

Global Energy Management System Implementation: Case Study

Global



Energy Efficiency as a 3M Competitive Advantage



Business Benefits Achieved

3M has long recognized the bottom-line benefit of improving energy efficiency. Having established its Corporate Energy Management Department in 1973 and having set and achieved numerous improvement goals since then, the concept of continuous improvement has become a key factor in our program design. The Management Systems approach has provided 3M the tools needed to achieve continuous improvement from a program that has been in place for more than forty years.

3M participated in the development of the international standard for Energy Management Systems, ISO 50001 and Superior Energy Performance, ISO 50021 through the U.S. Council for Energy Efficient Manufacturing (U.S. CEEM), beginning in 2007. 3M facilities were among the first to pilot the implementation of ISO 50001 in

‘The implementation of a management systems approach for energy management has provided great value to our organization. The proven performance of our ISO 50001 certified facilities has led 3M to include ISO 50001 and Superior Energy Performance as one of our strategies to meet our next set of corporate energy efficiency goals.’

-Jean Bennington Sweeney, Chief Sustainability Officer, 3M

Case Study Snapshot

Industry	Manufacturing
Location	7 Countries
Energy Management System	Energy Management System (ISO 50001) and Superior Energy Performance (ISO 50021)
Product/Service	Multiple
Energy Performance Improvement (%)	10.5%
Annual energy cost savings	\$8 million (USD)
Cost to implement	NA
Payback period	Less than 1 year

2011, and, since that time, 3M has implemented the standard at eighteen facilities in seven countries. Superior Energy Performance (ISO 50021) has been implemented at three of the eighteen facilities.

3M expects to obtain enterprise-wide certification for ISO 50001 at five additional locations within the next

few months. Each of the five facilities will receive Superior Energy Performance Certification as well. Additionally, 3M has locations in Canada, Mexico, and the U.S. participating in the recently announced North American Energy Management pilot, with the objective of becoming certified by the end of 2017.

3M's most recent corporate goal was to improve the energy efficiency of its global operations by 15% between 2010 and 2015. Each operational facility is expected to improve its energy performance to help the corporation achieve the goal. At each location, plant energy teams are provided management systems guidelines that lead them to identify and implement energy saving opportunities

During the most recent five year goal period, 3M global operations improved their energy performance by 14.1%. Facilities that are participating in ISO 50001 and Superior Energy Performance are outpacing other 3M facilities and have provided energy efficiency improvements 60% greater than the 3M average.

The resultant energy savings from 3M's global program over the past five years have shown an energy savings of 13 Trillion Btu's and reduced greenhouse gas emissions of 1.9 million metric tons CO₂e.

3M facilities participating in ISO 50001 and ISO 50021 have shown an energy performance improvement of 10.5% over the past three years. This has resulted in 700,000 million Btu of energy savings and a reduction of 104,000 metric tons of CO₂e. The average energy cost savings at each of these facilities was greater than \$1 million USD.

'Implementing ISO 50001 and Superior Energy Performance has provided measurable results and raised the visibility of the energy program at 3M.'

-Steve Schultz, Corporate Energy Manager, 3M

Company Profile

3M

A Global Innovation Company

3M is a global innovation company that never stops inventing. Over the years, our innovations have improved daily life for hundreds of millions of people all over the world. We have made driving at night easier, made buildings safer, and made consumer electronics lighter, less energy-intensive and less harmful to the environment. We even helped put a man on the moon. Every day at 3M, one idea always leads to the next, igniting momentum to make progress possible around the world.

Our Values

- Act with uncompromising honesty and integrity in everything we do.
- Satisfy our customers with innovative technology and superior quality, value and service.
- Provide our investors an attractive return through sustainable, global growth.
- Respect our social and physical environment around the world.
- Value and develop our employees' diverse talents, initiative and leadership.
- Earn the admiration of all those associated with 3M worldwide.

