

**Superior Energy Performance® Accelerator**

## Cummins Saves \$4.1 Million by Implementing Enterprise-wide ISO 50001 and SEP

Cummins, Inc., a Fortune 500 U.S. manufacturer, took advantage of a streamlined, enterprise-wide approach to implement an ISO 50001 energy management system (EnMS) and Superior Energy Performance® (SEP) at three of its U.S. locations. These efforts achieved more than \$4 million in annual energy cost savings. Cummins successfully leveraged existing management systems and deployed corporate tools through a “Central Office” to streamline the adoption of an ISO 50001 EnMS at U.S. and international sites. These leadership activities earned the company an Award of Excellence in Energy Management from the multinational Clean Energy Ministerial in 2016. As a next step, Cummins plans to get 40 sites certified to ISO 50001 by 2020, representing 90% of the company’s manufacturing carbon footprint.

After successfully certifying its Rocky Mount Engine Plant (RMEP) to ISO 50001 and SEP in 2014, Cummins expanded the pilot to realize similar benefits at additional sites. The company has since certified the Cummins Technical Center (CTC) in Indiana to ISO 50001/SEP and achieved ISO 50001-certification at its engine plant in Jamestown, New York. The Jamestown plant has implemented most of the requirements for SEP and is preparing for certification. Cummins has also successfully renewed the RMEP site’s SEP certification under the enterprise-wide EnMS. The CTC and RMEP sites have saved close to 320 billion Btu of primary energy and more than \$4 million in utility costs.

**Implementing an EnMS through our Corporate Enterprise approach has yielded savings in cost, energy, and CO<sub>2</sub>, fortifying the company’s energy leadership.**

— Mark Dhennin  
Director, Energy & Environment



*Headquartered in Indiana, Cummins designs, manufactures, distributes, and services diesel and natural gas engines. The company employs 14,000 people at 22 facilities in North America.*

(Photo: provided by Cummins)

Enterprise wide Approach	Key Takeaways
<b>Energy and Cost Savings</b>	Saved 318 billion Btu and \$4.1 million in energy costs as verified through an SEP Enterprise-wide approach
<b>Implementation Cost Reduction</b>	Reduced per-site implementation costs by close to \$13,000 and 0.5 annual full-time person equivalent
<b>Corporate Tools</b>	Corporate “Energy Review Tool” and other similar tools streamlined ISO 50001 and SEP implementation at the sites

### Business Drivers for Adopting Enterprise-Wide EnMS/SEP

Cummins’ active pursuit of energy management programs and certifications has multiple drivers, including ambitious corporate environmental goals, high energy bills, and meeting regulatory requirements. Cummins’ long-standing energy program had previously defined clear energy savings goals, set up the Cummins Energy Champion program, and established a corporate capital fund for energy efficiency. Sites were responsible for defining and training Energy Teams and implementing Energy Champion program tools.

### What is ISO 50001?

*ISO 50001:2011 – Energy Management Systems*, is an international standard that provides a framework for the implementation of an energy management system (EnMS) for the purpose of continuously improving energy performance.

### What is SEP?

DOE's Superior Energy Performance® (SEP) program drives systematic improvements in energy performance across the manufacturing and commercial buildings sectors in the U.S. Facilities certified to SEP have an ISO 50001-certified energy management system in place and demonstrate third-party verified improvement in energy performance.

### What is SEP Enterprise-wide?

The SEP enterprise-wide approach enables multiple sites to share a common ISO 50001 EnMS managed by a "Central Office," though each site must still improve their energy performance and obtain third-party certification to SEP individually. This approach promotes consistency, leverages resources, and accelerates system adoption. A growing number of companies are taking up this approach to streamline EnMS implementation, make the process more cost effective, and further increase savings.

### What is the SEP Enterprise-wide Accelerator?

DOE launched the Better Buildings SEP Enterprise-wide Accelerator (EWA) to test the hypothesis that ISO 50001 and SEP could be implemented at multiple sites and coordinated through a Central Office to reduce the overall implementation costs and labor per site—compared to the conventional, single-site approach. The Accelerator successfully showed that the enterprise-wide approach reduces the costs of SEP implementation.

ISO 50001/SEP Enterprise-wide fits well with Cummins' existing Health, Safety and Environmental Management Enterprise, expediting cost-effective deployment of an ISO 50001-certified EnMS across multiple sites. Cummins particularly values the central mechanism for sharing tools, experiences, and procedures.

