

# Global Energy Management System Implementation: Case Study

India, United Kingdom, United States

## Cummins Inc.

*Cummins achieves 20% energy performance improvement through Corporate EnMS Enterprise*



Newly trained Energy Champions in India are ready to improve energy performance.

### Business Benefits Achieved

The focus on energy and greenhouse gas reduction was the first company-wide initiative of its kind at Cummins, based on the company's developing strategies to reduce its environmental footprint. Energy efficiency and management have provided many benefits to Cummins. Not only has the company obtained real costs savings and CO<sub>2</sub> avoidance, achieving an aggressive company-wide goal instilled a sense of pride in employees and a call to action - in being part of a solution and delivering savings to the bottom line. For the nine sites included in this application, implementing an EnMS through our Corporate Enterprise approach resulted in a combined energy performance improvement of 20.25 percent by 2015 from a 2010 baseline. Their total annual savings equal to \$3,541,365 and 352,434 MMBTU, or 39,740 metric tons of CO<sub>2</sub>e reduction.

These nine sites are part of our Corporate EnMS, which is fully integrated within our larger Health, Safety and Environmental Management System (HSEMS) that now encompasses 390 global sites. The experience and

lessons learned from these sites have allowed us to strengthen our corporate system and be in a better position to deploy a common approach to environment and energy management at additional sites prioritized based on their energy footprint or other drivers such as regulatory compliance. The Enterprise approach makes the EnMS implementation much more efficient and supports our progress towards Corporate Energy Goals.

Case Study Snapshot	
<b>Industry</b>	Engine and related technology Manufacturing
<b>Location</b>	1 site in India, 4 sites in United Kingdom, 4 sites in United States
<b>Energy Management System</b>	ISO 50001 and Superior Energy Performance (SEP)
<b>Product/Service</b>	Design, manufacture, install, service and distribute diesel engines, gas engines, generator sets, alternators, turbo chargers, filtration products, fuel and exhaust systems
<b>Energy Performance Improvement (%)</b> <small>(2015 total energy consumption of our nine sites, normalized using their total hours worked, with 2010 as baseline*)</small>	20.25%
<b>Annual energy cost savings</b> <small>(total savings for our nine sites)</small>	\$3,541,365
<b>Cost to implement</b> <small>(total costs for our nine sites, not including capital projects)</small>	\$1,405,600
<b>Payback period</b> <small>(Based on total operational improvement energy savings resulting from EnMS efforts and not on capital projects, for our nine sites)</small>	12 months

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\* 2010 is the common baseline used to calculate the energy performance improvement of our 9 sites in this application. In 2010, Cummins established energy as a significant aspect in its environmental management system.

*“The ISO 50001 and SEP Program development process drove a data driven approach which helped our site energy team focus our efforts and attain greater energy performance. Throughout this process, Columbus Technical Center employees demonstrated passion and hard work to make a positive impact on our internal processes, on the environment, and on Cummins’ bottom line.”*

— Wayne Eckerle, Vice President, Corporate Research and Technology

## Company (or Facility) Profile

With 54,600 employees globally, Cummins is a global power leader that designs, manufactures, sells and services diesel engines and related technology around the world. Cummins serves its customers through its network of 600 company-owned and independent distributor facilities and more than 7,200 dealer locations in over 190 countries and territories.

This application focuses on nine EnMS certified facilities which employ approximately 11,600 people. Seven sites are certified to the international energy management standard ISO 50001 and two are both ISO 50001 and Superior Energy Performance (SEP) certified. SEP is an energy management program offered by the U.S. Department of Energy. Eight out of those nine facilities are manufacturing sites, with the ninth a research and development Centre (SEP certified).

In the course of their manufacturing and testing activities, our certified sites consume electricity, natural gas, and diesel fuel for a total of 4,560 TJ per year (based on 2015 primary energy consumption) which represent a spend over \$40,323,800.

## Business Case for Energy Management

**Energy’s role in corporate strategy:** At Cummins, our mission statement says “we demand that everything we do leads to a cleaner, healthier and safer environment.” Energy and greenhouse gas reduction is key to fulfilling this mission and a key component of the company’s environmental sustainability plan.

