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## ISO 50001: Setting a New Standard for Energy Efficiency



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## Introduction

Plan, do, check, act. This is the four-step process defined in ISO 50001, “Energy management systems – Requirements with guidance for use.” These four simple verbs are helping to drive commercial and industrial facilities around the globe to new levels of energy efficiency. Adopting this continuous-improvement strategy for energy management can lead to both lower operating costs and a reduced environmental footprint. Successful implementation, however, requires a commitment to the philosophy and process outlined by the standard’s developers.

Adopted by the International Organization for Standardization (ISO) in 2011, ISO 50001 has quickly become a leading influence for facility managers who are planning and managing their buildings’ energy use. Though it’s a voluntary standard, it has received strong

backing from European regulatory agencies, which have made it an alternative compliance path for meeting the demands of two recent continent-wide efficiency directives. In the United States, buildings certified to ISO 50001 compliance also are deemed to meet the requirements for certification to the Leadership in Energy and Environmental Development (LEED) standard, “Existing Buildings: Operations and Maintenance.”

It’s important to remember that ISO 50001 is a standard defining a general process for continuous improvement, but it does not provide guidance on either the methods for performing assessments or the metering and measuring devices needed to assure the accuracy of such assessments. The table below outlines the additional standards related to methods and products.

| Application Assessment Standards  | Methods Standards   | Product Standards   |
|---|---|---|
| ISO 50001<br>Energy Management Systems – Requirements with guidance for use | ISO 50006<br>Energy Baseline (EnBs) & Energy Performance Indicators (EnPIs)<br><br>IEC 60364-8-1<br>Low voltage installations – Part 8-1: Energy Efficiency<br><br>FD X30-147<br>Measurement plan for energy performance monitoring | Power Meters<br>IEC 61557-12<br><br>Power Metering and Monitoring devices (PMD)<br><br>Gateways, energy servers, data loggers<br><br>IEC 62974-1<br>Monitoring and measuring systems used for data collection, gathering and analysis – Part 1: Device requirements |



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## Introduction (cont.)

This eGuide, with contributions from several Schneider Electric ISO 50001 experts, offers a valuable introduction to both the management theories behind this important standard's development and some very practical advice for putting those theories into practice. We also provide information on what specifiers need to know to use the metering and monitoring systems covered by IEC 60364-8-1 to their best advantage, for both improving facility performance and reducing energy costs. Read on, to learn how your organization can start on a path toward continuous improvement in energy management and operational performance.



ISO 50001 has quickly become a leading influence for facility managers who are planning and managing their buildings' energy use.



# IEC 60364-8-1: Setting a New Standard for Efficient Buildings

**Author:** Philippe Vollet

Around the globe, cities are growing. Today, they house 50 percent of the world's population and are responsible for 75 percent of all energy consumption and 80 percent of carbon emissions. Reducing our cities' environmental impact means taking a closer look at how their buildings use energy, particularly electricity, and what we can do to reduce that demand. The new international standard IEC 60364-8-1, "Electrical energy efficiency within low-voltage installations," provides a framework for this effort, with useful guidance for both the designers of new buildings and owners of existing structures.

Released in November 2014, IEC 60364-8-1 isn't a mandatory standard, but rather describes the state of the art in energy-efficient electrical design and operation. This article provides an introduction to the document's intent and implementation, focusing on the three overarching goals that guided its development (these are summarized in Figure 1).

| General  | Determination of load demand (in kWh)  |   |
|--|--|---|
| 1. Minimize energy losses in the electrical installation                       | Optimize the voltage drop within the installation "Barycenter method"  | New Installations<br>Existing Installations |
| 2. Use energy:<br>• at the right time<br>• when needed<br>• at the lowest cost | Define circuits or groups of circuits with regard to EE: "Meshes"  |   |
|  | Optimize the use of electricity by controlling the electrical installation (energy efficiency management system) |   |
| 3. Maintain the building performance   | Life cycle methodology   |   |
|  | Assessment process (informative)   |   |

Figure 1: IEC 60364-8-1: How to implement Energy Efficiency

- Minimize energy losses in the electrical installation
- Use energy at the right time, when it's needed and at the lowest cost
- Maintain efficient performance over time