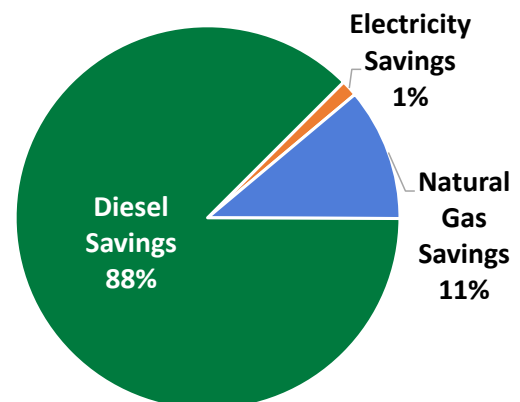
Formalized roles and responsibilities ensure that continuous performance improvements are achieved and sustained. Cummins' decision to undertake ISO 50001/SEP Enterprise-wide was reinforced by the significant benefits achieved in 2014, when it implemented ISO 50001 and SEP at RMEP.

## Results

Table 1 shows the SEP-certified energy performance improvement and associated annual energy cost savings for the CTC site; at the time of publication, the Jamestown Engine Plant (JEP) - had been certified to ISO 50001 and implemented most of the requirements for SEP, but was still waiting to complete third-party SEP certification. Labor and other costs involved in the implementation of ISO 50001 and SEP for the CTC and JEP sites are also summarized in the table.

### Energy and Cost Savings

Cummins achieved significant energy savings at the CTC site using ISO 50001 and the SEP Enterprise-wide approach. The site saved 192 MWh of site electricity, 124 billion Btu of diesel, and 16 billion Btu of natural gas. These savings reduced annual energy costs at CTC by nearly \$2.7 million.<sup>1</sup> In addition, the re-certified RMEP site also saved 176 billion Btu of primary energy, which resulted in \$1.5 million of energy cost savings for the site.



**Figure 1: Primary Energy Savings Breakdown at the Cummins Technical Center**

<sup>1</sup> 2015 U.S. industrial average rates for electricity (6.89 cents per kWh), natural gas (3.91 dollar per Mcf), and diesel (2.71 dollar per gallon) are used.

**Table 1: Cummins ISO 50001 and SEP Enterprise-wide Sites Summary**

Site Name	Certification Status	SEP Implementation Cost (\$) <sup>1</sup>	SEP Implementation Labor (FTE yr.) <sup>2</sup>	Annual Energy Cost Savings (\$) <sup>3</sup>	Performance Improvement (%) <sup>4</sup>
Cummins Technical Center (CTC), IN	SEP Certified	\$33,000	1.8	\$2,661,000	16.8%
Jamestown Engine Plant (JEP), NY	ISO 50001 Certified	\$183,000	0.6	N/A	N/A
Rocky Mount Engine Plant (RMEP), NC <sup>5</sup> (Re-certification)	SEP Re-certified	N/A	N/A	\$1,458,000	15.5%

<sup>1</sup> SEP implementation costs (rounded to the nearest thousand dollars) contains non-requisite investment in metering equipment at the JEP site.

<sup>2</sup> SEP implementation labor includes both site and central office staff time. Site labor which would have been spent on energy management under business-as-usual during the implementation period was subtracted to represent the additional labor for implementing SEP.

<sup>3</sup> Annual energy cost savings (rounded to the nearest thousand dollars) reflect SEP certified energy performance improvement, which included results from both capital and operational projects.

<sup>4</sup> SEP certified energy performance improvement was achieved in 3 years (including the reporting period) for CTC and 7 years for RMEP.

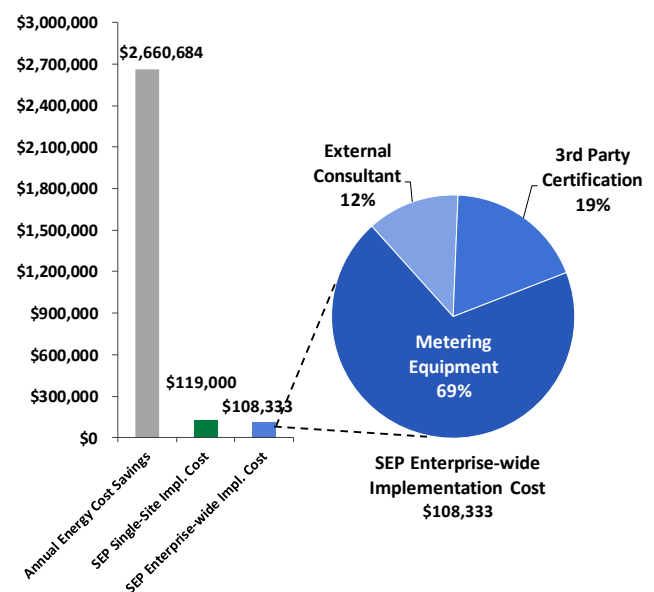
<sup>5</sup> RMEP site is SEP re-certified and was not examined for implementation cost and labor or project details. The reported annual energy cost savings and energy performance improvement only considers the re-certification period under the Enterprise-wide approach.