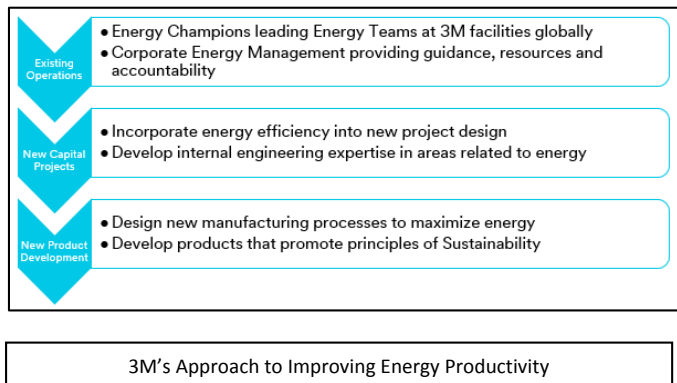
Business Case for Energy Management

3M recognizes the value of managing energy within our operations and is also eager to share with others the best practices that have been developed. 3M's energy management journey began in 1973 when energy supply and cost concerns were affecting the operations of companies globally. 3M has maintained a continuous corporate focus on energy management since 1973 and has established ambitious energy performance improvement goals over the years.

Managing energy supports 3M’s corporate values. 3M has a corporate energy policy stating that we will seek to both promote the efficient use of energy in our operations and to deliver products to our customers that help them save energy. In addition to setting numerous internal goals for energy performance improvement, 3M has helped develop and participated in voluntary programs to improve energy efficiency such as the U.S. Environmental Protection Agency Energy Star™ program, and numerous U.S. Department of Energy programs such as the Better Buildings program where we are a Challenge Partner. 3M facilities in many countries support government initiatives to implement ISO 50001 as demonstrated by our partnerships with Natural Resources Canada, the Korean Energy Management Agency, and others.

Keys to Success

- Top Management Commitment and Corporate Goals
- Corporate Level Program Leadership
- Empowered Energy Leaders at Each Facility
- Sharing of Best Practices Among Facilities



EnMS Development and Implementation

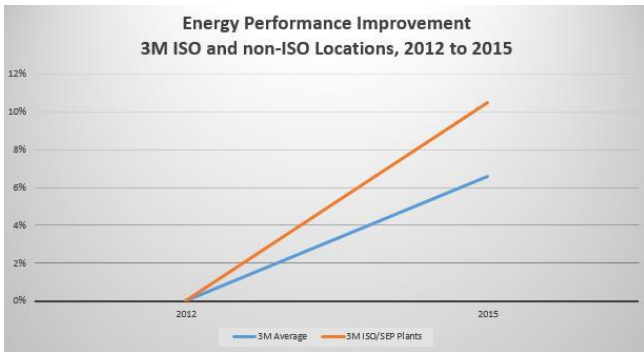
Having had a corporate energy management program in place for many years, 3M recognized that the project by project approach to managing energy could be improved. In 2002, 3M developed a new approach using concepts from the EPA Energy Star™ Guidelines for Energy Management and the Management System for Energy (MSE 2000) program that had been developed by Georgia Tech. Energy champions and energy teams were established at each major facility with guidance for their roles and responsibilities provided through the corporate energy management group.

3M developed an internal program to recognize facilities that had successfully implemented the new approach and met corporate goals for improved energy performance. The concept of being able to offer certification and recognition from a reputable third party led 3M to participate in the development of the ISO 50001 and 500021 standards through an industry collaborative led by the U.S. Department of Energy. 3M facilities were among the first to pilot the new programs and 3M continues to include ISO certification as one of the strategies to achieve corporate energy goals.

The 3M facilities that are presently certified to ISO 50001 and ISO 50021 have improved energy performance 10.5% over the past three years, exceeding corporate goals. These facilities have saved 700,000 million Btu of energy from being used and 104,000 metric tons of CO2e from being emitted. The average energy cost savings at each of these facilities was greater than \$1 million USD.

‘ISO 50001 is a standard that drives results directly to the bottom line. ISO 50001 systematically drives down energy costs and improves competitiveness through the assignment of responsibilities and raising the visibility of energy management within the organization.’