## Minimize Energy Losses in the Electrical Installation

Decisions made when a building is initially designed or undergoing major renovations can have the biggest impact on its environmental and financial performance, because resulting energy savings accrue over the structure's entire lifespan. This is why the new standard pays special attention to the following aspects of wiring design and installation:

- **Voltage drop.** Maximum voltage-drop recommendations are provided in Clause 525 of IEC 60634-5-52:2009.
- **Conductor sizing.** Increasing a conductor's cross-sectional dimensions will reduce power losses, saving both energy use and costs over time. Designers should assess the cost of losses during the conductors' working life against any initial additional cost due to oversizing. IEC 60287-3-2 offers a method for this calculation.
- **Optimize main switchboard placement.** Electrical designers should use the "Barycenter method" to optimize placement of the main switchboard (and transformer). This move improves the installation's energy performance and can reduce initial cost by reducing the total length of cables/conductors.

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# IEC 60364-8-1: Setting a New Standard for Efficient Buildings (cont.)

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### Use Energy at the Right Time, When It's Needed and at the Lowest Cost

This goal also is most easily implemented during a project's design phase, but also could be part of an efficiency upgrade at other times during a building's lifespan. Specifically, designers should:

- Optimize circuit design. Circuits should be defined/ grouped with energy efficiency in mind.
- Control how electricity is used. Designers can reduce future electricity use by incorporating sensors and related controls in lighting, space-conditioning and other systems.

### Maintain Building Performance

Even the highest-efficiency buildings become less efficient over time if owners aren't vigilant in monitoring ongoing operations. A formal, continuous-improvement style efficiency program can ensure new buildings maintain their performance and can help bring existing facilities up to present-day standards over time. As illustrated in Figure 2, the essential requirement for such a plan is an understanding of current and ongoing electricity use through appropriate metering and monitoring equipment.

For more detailed guidance on the new IEC 60634-8-1, along with other IEC standards, you can [download the latest edition of the Electrical Installation Guide](#).

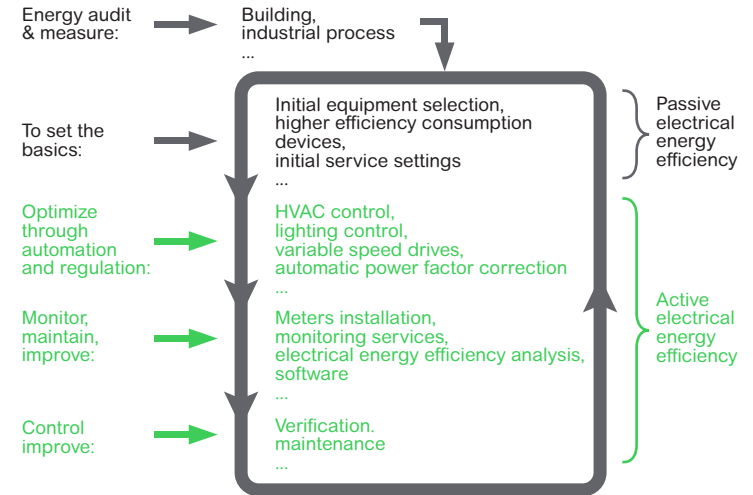


Figure 2: IEC 60364-8-1: Life cycle method in order to maintain the building performance



Reducing our cities' environmental impact means taking a closer look at how their buildings use energy, particularly electricity, and what we can do to reduce that demand.



# ISO 50001 Offers Energy-Efficiency Compliance and Environmental Certification in One Program

**Author:** Henri Obara

Today's building owners are facing increasing pressure to make their facilities operate more efficiently on multiple fronts. Certainly, energy prices remain high in many regions and are a primary driver for businesses seeking to lower their ongoing operating costs. More recently, energy-efficiency regulations also have been pushing owners to understand and begin reducing their energy use. In this article, I'm proposing those owners take a hard look at the value one international standard, ISO 50001, can bring to both efforts – and also help companies gain recognition from the two major environmental certification programs, BREEAM and LEED.



Nations around the globe are increasingly focused on reducing their fossil fuel-based emissions.

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ISO-50001 provides easy access to recognition from two of the world's most influential environmental certification programs.