Note that the SEP-certified energy savings are not entirely credited to the implementation of ISO 50001 and SEP but also include results of the company's existing energy management program and capital investments. However, previous analysis has shown that ISO 50001 and SEP generally drive deeper energy savings.<sup>2</sup>

### Implementation Cost

The cost to implement ISO 50001/SEP Enterprise-wide at Cummins averaged about \$108,000 per site. Metering equipment was the biggest cost, followed by third-party certification and external consultants, as shown in Figure 2. The JEP site invested \$150,000 in metering equipment to facilitate energy tracking for ISO 50001 and SEP. This was not required for certification, though the site found it very useful.

The level of effort required from internal staff to implement the ISO 50001 EnMS and SEP averaged 1.2 annual full-time equivalent (FTE-yr) staff members (0.9 FTE-yr for site staff and 0.3 FTE-yr for Central Office staff). Staff time spent on implementing specific energy-saving action plans was excluded from this calculation. Site labor that



**Figure 2: Cummins SEP Enterprise-wide Costs and Benefits (per site)**

would have been spent on energy management under business-as-usual operations during the implementation period was subtracted to represent the additional labor for implementing ISO 50001 and SEP.

<sup>2</sup> Therkelsen, Peter, et al. "Development of an Enhanced Payback Function for the Superior Energy Performance® Program." ACEEE Summer Study on Energy Efficiency in Industry, Buffalo, NY (2015).

Implementing ISO 50001/SEP Enterprise-wide at Cummins' first Enterprise site, CTC, required about 18 months. JEP was able to benefit from RMEP and CTC's experience as well as the Corporate Energy Leaders' expertise. By using a smaller team, they moved much quicker and implemented their ISO 50001 EnMS in 4 months.

### Cost Reduction

ISO 50001/SEP Enterprise-wide significantly reduced the cost of ISO 50001/SEP implementation by nearly \$11,000 per site on average. This is attributable to external consultant cost savings for EnMS trainings (reduced by \$11,000) compared to the same costs at the single-site implementation at RMEP in 2014 (see Figure 2). Third-party certification costs were also examined and these costs remained unchanged. Costs for external consultants were significantly reduced through adopting a cohort approach where multiple sites attended the same training sessions and shared in the costs. In addition, the sites estimate that an average 0.5 FTE-yr of additional internal labor would be needed if ISO 50001/SEP were implemented on a stand-alone basis. Cummins has reduced its implementation costs by:

- Sharing experiences, tools, and procedures from its early pilots;
- Leveraging the existing Health, Safety, and Environmental Management System (HSEMS)
- Reducing the need for external consultants by building internal expertise and providing internal auditors with on-the-job training.

## Implementation Strategies

### “Central Office” and Site Responsibilities

Cummins' ISO 50001 EnMS utilizes a three-level organizational structure. As shown in Figure 3, this structure incorporates members at the Corporate, Business Unit (BU), and Site levels.

Cummins' Central Office, which is leading ISO 50001/SEP implementation, is based out of Cummins' headquarters in Columbus, Indiana,

although multiple staff members are located elsewhere. It includes seven corporate staff members (see blue box in Figure 3). The Central Office provides the sites with corporate procedures, tools and training to facilitate EnMS implementation. Most importantly, the Central Office defines energy objectives and targets related to energy management and the EnMS.

The Cummins Leadership Team then validates the energy objectives and targets through a Corporate Management Review and additional environmental performance reviews. The Central Office subsequently oversees the Site Management Review process through the Business Units to monitor the effectiveness of action plans in achieving the validated site energy objectives.