**Drivers:** Cummins focus on energy management became a priority for a number of reasons. First, the company’s environmental policy mandates company actions to reduce its emissions and impacts on natural resources. Cummins’ efforts to measure its global footprint highlighted opportunities to reduce its impacts and contribute to the bottom line through energy efficiencies. Initial successes in these areas created further momentum and ultimately brought stakeholder recognition of Cummins as an energy and environmental leader. Senior leaders and global employees rallied around the effort due to continued success in driving efficiency and reducing operating cost and risk. The company also found that its efforts to measure and manage energy positioned it well to comply with developing energy/carbon related regulatory requirements and costs. Non-energy drivers included the desire to be recognized by employees, customers and shareholders as a great company known for social responsibility, of which energy efficiency and CO<sub>2</sub> reduction is a part. Employee motivation was also key, considering that all employees can contribute to energy efficiency and were engaged accordingly across the company.

**Energy management program:** Cummins has been a part of and learned much from five main energy management programs: U.S. Environmental Protection Agency’s (EPA) Climate leaders program (joined in 2006); U.S. Department of Energy’s (DOE) Save Energy Now LEADERS program (joined in 2009); the DOE’s Better Buildings, Better Plants Challenge program (joined in 2011); DOE Superior Energy Performance program (joined in 2012, first SEP certified site in 2013);

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DOE SEP Enterprise-wide Accelerator (joined in 2014, second SEP site certified in 2015).

**History of energy reduction approach:** In 2006, Cummins set its first energy goal to reduce GHG emissions intensity by 25 % by 2010 from 2005 as part of the U.S. EPA's Climate Leaders program. We surpassed this goal by achieving a 28 % in GHG emissions intensity reduction. In 2010, we set another goal: 25 % reduction in energy use (27% GHG emissions intensity reduction) by the end of 2015 (also compared to a 2005 baseline, adjusted for sales). At the same time, Cummins established energy consumption as a corporate "Significant Environmental Aspect" of our Enterprise Environmental Management System. This designation uses the power of the ISO 14001 structure to systematically drive, track and improve energy performance at all our ISO 14001 certified sites globally, in advance of the development of the ISO 50001 Standard.

In 2013, an initial three sites certified to ISO 50001, one of which was also SEP certified. This pilot site implementation was a great success allowing the company to go a step further and use an Enterprise EnMS approach to support the achievement of our corporate energy goals. In 2014, we joined the SEP Enterprise-wide Accelerator program coordinated by the U.S. DOE which encouraged us to deploy the SEP standard at three additional sites. This further allowed us to grow our internal energy management expertise. In parallel, Cummins identified ISO 50001 priority sites based on their energy footprint to join the Enterprise EnMS and support the achievement of our energy goals. The company found that EnMS implementation supported a path to ensure regulatory compliance (e.g. EU Energy Efficiency Directive).

In 2015, we exceeded our second energy/GHG goals set in 2010 (respectively 34% and 35% for energy and GHG intensity reduction). At the end of that year, six additional sites were ISO 50001 certified, including one SEP Site. The success of the program confirmed that the

approach to manage energy through an Enterprise EnMS was effective and efficient means to sustain improvements, systematize energy management practices and accelerate site EnMS implementation through a common approach and tools.

In 2016, Cummins plans to release new energy goals as part of our 2020 Sustainability Plan. The goal will have an energy reduction component as well as a renewable energy commitment. To support those aggressive goals, we plan to continue to roll out our Enterprise EnMS to achieve a total of 40 certified sites by 2020.

## EnMS Implementation Approach

2013	2015	2016	2017	2020
<ul style="list-style-type: none"> <li>• 3 Pilot incl. 1 SEP sites</li> </ul>	<ul style="list-style-type: none"> <li>• 9 ISO 50001 incl. 2 SEP sites</li> </ul>	<ul style="list-style-type: none"> <li>• 21 ISO 50001 incl. 3 SEP sites</li> </ul>	<ul style="list-style-type: none"> <li>• 28 ISO 50001 incl. 11 SEP sites</li> </ul>	<ul style="list-style-type: none"> <li>• 40 ISO 50001 sites, SEP based on local programs</li> </ul>
<ul style="list-style-type: none"> <li>• 18% of footprint</li> </ul>	<ul style="list-style-type: none"> <li>• 37% of footprint</li> </ul>	<ul style="list-style-type: none"> <li>• 58% of footprint</li> </ul>	<ul style="list-style-type: none"> <li>• 78% of footprint</li> </ul>	<ul style="list-style-type: none"> <li>• 90% of footprint</li> </ul>

This chart shows Cummins implementation strategy for achieving ISO 50001 and Superior Energy Performance at its sites. Priority sites were implemented first, with 90% of Cummins carbon footprint to be included in these programs by 2020.