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## Regulatory background

In the years leading up to the 2015 United Nations Conference on Climate Change in Paris, nations around the globe became increasingly focused on reducing their fossil fuel-based emissions, and improving the energy efficiency of buildings became a critical component of these plans. To this end, the member states of the European Union (EU) passed two important regulations, the Energy Performance of Buildings Directive (EPBD) and the Energy Efficiency Directive (EED). Energy audits are mandatory first steps to compliance under these directives, and they must be repeated at least every four years to maintain compliance.

However, organizations with goals that look beyond one-off compliance with individual regulations can consider an alternative to this audit requirement. The EU recognizes the value both organizations and the environment can gain with more holistic approaches to performance improvement and exempts those organizations that have adopted the International Organization for Standardization (ISO) specification ISO 50001:2011, "Energy management systems – Requirements with guidance for use," from the otherwise mandatory periodic energy audits.

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# ISO 50001 Offers Energy-Efficiency Compliance and Environmental Certification in One Program (cont.)

## A process, not a snapshot

Why would international regulators see such value in a systematic approach to energy management? In this case, unlike an audit, ISO 50001 does more than simply take a snapshot of a building's energy use – it provides a process for using that data to establish new performance goals and set the facility on a path of continuous improvement. This iterative process takes place in [four steps](#), as shown below in Figure 1.



Figure 1: Image source: By FW8100 (Own work) [CC BY-SA 3.0 (<http://creativecommons.org/licenses/by-sa/3.0/>)], via Wikimedia Commons

- The first step is a corporate-wide assessment to establish a baseline of current use, along with performance indicators to be used to evaluate efficiency improvements. Efficiency targets, along with action plans for reaching those goals, are established.
- Put the action plans into place.
- Monitor and measure progress, based against established performance indicators, and report the results.

- Move to address shortcomings identified in the reported results, and determine new strategic goals for optimizing performance.

More than simply eliminating the periodic regulatory audit requirements, adopting ISO 50001 also can be a boon to those organizations seeking certification under the existing-buildings provisions of [BREEAM](#) (Building Research Establishment Environmental Assessment Methodology) and [LEED](#) (Leadership in Energy and Environmental Development). Recognition by either of these internationally respected programs can add credence to corporate claims of environmental stewardship.

[LEED has established ISO 50001 as an alternate compliance path](#) for meeting the requirements of its “Existing Buildings: Operations and Maintenance” certification. Similarly, ISO 50001-certified buildings are deemed to also meet energy-improvement requirements of BREEAM’s In-Use certification program. So, not only does implementing an ISO 50001 plan exempt organizations from the expense of regular audits, it also provides easy access to recognition from two of the world’s most influential environmental certification programs – a win/win investment, if ever there was one.

You can learn more about incorporating ISO 50001 into your organization in our white paper, “[Implementing an Energy Management System: Your Guide to ISO 50001 Compliance](#).” And to find out how Schneider Electric can help you put a plan into action, check out the [Energy Management Services](#) section of our website and register for our dedicated [Partner Portal](#) to access additional tools, resources and product information.

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# Future Looks Bright for ISO 50001: Recent Trends

**Author:** Meriah Jamieson

The ISO 50001 standard launched in 2011 to provide organizations with a recognized framework for integrating energy performance into management practices. Since then, the number of certified sites has reached more than 7000 around the world. Here are some of the recent trends we are seeing.

## ISO 50001 Trends:

### 1. Tax incentives for certification work

At 43% of the world's certified buildings, Germany is the clear leader for ISO 50001 certification. This is due to tax incentives that businesses receive upon compliance. We expect this trend to continue with other countries applying similar tax incentive programs.

### 2. Not just for industry anymore

Industrial firms have been the earliest adopters of ISO 50001, 95% are in energy-intensive sectors such as automotive, chemicals and technology. This is changing with a growing number of commercial buildings adopting the standard.

### 3. EED: First of a global trend?

In 2014, the European Union launched the Directive on Energy Efficiency (EED). This directive covers all sectors and requires mandatory audits or ISO 50001 certification for buildings with more than 250 employees. Affecting approximately 50,000 businesses in Europe, this directive will certainly affect the number of buildings ISO 50001 certified. Other countries could follow suit with similar directives.

