnings hysteria is totally contrary to the long-term approach we need."

Larry Fink, BlackRock CEO

In addition, new associations and networks have formed, creating small- to mid-sized business partnerships that pursue renewable and cleantech initiatives. Alone these businesses wouldn't have the buying power to play an active role in the green economy, but together they can clear these hurdles, which further opens and grows the marketplace for everyone.

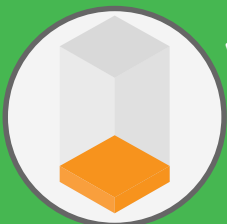
Sustainability drives long-term decisions using a harmonized approach

Almost 60 percent of companies have already integrated sustainability into strategic planning based on a survey of 3,000 executives. CEOs are also taking a long view to ensure a sustainable business [3]. As BlackRock CEO Larry Fink recently said, "Today's culture of quarterly earnings hysteria is totally contrary to the long-term approach we need".

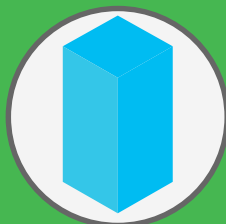
2,500

unique metrics that corporations use for sustainability reporting today

20
Financial
Metrics



vs



2500
Sustainability
metrics

Compared to the 20 common metrics used in financial reporting

The majority of respondents in a recent survey indicated risk mitigation and the potential to add value were the key objectives of a sustainability strategy ^[4]. Most importantly, business benefits are getting sustainability into the C-suite, adding to the widely accepted ethical and public perception advantages. Evidence suggests using resources more efficiently is a strong indicator of superior financial performance in industrial sectors, and companies that have over-performed have taken their sustainability strategies the furthest.

In their current state, sustainability and corporate social responsibility departments are often stretched thin and under-resourced. For example, more than 75 percent of retailers have a sustainability team of 3 people or fewer ^[5]. And yet, many are still expected to react to market changes and regulations around the globe. Small teams wearing multiple hats is more often the rule than the exception. However, as sustainability becomes a way of doing business, departments across the enterprise will share this responsibility to ensure each area of the business is as sustainable and efficient as possible.

75% of retailers have a sustainability team of 3 people or fewer

Retail Industry Leaders Association

This will filter down to how organizations produce, package and market products and services. After all, to foster sustainable design, companies have to carefully examine the entire life-cycle. Solving the challenge of making products more sustainably often brings with it the reward of increased efficiency, less waste and potential cost savings in every step of the process. This is completely in line with lean principles that many organizations have already adopted — a systematic approach to identifying and eliminating waste through continuous improvement.



The Future Is Now

Living buildings have emerged as a new ideal for design and construction. A living building is defined as a structure that generates its own energy with renewable resources, captures and treats all of its water, and operates efficiently. Buildings can be certified by the International Living Future Institute.

As of September 2015, there were 300 registered projects. But, as the return on investment becomes more positive, the living buildings movement and concepts such as net-zero-energy facilities will continue to grow.



Today, companies collectively track, measure and report on more than 2,500 sustainability metrics that address nearly 600 areas of operation according to the Global Initiative for Sustainability Ratings. Contrast this against the 20 metrics used in standard financial reporting, and a picture of the complexity of energy and sustainability reporting appears.

As consumers and shareholders demand the ability to compare data within and across corporations, metrics will become more consistent and harmonized — requiring better data management and greater transparency.

Today	Future	Benefit
Philanthropic sustainability	Solid business case and science-based targets for sustainability initiatives	New capital easier to get
Risky supply chains	Transparency across supply chain, non-conformers out of business	Risk decreases and sustainable growth is possible
Separate sustainability department	Sustainability embedded everywhere	Sustainability acts as a driver for innovation in lean manufacturing and business process
Unique sustainability metrics, not consistent	Globally accepted metrics, universally reported	Consumers and investors can compare apples to apples

4

New Business Models Remove Financial Barriers

Company leaders are starting to look at the total cost of energy over longer time horizons, both in terms of capital assets and operating expenses. This closer inspection leads to a more comprehensive view of energy — e.g. electricity as a cost of operations is more than the price per kilowatt-hour on an electricity bill.

Realistically, companies must factor in costs that may include:

- Backup generation to maintain reliability and add resiliency
- Maintenance and repair
- Critical infrastructure upgrades
- Personnel, training and safety

When companies add up all the explicit and implicit costs, they may find the actual price of electricity is double or even triple the line item amount on their bill. From this vantage point, the potential return on efficiency and sustainability investments is much greater.

Organizations are actively looking for new investors and funding sources for efficiency and reliability projects. Rather than react as operational needs develop, they develop a strategic plan to guide the implementation of their energy and sustainability management programs.



The Future Is Now

Breaking the mold

Starbucks recently offered the first U.S. corporate sustainability bond. Starbucks will use the \$500 million in net proceeds to enhance its sustainability programs, improve supply-chain management and verify that coffee purchases comply with its ethical sourcing verification.



Bill Brewer
Schneider Electric, Vice
President of Strategy and
Operations

“Looking at new financial models to assess ways to fund energy and sustainability initiatives is creating opportunities for third parties to engage with businesses in meaningful ways.”

Outsourcing energy assets, initiatives, and management can provide alternative models to address program expansion in an ever-changing market. In this energy-as-a-service (EaaS) model, companies receive one bill in exchange for an agreed on level of service. All maintenance is handled under a service level agreement that is either pay-for-service or similar to a performance contract in which costs are covered by energy savings.

While risks and needs must be analyzed carefully, alternative financing models can provide companies with cost-effective alternatives. With the shift to AEM and convergence, EaaS may become a preferred mechanism for companies to manage operations. Even companies with in-house expertise may gravitate toward EaaS as a way to focus scarce resources — time, talent and capital — on other priority objectives. That’s important because energy is a significant line item for many businesses, yet the complexity and expertise required to manage energy and sustainability in-house leaves large cost-reduction opportunities untapped.

With the shift to active energy management and convergence, EaaS models may become a preferred mechanism for companies to manage operations.

New business models like energy-as-a-service (EaaS) mean companies can delegate their energy program and spending to a trusted advisor, allowing them to focus on their core business.

Today	Future	Benefit
Look at energy consumption only	Add in other costs: monitoring, repair, training, updates, equipment life	Make better informed decisions: invest for the long term, not short-term lower expenditure
Fund projects through budgets or purchasing requests	Look at new financial vehicles to finance energy efficiency, reliability, and sustainability operations	Less risk, long term energy pricing, avoid upfront capital investment
React to problems	Proactive	Save money, time

AEM is a smart and increasingly necessary move for businesses. When buying energy is integrated with energy and sustainability management as part of a strategic plan, lower costs, increased sustainability, and more reliability result. The good news: Major technological and societal shifts are providing the means to that end, giving companies a path to reach the summit. For companies that take the long view and get active, the future looks bright.

Sources

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2. PwC, Corporate renewable energy procurement survey insights
3. McKinsey & Company, "Profits with purpose: How organizing for sustainability can benefit the bottom line"
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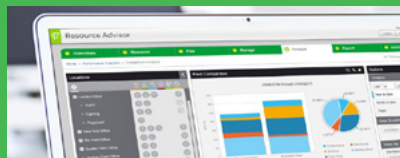


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▶ Expert Perspectives on Energy & Sustainability



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▶ Energy & Sustainability Services



▶ AEG Case Study



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