## Keys to Success

- Get senior management buy-in from the start.
- Set external goals and report transparently.
- Understand where, when and how energy is used.
- Use readily available tools and procedures.
- Engage employees at all levels: individually and in teams, from top managers to the shop floor.
- Harness the technical expertise on-site.
- Partner with others outside the organization.
- Integrate energy in the existing HSEMS to make energy efficiency a routine part of all employee work.
- Acknowledge and reward accomplishments.

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### EnMS Development and Implementation

Cummins decided to build a Corporate Enterprise EnMS to support the achievement of its energy goals and ensure the sustainability of its energy management efforts in the long term.

#### Corporate Enterprise EnMS Organization & Resources

Cummins top management decided to manage energy through an Enterprise Energy Management System fully in line with the ISO 50001 and SEP requirements and to maximize efficiency by integrating requirements of these standards into its existing HSEMS Enterprise.

The company compiled priority sites for EnMS implementation and approved the addition of new resources at the corporate and business unit levels to support the overall program. The role of our Corporate HSEMS Manager was expanded to encompass energy management systems. Three business unit energy leader positions were created to provide energy management technical expertise and support to site EnMS implementation. Those BU resources were hired based on criteria associating management system knowledge and energy technical background.

At the site level, the success of our pilot sites helped gain leadership commitment. Their success also highlighted that a strong collaboration between the facilities and environmental departments was very important. Site EnMS ownership was strengthened by sharing responsibility for energy management between the facilities and environment groups. The EnMS roles and responsibilities at the corporate, business unit and site levels are documented and maintained in our corporate procedures to ensure consistent approach across the company, and save time in organizational decision making. At the site level, EnMS implementation is driven through cross-functional energy teams.

#### Enterprise Energy Review and Planning

Cummins has developed a corporate energy review tool and associated energy management procedures to drive consistency and avoid work duplication. This user-friendly tool includes a step by step approach

encompassing all the Energy Review, Energy Baseline and Energy Performance Indicators requirements. The tool contains historical energy consumption data that our sites reported in our Corporate Environmental Reporting software which has been already verified and validated by each Business Unit Environmental Leader. The Energy Balance step allows users to ensure that all energy uses have been identified and their consumption measured or estimated.

The Corporate Energy Review Tool allows our sites to define and adjust their baseline because it includes reliable historical energy data. Site baselines are a period of at least 12 months, generally defined prior to the beginning of energy improvements. They also identified within this tool their relevant variables, including hours worked and production ratio (e.g. equivalent engines). Based on their activities and geographical location, some also used heating/cooling degree days, outdoor temperature or testing hours. Our Energy Review Tool builds analytical graphs to check the relevancy of each variable. Some sites also used Six Sigma tools or the U.S. DOE Energy Performance Indicator Tool for more in-depth energy data analysis.

All those inputs allow our sites to identify opportunities for improvement, documented and prioritized in the Energy Review Tool. Energy action plans were implemented and fully integrated within the sites' HSEMS as part of their Objectives & Targets, with progress against them reported to site and business unit top management. Our sites use an on-going "project hopper" list of ideas to compile their energy projects which are prioritized based on environmental and financial return as well as strategic other criteria.

Several of our certified Sites benefited from the Cummins energy efficiency capital plan. From 2013 – 2015, Cummins invested \$32.5 million to improve the energy efficiency of global facility equipment, infrastructure and processes (equivalent to 8% of global energy spend). Energy projects are identified through site audits conducted by Cummins energy managers, site teams and external consultants. A high level assessment is performed to estimate project costs, energy and other savings, and associated GHG reductions using the Cummins financial analysis (USIRR) tool. Results are logged in a project hopper, and the



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projects are prioritized based on environmental and financial benefits. Projects must meet the minimum criteria of a positive Net Present Value, Internal Rate of Return (IRR) of 11% or greater, and GHG reduction cost of  $\leq$ 1000/metric ton CO<sub>2</sub>e per year or demonstrate strategic value (i.e. piloting new, higher risk technologies, or showcasing Cummins products). Higher priority is given to projects with >20% IRR and <\$500/mtCO<sub>2</sub>e per year. Cumulative return on investment for 2013 – 2015 was 33% IRR, with a GHG reduction total of 76,500 mtCO<sub>2</sub>e per year.