**4. Beyond compliance: A foundation for improvement**  
**Businesses are no longer looking at ISO 50001 for compliance reasons only.**

There has been a shift in perspective and companies are looking for a foundation to help them reduce energy consumption and carbon emissions. ISO 50001 is an excellent framework and starting point for a corporate energy management program.

### 5. Aligned ISO requirements will drive adoption

ISO is scheduled to revamp ISO 9001, 14001, and 50001 with a new aligned set of requirements so it will be easier to integrate all 3 standards in the future.

At Schneider Electric, we walk the talk. In fact, 79 Schneider Electric sites are ISO 50001 certified, and we have experts that help our customers achieve certification.

Interested in learning more? Read a [white paper](#) that discusses recommendations for ISO 50001 compliance, or take a look at [this article](#) that discusses adoption rates and how many sites are implementing the standard without certifying.



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# 7 Tips for Achieving ISO 50001 Compliance

**Author:** Meriah Jamieson

You have likely heard of ISO 50001 already, but may have dismissed it as yet another standard that can be ignored until it fades away. Well, this one seems to be gaining momentum, and you should know the basics so when your boss asks you, “What about ISO 50001 certification?” you have a good answer prepared. Check out these stats:

- By May 2012, less than a year after ISO 50001 was launched, global demand was already in the top 10 of some 19,023 standards.
- It is estimated it could influence up to 60% of the world’s energy use.



Plan ahead, it may be better to implement tools now that can help you achieve your goals in the coming years, rather than do the bare minimum to achieve compliance.

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ISO 50001 is a specification for an energy management system that defines requirements for establishing, implementing, maintaining and improving such a system.

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**What is ISO 50001? Here is an introduction:**  
ISO 50001 is a specification for an energy management system that defines requirements for establishing, implementing, maintaining and improving such a system. It is based on the Plan – Do – Check – Act continual improvement framework and integrates energy management into daily organizational practices. This enables an organization to follow a systematic approach to achieving continual improvement of its energy performance, including efficiency, usage and consumption. This is beneficial for organizations with reporting and transparency pressures from shareholders and other entities requesting measurement data. Plus, it generates energy savings that come from implementing an energy management system and provides a solid foundation for enterprise carbon and energy management.

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# 7 Tips for Achieving ISO 50001 Compliance (cont.)

## 7 tips to achieve compliance:

1. Establish clear objectives, “What are we trying to achieve?” Plan ahead, it may be better to implement tools now that can help you achieve your goals in the coming years, rather than do the bare minimum to achieve compliance.
2. Make energy data visible. This is crucial at all stages of an energy plan; before, during, after. This involves metering and data collection for analysis.
3. Ensure consistency of energy data at different levels of organization.
4. The Strategic Energy Plan must be part of an organization’s culture and supported from top executives down to operations staff. Educate your organization, promote it, get buy in.
5. Look for government grants available for compliance in your region. For example, in Canada there is [financial aid for industrial businesses in Canada who adopt ISO 50001](#).
6. Seek out internal resources and processes currently in place. If you do not have all the required competencies internally, seek help. A reputable consultant with industry experience can share industry best practices, and help you comply faster.
7. Revisit past decisions regularly, strive for continuous improvement; practice both passive and active energy efficiency.



A reputable consultant with industry experience can share industry best practices, and help you comply faster.

If you are looking for more details, you can read a white paper on recommendations for [ISO 50001 compliance](#).

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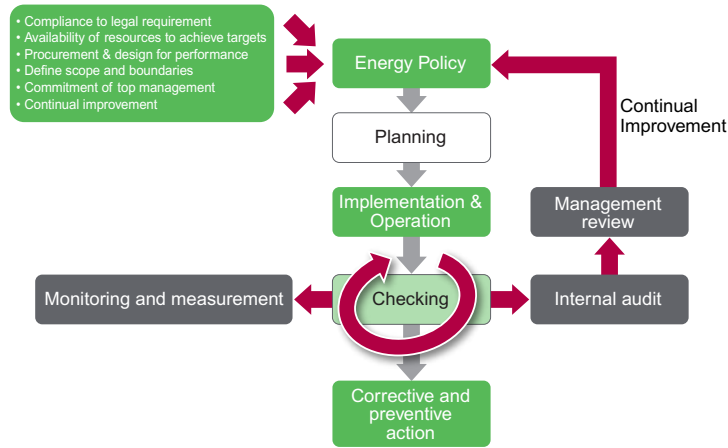
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# Part 1: Enterprise Energy Management Through ISO 50001 and Data Driven Decision Making

**Author:** Satish Kumar

What is the single most important factor that differentiates a good or even an excellent enterprise from an outstanding one when it comes to energy management excellence?