-Andrew Hejnar, Energy Manager, 3M Canada



3M energy performance improvement, ISO/SEP facilities compared to other 3M.

3M is organized with five major business groups operating over 275 facilities globally. Each facility has an energy champion identified who has responsibility for energy activities. Each facility is held accountable for improving its energy performance through the publication of quarterly energy dashboards. Results from facilities within each business group are totaled to create a business group energy dashboard, and the business groups are totaled to create a corporate dashboard. These quarterly reports are provided to the Corporate Operating Committee which includes 3M’s Chief Executive Officer and his direct reports. This leadership committee provides the direction for energy performance activities within their business groups.

The corporate energy management group tracks energy performance at each facility, publishes the quarterly energy dashboards, provides energy team guidelines and resources that facilities can use to improve performance, and coordinates activity among multiple facilities and internal organizations. The corporate group also identifies leading technologies and approaches to energy management and leads their implementation across 3M’s global operations.

At the corporate level, energy review and planning is done through the identification of significant energy uses, meaning we have identified the facilities that have the largest impact on 3M’s corporate goals. We actively engage those facilities through individual coaching and

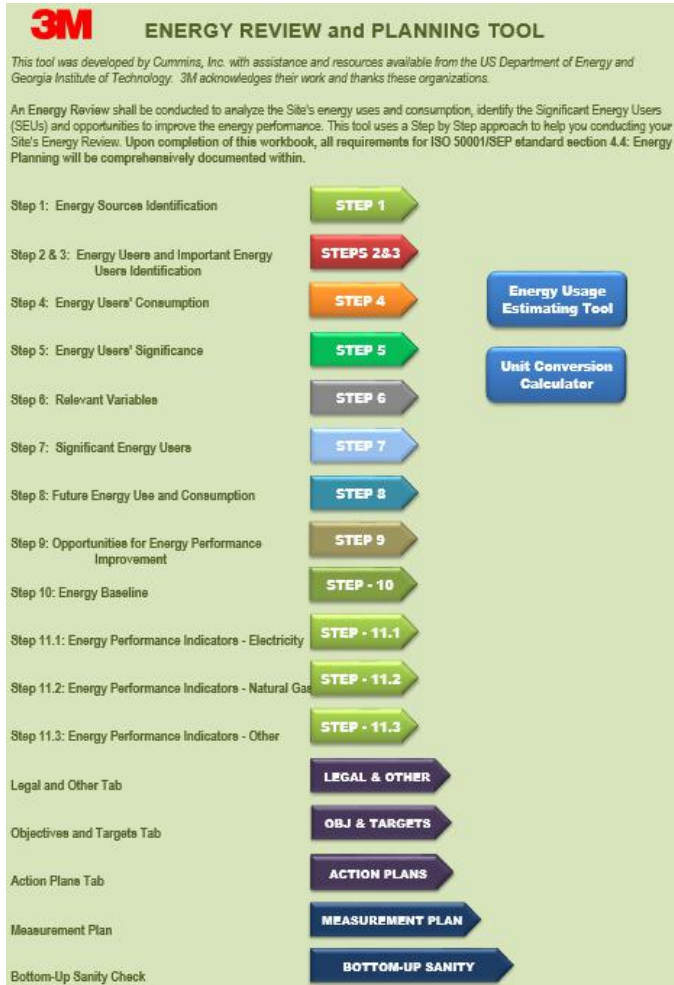
support, sharing of best practices, and highlighting the energy performance of these facilities throughout the company. Through this process of corporate level energy review and planning, we have engaged many of our high priority facilities in the implementation of the ISO 50001 Energy Management System.

Eighteen 3M facilities are presently certified to ISO 50001. At the corporate level, 3M is working to achieve a corporate, enterprise-wide certification. A Corporate ISO Leadership Committee provides support for the corporate level ISO program. This top level committee includes the Chief Sustainability Officer, the Global Director of Engineering, the directors of manufacturing that have responsibility for the ISO facilities within 3M, and the corporate energy management group. The Corporate Energy Manager serves as the management representative.