Sites have reported an average duration of 12 months for ISO 50001 and 20 months for SEP implementation.

### Energy Expertise, Training and Communication

Energy Management at Cummins includes more than capital investment projects. Since 2009, we have deployed energy management skills and low-cost/no-cost improvements across our global facilities through our Energy Champion program, which has nearly 400 Cummins Energy Champions in US, Europe, India, China, Mexico and Brazil. Our Energy Champions take intensive training over a week to become professionals in improving energy efficiency. They lead site Energy Teams, conduct energy efficiency assessments (Treasure hunts), Unplugged Challenges, Kaizen projects and leverage energy management cultural shift at our Sites. In addition, they act as energy subject matter experts and provide the necessary expertise to support the roll-out, development and continuous improvement of their Site EnMS.

***“As with everything at Cummins, we only achieve our goals through employee ingenuity and engagement”***

— Mark Dhennin, Director,  
Energy & Environment Cummins Inc.



Also, our Enterprise approach includes an auditor certification and audit reciprocity program, in addition to the external audits conducted by our certification body. Our company auditors strengthen their energy

management technical skills, share best practices, and leverage successful programs used at other sites when auditing their peers. Over the last three years, 106 company auditors participated in ISO 50001 / ISO 50001 and SEP training sessions in the US, UK, India and China to support the growth of our EnMS Enterprise.

Selected business unit Energy Leaders were certified as Practitioners in Energy Management Systems by the Georgia Institute of Technology. Experts from the same institute also provided support to our sites working on SEP implementation. They conducted our first EnMS internal audits with Cummins co-auditors to mentor them. As a result of those internal audit coaching sessions, our EnMS internal audits are now conducted solely by company auditors.

Our sites have approached the important element of employee engagement in many ways: raising awareness through regular communications at all levels promptly; providing prompt feedback to employees to follow-up on their suggestions; making complicated energy data analysis easy to understand; setting monthly environmental meetings; providing tips on how employees can reduce their domestic energy spend; and participating in community energy efficiency improvement work.

### Cummins Energy Tools & Resources

Cummins has created common tools to support consistent and efficient global EnMS implementation.

The main tools used by our Sites are:

- Corporate procedures and shared best practices,
- Corporate Energy Review Tool: a key aspect to ensure a common approach to organizing site energy data and allows to document conformance to multiple clauses of the standard in one document,
- Corporate ISO 50001 Implementation Toolkit which includes four sections: 1) analysis of the ISO 50001 requirements; 2) comparison with ISO 14001; 3) practical steps to ensure compliance; 4) examples of tools and procedures from Cummins pilot sites and the US DOE ISO 50001 guide.

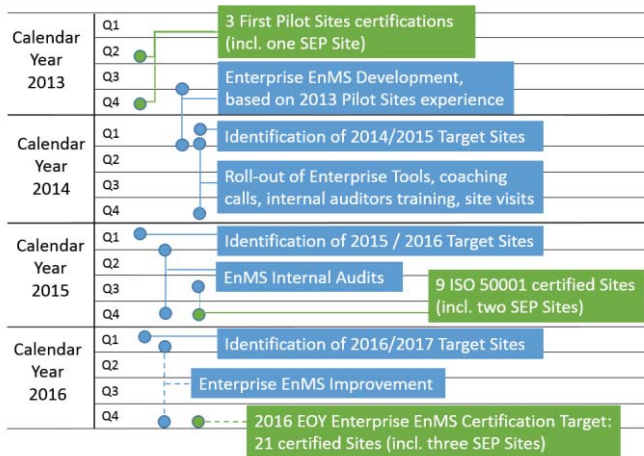
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Sites use other tools to measure and verify their energy performance, including a Cummins Energy Balance Tool or the US DOE Energy Performance Indicator Tool. These tools use data from utility bills, meters, sub-meters and building management systems from selected sites.

Regional training sessions and coaching calls explain the use and the content of the Corporate ISO 50001 Toolkit and Energy Review Tool so that all sites working on their ISO 50001 implementation can ask questions, share best practices and get lessons learnt from the internal and external audits conducted at other sites. Our sites working on SEP also benefited from coaching calls provided by the Georgia Tech experts. On-site expertise is available to analyze and verify data through our Energy and Six Sigma Teams.