### EnMS Functions of Cummins Central Office



1. Policy & Energy Objectives
2. Full Guidance, Tools, Support
3. EnMS Integration into HSEMS

### EnMS Functions of Cummins Sites

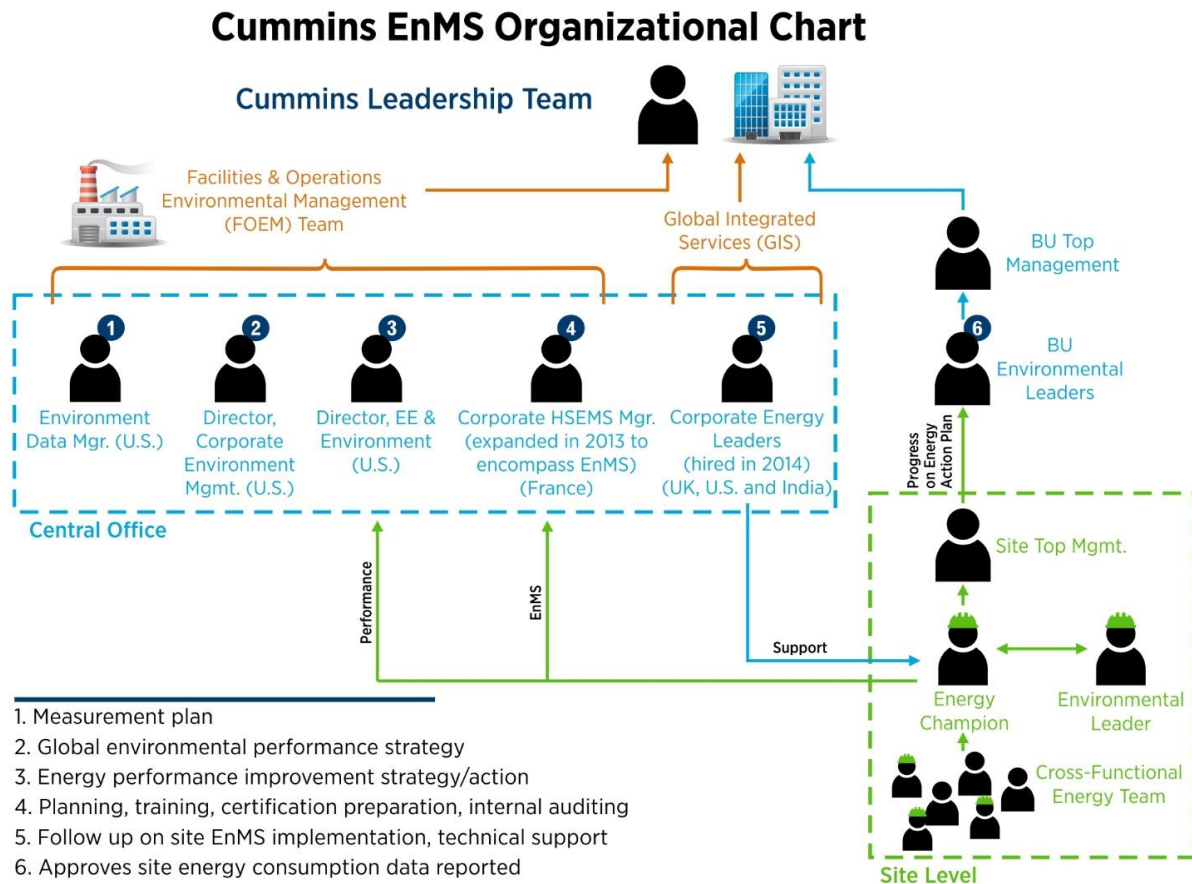


1. Energy Review
2. EnMS Implementation
3. Action Plan, Perf. Improvement

Individual sites (see green box in Figure 3) perform the majority of the work in setting up the EnMS and conducting the energy reviews (with assistance from the Central Office as needed). The site energy teams typically consist of staff members from the facilities department and environmental department. Sharing responsibilities between these two departments strengthened EnMS ownership at the site level.

### Integrating EnMS into the HSEMS

The corporate ISO 50001 EnMS is fully integrated within Cummins' existing Health, Safety and Environmental Management System (HSEMS), making energy efficiency a routine part of all the employees' work. Existing processes and



1. Measurement plan
2. Global environmental performance strategy
3. Energy performance improvement strategy/action
4. Planning, training, certification preparation, internal auditing
5. Follow up on site EnMS implementation, technical support
6. Approves site energy consumption data reported

**Figure 3: Cummins Enterprise-wide SEP Management Structure**

associated infrastructure in the HSEMS, such as communication and documentation, are leveraged for the EnMS, thereby avoiding duplication of effort.

The corporate HSEMS manager's role was expanded to include the EnMS. At the site level, energy action plans are integrated into Objectives and Targets for the site's HSEMS, and progress toward targets is automatically reported to top management at the Site and Business Unit levels.