Country	Site	Latest Action	SEP Certified
Canada	Brockville 501 (Tape)	ISO 50001 Certified	Platinum
Canada	London	ISO 50001 Certified	No
Canada	Perth 301	ISO 50001 Certified	No
Canada	Perth 302	ISO 50001 Certified	No
Canada	Montreal	Being ISO Certified	No
Canada	Mordon	Being ISO Certified	No
France	Tilloy	ISO 50001 Certified	No
Germany	Kempton (Cera dyne)	ISO 50001 Certified	No
Germany	Obernburg	ISO 50001 Certified	No
Germany	Wuppertal	ISO 50001 Certified	No
Germany	Neuss	ISO 50001 Certified	No
Germany	Hilden	ISO 50001 Certified	No
Germany	Kamen	ISO 50001 Certified	No
Germany	Seefeld & Landsberg	ISO 50001 Certified	No
Germany	Jüchen	ISO 50001 Certified	No
Korea	Naju	ISO 50001 Certified	Yes
Poland	Wroclaw PSD	ISO 50001 Certified	No
Poland	Wroclaw Automotive	ISO 50001 Certified	No
Taiwan	Tai nan	ISO 50001 Certified	No
U.S.	Cordova	ISO 50001 Certified	Silver
U.S.	Aberdeen	Working as a group of co-horts	Enterprise-wide ISO 50001 and individual Superior Energy Performance certificates
U.S.	Cynthiana		
U.S.	Decatur		
U.S.	Hutchinson		
U.S.	Prairie du Chien		
U.S.	Cottage Grove MRD	International Program of cohorts	
Canada	Brockville PSD		
Mexico	San Luis Potosi		

Eighteen 3M facilities in seven countries are presently certified to ISO 50001. Nine additional facilities are implementing ISO/SEP.

Each facility included in the corporate certificate uses an Energy Review and Planning Tool provided by the corporate energy management group. This tool provides a common, comprehensive methodology for energy review and planning. 3M requires that users of the tool complete corporately developed training and to receive certification for its use.



The 3M Energy Review and Planning Tool provides a common, comprehensive methodology for each facility to use in the review and planning process.

present energy performance, and estimate future energy use and consumption.

The Review and Planning Tool also leads each facility through the process of establishing energy objectives, targets, and action plans. Corporate staff at 3M provide each facility with guidance and awareness of legal and other requirements to be used along with the site's local knowledge to define legal and other requirements.

Action plans are developed based on this background and with knowledge of the opportunities that exist for improvement. Actions are assigned and followed-up during regular facility energy team meetings and during facility level management reviews. Sharing of these ideas across 3M facilities is a definite advantage to implementing ISO 50001 at the corporate, enterprise level.

The energy review and planning process is completed annually, or when significant changes occur at the facility. The 3M corporate office has developed a schedule for each facility in the enterprise to use in the operation of the Energy Management System.

	Q1			Q2		
	January	February	March	April	May	June
Central Office	Annual update of tools - Review & Planning Tool/Management Review Workbook, etc. Training on updated tools provided to plants.	External Stage I audits		External stage II audits or surveillance audits	New plants to join enterprise	
Plants					PEPR's take place. PEPR Workbook and Review & Planning Tool saved and uploaded to SharePoint.	
	Q3			Q4		
	July	August	September	October	November	December
Central Office		Internal audits completed		Participate in PEPR's as appropriate	Schedule internal/external audits for upcoming year - Plant, Corporate, DEKRA	Top Management Review
Plants		Internal audits completed		PEPR's take place. PEPR Workbook and Review & Planning Tool saved and uploaded to SharePoint.	Schedule internal/external audits for upcoming year - Plant, Corporate, DEKRA	

Calendar showing the annual cycle of 3M EnMS activity including the update of corporate resources, internal audits, management review, and top-management reviews.

Funding for energy projects is generally provided by each business group. A Corporate Energy and Sustainability Fund has been established to support energy projects that can have a significant impact on energy performance, but do not meet the financial targets of the individual business groups. As an example, this fund has provided financing for the installation of combined heat and power projects at several 3M ISO 50001 certified facilities.