Cummins Corporate Enterprise EnMS Timeline



## Operational Controls Maintenance and Energy Performance Sustainability

Sites use several approaches to maintain operational controls and sustain energy performance. They maintain employee engagement by planning regular energy management refresher sessions. EnMS roles are continually refined and clarity improved with regular communications to all levels in order to keep all updated and in line with program changes. On the floor, energy related operational controls such as work instructions have been documented and integrated within our Preventive Maintenance software so that they become part of our daily operations. In addition,

energy has been added to our site Management of Change procedures to ensure continuity over time. Energy performance is at all levels so any gaps or deviation in energy performance can be discussed and addressed before it becomes significant.

## Energy Performance Improvement Verification & Validation

The Corporate Energy Review Tool is used by our sites to monitor Energy performance by following up on their Significant Energy Users, relevant variables, Energy Performance Indicators and evaluating their actual versus expected energy consumption. Many sites also use their building management system to analyze the energy consumption data in real time and evaluate energy performance. The Site Management Review process monitors the effectiveness of action plans in achieving sites energy objectives and targets.

Cummins Enterprise EnMS is supported by an internal audit reciprocity program to validate its energy performance improvement. Our internal auditors conduct pre-assessment audits to ensure site readiness before the external certification audit and internal surveillance audits on a yearly basis. To do this, we use our own EnMS Internal Audit Tool, which was designed as a checklist addressing all ISO 50001 clauses and Cummins' additional related requirements. This allows us to ensure that our internal auditors conduct their audit in a consistent way throughout our sites. The tool gives a final score, which is broken down by section of the ISO 50001 Standard which allows us to compare the overall scores globally and identify areas of weakness and strength. Our sites in the UK have also been audited by a Cummins auditor certified as Energy Savings Opportunity Scheme (ESOS) Assessor to be in compliance with the UK transposition of the EU Energy Efficiency directive.

## Business Benefits

Implementing an EnMS through our Corporate Enterprise approach has not only resulted in savings in cost, energy and CO<sub>2</sub> but has established the company an energy leader among its peers. The EnMS implemented at nine of our sites has led us to achieve a combined energy performance improvement of 20.25%

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by 2015 from a 2010 baseline and save annually a total of \$3,541,365 and 352,434 MMBTU, which represent 39,740 metric tons of CO<sub>2</sub>e reduction. Our reputation as a good environmental steward has led us to be invited to participate in programs such as the Better Building Better Plant Program (US DOE) or the North American Energy Management Pilot Program (Commission for Environmental Cooperation) for three of our Sites based in Mexico. Those programs help us accelerate energy and cost savings, reduce GHG emissions and drive progress towards our Corporate environmental and energy Goals. The company has also been recognized on the Dow Jones Sustainability Index for the last ten years as well as a Greenbiz “Decoupling Leader” within a list of 34 companies among the largest 4000 global companies, for continued reductions in environmental footprint while experiencing business expansion.

*“The energy management system put real savings and dollar values on routine work, not just large projects”*

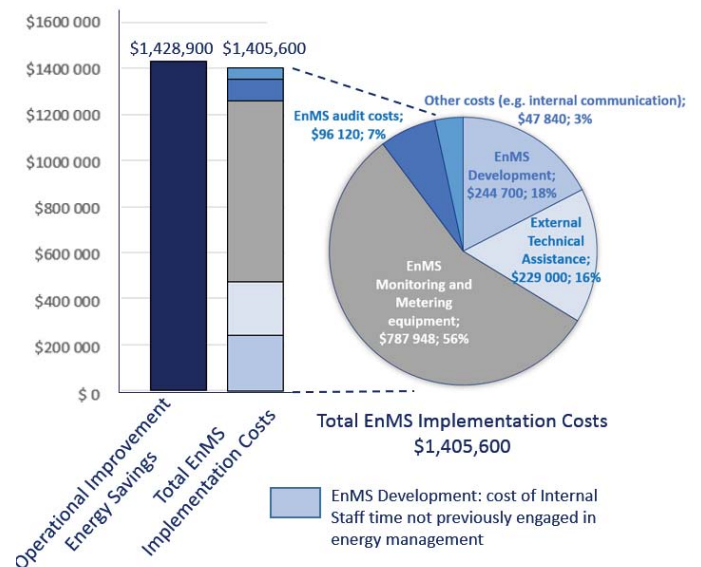
—Cummins Technical Center Test Operations Maintenance

### Cost-benefit Analysis

Our nine sites spent a total of \$1,405,600 to implement their Energy Management System and reported a total annual operational energy savings related to EnMS efforts of \$1,428,900, resulting in a payback of 11.8 months. What has been very encouraging is the improved payback from the first three sites (18.4 months) to the 8.4 month payback for the 2015 sites.