I believe it is the way an enterprise treats energy data – from the point it is generated to the way it is collected, stored, analyzed, and finally to the way actions are initiated to make the enterprise more efficient. Clearly, the facility/plant engineering team, the O&M and due diligence practices, use of appropriate technologies are critical factors but I would like to focus on the Energy Management Framework that can get any enterprise started on this win-win environment friendly and bottom line enhancing journey. I am choosing to focus on this because in my professional experience, I have found that medium sized enterprises especially struggle to start on the energy management journey because in the absence of a playbook, they find it too daunting.

ISO 50001 is a voluntary international standard developed by the International Organization for Standardization (ISO) to provide an internationally recognized framework to establish, implement, maintain and improve an energy management system. ISO 50001 helps an organization develop and follow a systematic approach for achieving continual improvement of energy performance by setting energy reduction targets. It can be applied to industrial plants; commercial, institutional, or government facilities; as well as entire organizations. Organizations can subsequently use [IPMVP \(or ISO 50015\)](#), a widely-used global M&V protocol to quantify and calculate energy savings accruing from the implementation of energy conservation measures.



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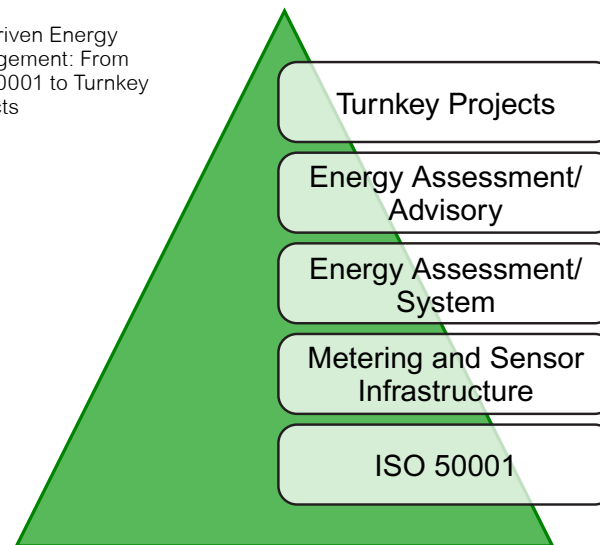
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A competent internal team or service provider can help an organization in [ISO 50001 adoption and compliance](#) by offering services and solutions that meet the various requirements under the standard, such as Energy Review, Energy Baseline identification, establishing Energy Performance Indicators, Objectives, Targets and Action Plans. This internal team can assist in developing the organization's internal/external communication – and effectively provide a complete framework for Monitoring, Measurement and Analysis of an Energy Management System within an organization.

[ISO 50001 is an overarching framework for managing energy performance.](#) During the ISO 50001 implementation process, one needs to actively challenge the organization – whether it is an internal customer or an external customer

– forcing them to think of relevant Key Performance Indicators (KPIs). For data centers, these KPIs can be PUE, cooling efficiency, IT server efficiency, power distribution efficiency or UPS utilization and efficiency. For buildings, these can be Energy Use Intensity (EUI), kW/ton, lighting power density, fan and pump efficiency, UPS or transformer losses, etc.; and for manufacturing facilities, these can be energy use or cost per unit of production or per unit of revenue, combustion efficiency of furnaces, energy consumed in the painting and drying process, percent of waste heat recovery, and so on. Identifying the right KPIs is probably the toughest but most critical part of the exercise because once this is done, then everything that follows becomes relatively easy. Most of the time, the set of KPIs are either already known to the facility managers or can be developed quickly by asking the right questions to get them to start thinking in the right way.

KPI Driven Energy Management: From ISO 50001 to Turnkey Projects



ISO 50001 is an overarching framework for managing energy performance.