Implementing ISO 50001 at our facilities elevated the importance of managing energy, which provides the energy champions and energy teams at our facilities greater visibility and recognition from business group leadership.

3M utilized the services of numerous certified and trained professionals during the implementation of ISO programs at its facilities. During the first pilot implementations, professionals from the U.S. Department of Energy and Georgia Tech trained and coached our facility personnel on the implementation of ISO 50001. Staff from Georgia Tech also provided training and coaching to 3M for the implementation of the enterprise-wide ISO certification. The Corporate Energy Manager at 3M, who serves as the management representative, has been trained and is a Certified Professional in Energy Management Systems and has received certification as a Superior Energy Performance Verifier.

The 3M corporate energy management group developed extensive resources to support the facilities pursuing ISO certification. This includes:

- Corporate Energy Manual
- Corporate Energy Policy
- Corporate Energy Use and Cost Tracking System
- Corporate Energy Project Tracking System
- Corporate Supported Energy Review and Planning Tool
- Corporate Template for Plant Management Reviews
- Corporate Corrective and Preventive Action Tracking System

The corporate manual describes the requirements each facility must meet to obtain ISO certification. The corporate manual identifies standard operating procedures for the operation of the energy management system at the corporate level, and yet provides flexibility for each facility to develop facility standard operating procedures to address specific circumstances.

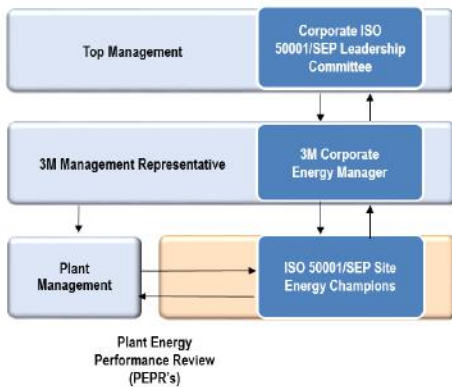
The operation of the energy management system at the facility level is the responsibility of the facility manager and the facility energy champion who serve the role of top management and management representative at the facility. Each facility has identified the significant energy uses within the facility and is meeting ISO requirements for operational control.

Non-conformities, corrective actions, and preventive actions at each facility are tracked using a corporate corrective and preventive action tracking system. This system provides corporate level visibility to the internal and external audit results and corrective actions being addressed at each facility. Repeated and common findings will initiate changes and updates to the corporate Energy Management System.



Members of the 3M Naju, South Korea energy team celebrate their ISO 50001 and Superior Energy Performance Certification. Assistance was provided through the Korean Energy Management Agency

Each ISO/SEP facility conducts a facility level management review bi-annually to ensure that the EnMS is suitable, adequate and effective at meeting the facility’s goals and objectives. The results of the facility level management review are communicated to the corporate level management representative for inclusion in the corporate level management review. The role of top management at the corporate level is held by the Corporate ISO Leadership Committee consisting of the Chief Sustainability Officer, the Global Director of Engineering, the directors of manufacturing with responsibility for the ISO facilities within 3M, and the corporate energy management group.



3M developed a strategy to incorporate a two tier management review process into the operation of the corporate, enterprise-wide ISO 50001 Energy Management System.

3M measures energy performance utilizing three key factors. These factors are included on the energy dashboard for each facility and are part of each facility’s management review:

- Measured energy use per unit of product produced
- Energy savings from energy projects implemented
- The effectiveness of the EnMS