The most recent sites benefited from our Enterprise approach: using existing Corporate documentation and tools (such as the Energy Review Tool), partnered with other sites to share best practices, lowered their internal and external audit costs and received technical expertise from our BU Energy Leaders and Enterprise Managers. This great result is now used as our internal business case to highlight the importance of EnMS implementation at additional Sites.

### Costs and Benefits of Enterprise EnMS Implementation



### Lessons Learned

Our 2013 pilot site experience was used as baseline to build tools, processes and procedures into our Corporate EnMS. We also used Six Sigma tools such as customer interviews to gather feedback and ideas for improvement. In addition, we compiled all findings from our internal and external audits. We are now in the process of updating our corporate procedures and tools (Energy Review Tool, ISO 50001 Implementation Toolkit) to make implementation of the Cummins EnMS even easier at our new target sites. Our EnMS implementation also required the close collaboration with our Facilities organization and their company infrastructure expertise. This collaboration represents a model for the engagement of other functions necessary for a program’s success at the company.

The following summarizes important lessons Cummins has learned in its energy management journey.

**Data Analysis:** The new ISO 50001 energy review process was a challenge reported by almost all our sites. They found value in spending time to analyze energy consumption data (preferably in small groups), which required a focused effort. Understanding where and when the site energy is consumed was a key to success

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and allowed sites using test cells (e.g. our CTC Research & Development Site) to find good normalization factors / performance indicators for testing. Some of our sites installed building management systems to dive further into the energy data analysis and make their energy use more efficient. The support of our Energy and Six Sigma Teams was extremely beneficial in the data analysis phase.

**Communication & Awareness:** Our sites struggled at the beginning of their EnMS implementation to raise awareness. Communicating technical data in a simple and clear way the audience could understand took some time to perfect. Our sites provided regular communications through monthly environmental meetings with all employees, and they also meet with specialized subteams: energy teams, top managers and shop floor employees. Written communications that emphasized energy as everyone's job were published at our sites to raise awareness on the EnMS and how our employees can help in improving energy efficiency at home and in their community.

**Employee Engagement:** Driving the site level energy management cultural attitude was a challenge. Management commitment from start to drive the program from the site leadership team is key. Defining responsibilities through job descriptions helps to clarify the site's cross-functional team's duties. Employees from all departments were appointed to ensure that energy was considered in all areas. Sites have highlighted the importance of acknowledging and rewarding accomplishments to all employees.

**Off-shift management:** Work that cannot normally be accomplished when the site is the busiest can be performed during off-shifts (critical in air leak program, meters / sub-meters installation).

**Pre-assessment audits:** Internal audits are key to identifying any gaps before the certification audit. However, it is necessary to schedule them at least 3 months ahead the external audit to have sufficient time

to analyze the findings, investigate root causes and ensure sustainable closure of corrective actions.

**EnMS Documentation & Tools:** Sites had the following recommendations for making documentation and tool development simpler:

- Use the corporate tools and ready written procedures to save time and resources.
- Integrate with existing HSEMS system to bolster the common approach, increase efficiency and strengthen the overall EnMS.
- Keep referring back to the Standard to avoid doing things that are not required.
- Re-evaluate systems periodically.
- Ensure energy is integrated into management of change process prior to any changes.

**EnMS Sustainability:** Taking on a new standard is a challenge and is a big investment of time and resources. The work continues after the implementation. Sites should ensure resources are available to manage and continuously improve their EnMS. These resources pay for themselves on an ongoing basis.

### Energy Performance Improvement calculation challenges:

Measuring real energy performance in a complex business is a primary reason Cummins is implementing ISO 50001 and SEP. The nine sites selected for our pilot represent this complexity of measuring energy improvements across a broad range of site requirements and campus structures, levels of site automation, local climate, changes in market demand, new product launches, and restructuring efforts. It has been challenging to develop valid energy metrics for specific Cummins facilities, and even more difficult to consolidate site data to provide meaningful corporate performance metrics. Our Enterprise approach to ISO 50001, the SEP program, and our energy toolkits now provide the framework for this effort.