### Energy Review Tool

Cummins developed an internal Energy Review Tool that provides step-by-step approaches for meeting Energy Review, Energy Baseline, and Energy Performance Indicator requirements outlined in ISO 50001. The tool contains reliable, historical energy consumption data provided by each site and verified by the Business Unit

Environmental Leaders. Identifying the relevant variables affecting energy performance helps to uncover opportunities for improvement. These opportunities are then documented and prioritized within the tool; the resulting action plans are integrated into the site's HSEMS to track progress.

The Energy Review Tool provides the site energy teams with a standardized approach for analyzing energy performance prior to, during, and after implementation of the ISO 50001 EnMS. This approach helps simplify the process at the site-level and enables corporate staff to compare and aggregate energy performance data for analysis and reporting.

### ISO 50001 Implementation Tools

The Central Office provides additional tools to facilitate EnMS implementation across sites. These include clear corporate procedures that

ensure a consistent EnMS approach and reduce efforts for organizational decision making.

Another important tool is the Corporate ISO 50001 implementation Toolkit. It provides sites with 1) an analysis of the ISO 50001 requirements, 2) a comparison between ISO 50001 and ISO 14001, 3) practical steps to ensure ISO 50001 compliance, and 4) examples of tools and procedures from earlier Cummins' experiences with SEP.

### **Audit, Competency, & Best Practice Sharing**

Cummins emphasizes the importance of internal EnMS competency. The existing Energy Champion program provides a strong foundation for internal energy management expertise. Three Corporate Energy Leaders with both EnMS and energy-related technical credentials were hired in 2014, and part of their job functions were to support the enterprise-wide ISO 50001 EnMS globally. The Central Office also provides internal training on the aforementioned tools to ensure proper use and sharing of best practices.

Cummins worked with the Georgia Institute of Technology to conduct gap analyses, ISO 50001 and SEP training sessions, and internal audits. Through these, Cummins developed internal competency and reduced its implementation costs. Cummins also expanded the existing HSEMS auditor certification and audit reciprocity program to include energy. Through this program, internal auditors strengthen their EnMS skills and share best practices as they audit their peers. Cummins trained more than 100 internal auditors over the past few years to support the global growth of its enterprise-wide ISO 50001 EnMS.

The internal reciprocity audits are coordinated by the Central Office. Prior to the external ISO 50001 and SEP audits, site readiness is pre-assessed using an EnMS Internal Audit Tool—a checklist of all ISO 50001 elements.

### **Sustaining Engagement and Improvements**

Individual sites employ a variety of approaches to sustain their energy performance. Strategies include maintaining employee engagement through regular energy management “refresher”

sessions and communicating updated EnMS roles to staff at all levels of the organization. Work instructions are documented and integrated into Preventative Maintenance software to ensure that energy-related operational controls become part of daily operations. In addition, an energy component has been added to the site-specific Management of Change procedures to ensure continuity over time. Energy performance is assessed at all levels so that any gaps or deviations in performance are noted and addressed proactively.

**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

### **Lessons Learned**

Deploying ISO 50001 and SEP Enterprise-wide is a key strategy under Cummins' environmental policy. Strong corporate leadership and collaboration at all levels have led to many successes and lessons:

- Development of a multi-year greenhouse gas and energy plan and a leadership scorecard helped garner top management support.
- SEP's third-party verification secured top management confidence in energy cost savings, helping obtain needed funds for energy projects.
- Sub-metering provides granular data to deepen understanding of energy use (where, when, how).

- Integrating the ISO 50001 EnMS into HSEMS streamlines the implementation process at all levels of the organization.
- Leveraging standard tools/templates and sharing best practices expedites the implementation process and alleviates resource stress at the sites.

## Next Steps

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The positive experiences from Cummins' initial, single-site ISO 50001/SEP implementation helped make the case for three additional sites to implement ISO 50001/SEP Enterprise-wide. ISO 50001's data-driven approach to identifying and prioritizing both low-cost/no-cost improvements and capital-energy projects will help sites continue to achieve deeper savings.

Cummins noted the challenge involved in developing valid energy performance metrics for certain sites and meaningful corporate performance metrics. The company has identified the need for additional expertise in regression modeling as a next step.

Cummins plans to further expand its Enterprise-wide EnMS and has set a goal to certify 40 sites to ISO 50001 by 2020. These 40 sites represent about 90% of the company's manufacturing energy footprint.

**Not only has the company obtained real cost savings and CO<sub>2</sub> reductions...the Enterprise-wide approach makes the ISO 50001 EnMS implementation much more efficient and supports our progress towards Corporate Energy Goals.**

—Sylvie Doré  
Cummins Corporate HSEMS Manager