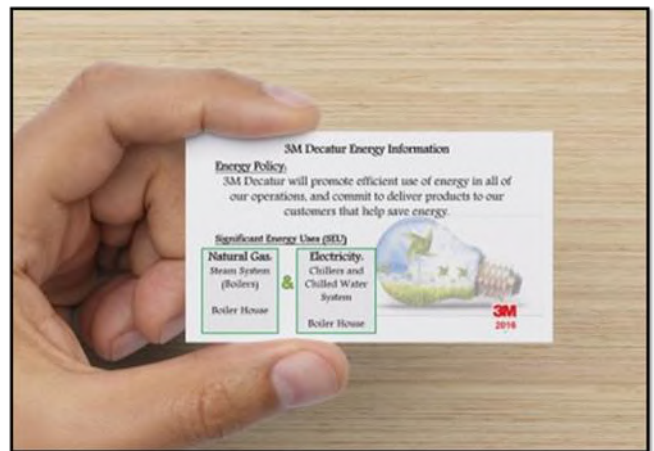
The energy use per unit of product produced metric is expected to show a reduction in energy intensity. Several methodologies are used to measure energy intensity including a simple Btu per unit of product calculation, the EnPI tool developed by the U.S. Department of Energy, and the GT SEnPI Tool developed by Georgia Tech.

The energy savings from energy projects implemented metric demonstrates the value resulting from the completion of energy action plans within the facility and provides a bottom-up validation of the energy use per unit of product metric.

The effectiveness of the EnMS is measured using an energy program effectiveness survey completed annually by each facility energy team and is substantiated through the supporting ISO certifications.

‘Since embarking on our ISO 50001 journey in Decatur we have seen an 8% reduction in energy usage. In addition to the savings, the value this program brings is in the implementation of the measurement and management systems that are needed for sustainable year on year improvements. The enterprise-wide approach has enabled us to learn from the other participating locations and to leverage best practices. Implementation does take management commitment of resources, but the payback in the end is well worth the effort.’

-Robin Higgs, 3M Decatur Site Manager



3M Decatur created cards for employees to carry in their identification badge holders to remind them of the energy policy and the significant energy uses the plant has identified.

The cost to implement the ISO 50001 and 50021 program was greatly offset by having an already established energy management program at each location and by the leadership provided by the corporate energy management group. The costs to implement the program are not significant considering the savings in energy use, energy cost, and related environmental impacts achieved.

through corporate leadership and with multiple plants working as cohorts through our enterprise-wide certification provided significant benefits in terms of time savings, cost savings, and sharing of best practices.

Having leadership within the organization with ISO 50001 and 50021 training and experience is a definite advantage, as is the ability to call upon outside resources as needed.

The time and resource commitment within a facility that seeks to become certified must be understood and supported by management. The status of the existing energy management program at the facility will be a consideration in determining the additional commitment needed to achieve certification.

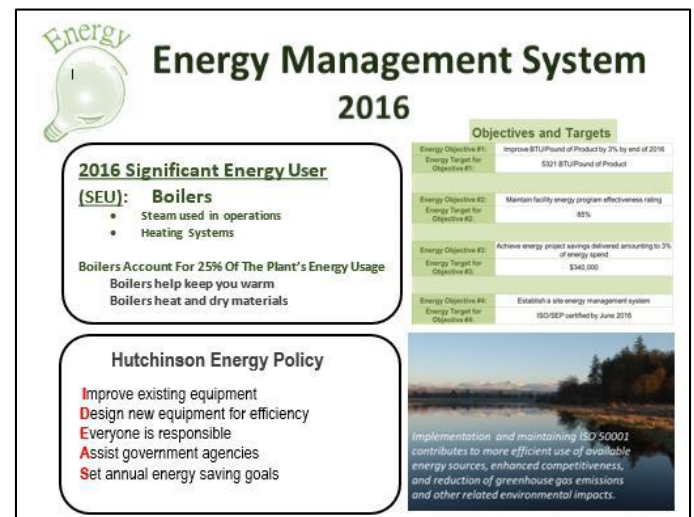
The results at 3M facilities that have implemented ISO 50001 show much greater improvement in energy performance than at other 3M facilities. 3M plans to expand the implementation of ISO 50001 to additional locations as part of its strategy to achieve its next energy efficiency goal, which calls for an additional 30% improvement in energy performance by 2025.



3M operations in Germany shared their ISO implementation in the company newsletter and through a public press release.

Lessons Learned

The management systems approach provides a proven methodology to achieve a culture of continuous improvement in energy performance. The opportunities to streamline the implementation process



The 3M Hutchinson facility created posters to share ISO implementation information with employees.