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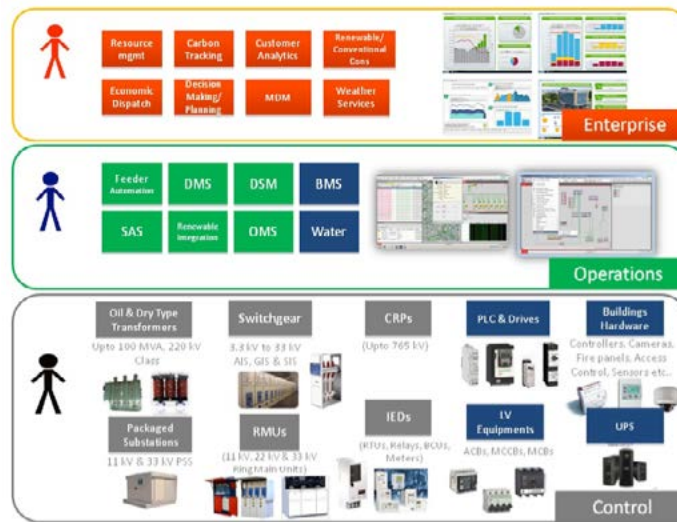
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# Part 2: Enterprise Energy Management Through ISO 50001 and Data Driven Decision Making

**Author:** Satish Kumar

In the previous article, I talked about the importance of creating an Energy Management Framework before embarking on an Enterprise Energy Management journey and how ISO 50001 can provide a good starting point for most organizations.



Once the right KPIs have been identified, one can start mapping out the sub-metering and sensor infrastructure that would allow for either continuous or periodic monitoring of those KPIs (with an appropriate level of manual involvement). This largely depends on an organization's budget and how advanced it is in the energy management cycle. Once this foundation has been laid, then one can talk about the Energy Management and Information System (EMIS) that will be most suitable and relevant. Since there are so many EMISs that come in different shapes and sizes, this is typically a difficult exercise for the customers. However, if they

have started the [ISO 50001](#) certification process and the mapping out of the meters and sensors to the KPIs is already identified, the EMIS selection can be relatively simple. The organization needs to decide if they want a fully automated system, track the KPIs real- or near-real-time, and what kind of benchmarks they want to use to learn from best practices. A data driven decision making approach based on tracking KPIs can provide useful insights on opportunities for energy use reduction in functional and end use areas, making it easier to identify the right interventions or energy efficiency measures. When done right, this approach can significantly reduce the amount of time energy auditors need to spend on site to identify and quantify energy efficiency measures.

Since data driven decision making takes a much more objective view, it takes the emotion out of what is often a difficult evaluation and resource allocation process. We are finding that a structured decision making process combined with the recent advances in energy monitoring and

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communication technology along with the advent of digitization of energy data is helping to cost-effectively address the credibility gap often found in the claims and actual performance. The evolution of energy monitoring technology, cloud computing supported by advanced analytics, and the reduced cost of meters and sensors is allowing today's enterprises to not only optimize energy performance of different systems and equipment, but to also do a much better job of multi-site monitoring through internal benchmarking and setting of targets, as companies take a portfolio approach towards energy management. They are being helped in this effort by the ISO 50001 framework that provides detailed guidelines in institutionalizing energy management systems



Fast tracking a data driven decision making culture helps organizations to get going on their energy efficiency journey which benefits not only the businesses, but can also strengthen a national energy efficiency program at a macro level.

(EnMS) as part of their management processes and to help in setting energy reduction targets.

According to Reinhard Peglau of [German Federal Environment Agency](#), more than 7,000 sites worldwide are ISO 50001 certified as of April 2014, with over 100 certified sites in India. Our own experience corroborates the value of the approach outlined above.

As a company, we are actively pursuing ISO 50001 certification at our own facilities worldwide. Globally, we have more than 90 sites that are ISO 50001 certified. In India, our head office at Gurgaon, along with nine factories at different locations, are ISO 50001 certified, and five other facilities are pursuing certification. More importantly, by combining a data driven decision making approach with the ISO 50001 framework, in India, we have been able to achieve cost-effective savings to the tune of 18% on average in some of our most intensive facilities that account for almost two-thirds of our total energy spend nationwide.

Fast tracking a data driven decision making culture helps organizations to get going on their energy efficiency journey, help reduce energy efficiency project development time and costs, and ultimately provides a better return on investments. This benefits not only the businesses, but can also strengthen a national energy efficiency program at a macro level.

