

# ISO 50001 Energy Management System – Case Study

2022

Global – 56 sites

## 3M Company

*Utilizing standardization to double the size of the ISO 50001 & SEP Enterprise*



Energy as a 3M Competitive Advantage

### Case Study Snapshot

<b>Industry</b>	Manufacturing
<b>Product/Service</b>	Multiple
<b>Location</b>	Global
<b>Energy performance improvement percentage</b> (over the improvement period)	4.7% improvement over 6 years
<b>Total energy cost savings</b> (over the improvement period)	\$24,000,000 USD
<b>Cost to implement Energy Management System (EnMS)</b>	\$3,936,000 USD
<b>Total energy savings</b> (over the improvement period)	1,758,000 GJ
<b>Total CO<sub>2</sub>-e emission reduction</b> (over the improvement period)	301,000 Metric Tons

### Organization Profile / Business Case

Since 3M's founding in 1902, the company has expanded from a small-scale mining venture to an innovative global manufacturing powerhouse with over 90,000 employees operating in 70 countries. Today, more than 60,000 3M products are used in homes, businesses, schools, hospitals, and other industries.

3M is a global leader in environmental stewardship, driving energy and climate sustainability efforts through a holistic approach, helping improve every life. From establishing the Corporate Energy Management Department in 1973, in addition to over 40 years of setting sustainability targets, energy has always played a big part in 3M's sustainable actions. The Energy Policy developed in 1991 incorporates energy conservation into our business practices, revised in 2020 to include design and procurement elements. As a result of this effort, operational costs continue to lower, the carbon footprint is reduced, the energy supply reliability has increased, and brand image has continued to be strengthened. Since 2019, 3M's sustainability goals include the requirement of a Sustainability Value Commitment ensuring that all new products entering 3M's new product commercialization process demonstrate how they drive impact for the greater good. In 2021, 3M announced their commitment to be carbon neutral by 2050 in further support of the Paris Climate Commitment.

**ISO 50001/SEP for 3M** – 3M's journey with ISO 50001 began as a pilot venture with the joint support of the US Department of Energy and Natural Resources Canada in 2011. 3M volunteered two facilities: 3M Cordova in Illinois, US and 3M Brockville in Ontario, Canada. Growing from two sites in the pilot to now 56 sites globally that are ISO 50001 certified; 36 of which have taken the additional step to achieve SEP certification (certified by Canadian Welding Bureau/Korean Energy Agency and accredited by ANSI National Accreditation/ DQS GmbH).

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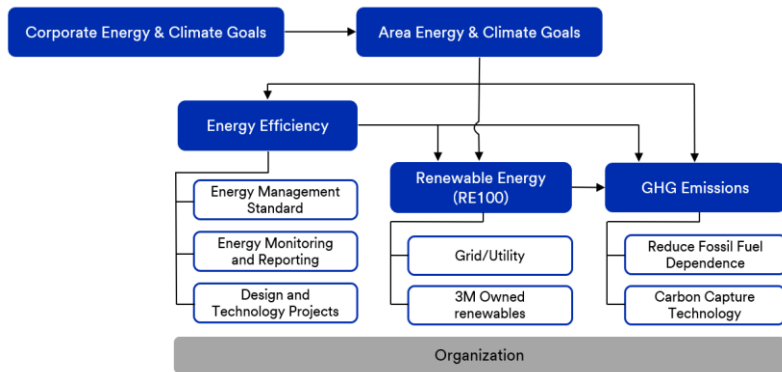


Figure 1: 3M’s Corporate Sustainability goals and strategy for Energy & Climate

In 2014, 3M developed the new corporate sustainability goals in accordance with the United Nations Sustainable Development Goals. The 2025 Climate & Energy sustainability goals stipulate corporate energy efficiency, renewable energy, and carbon neutrality goals. 3M recognizes that all three areas are interconnected – achievements made for energy efficiency will drastically contribute to realizing renewable energy and decarbonization goals (Figure 1).

**“Not only has ISO 50001 brought external recognition to the company, but has also created a solid foundation internally for meeting our energy improvement goals.”**

— Freddie Pask, EMEA Area Energy Manager

## Benefits

With the 56 certified sites combined, 3M Americas’ normalized energy performance has improved by 4.7% during the improvement period of 2016-2021.

After a decade of standard maintenance, the Enterprise team has had the expertise necessary to build a robust and standardized implementation plan. The team of four members consulted the existing sites to formulate a task list that encompassed all the standard requirements and its appropriate tools. This reduced the implementation timeline from 18 months for the first site down to only 3-8 months, using only internal resources.

With the growth of adding 16 sites in 2020 and 12 sites in 2021, implementation costs were drastically reduced. From spending \$63k USD on the first site, where half the cost went towards certification audits and remaining towards external staff and metering, to only \$3k per site.

**Enterprise Advantage** – 3M’s focus is to develop a global enterprise model for 3M in the future. As of 2022, there are two ISO 50001/SEP enterprise models: 3M Americas (North, Central & South America) and 3M Germany (Figure 2). As legacy sites recertified in the US and Canada region, they joined the Enterprise certification. There are now five additional sites to be certified by the end of 2022: 2 in US, 1 in Mexico and 2 in Singapore.

3M was able to expand the Enterprise quickly by leveraging our own trained internal auditors, having a dedicated central resource to assist with implementation at each site, and providing standardized tools, resources, and training material. The benefits of the enterprise-model are clear:

- Commitment from Senior-level Executive Management
- Centralized system for documents – Energy Policy, Energy Management System (EnMS) Procedures and Manual

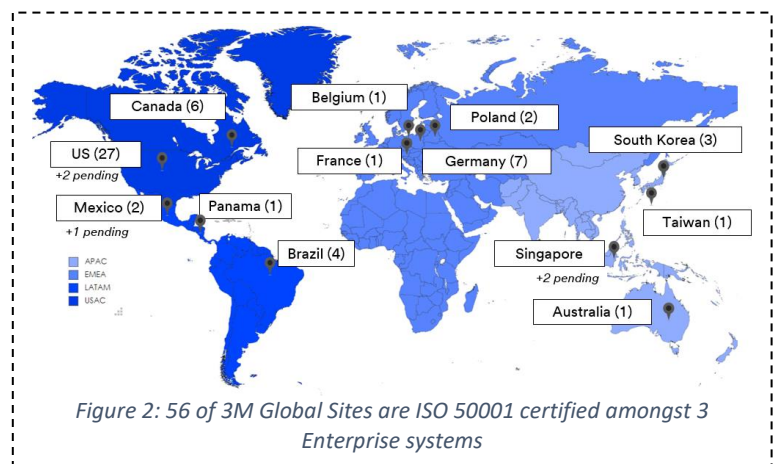


Figure 2: 56 of 3M Global Sites are ISO 50001 certified amongst 3 Enterprise systems

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- Sampled sites for conducting internal and external audits
- Knowledge share amongst sites (reduced cost, time, and resources)
- Common energy efficiency guidelines for design, procurement, and operations

**Other Benefits** – The EnMS system also provides benefits that extend beyond monetary gain. As stated within 3M’s Energy Policy, continuous energy performance improvement is encouraged by employees in their work and personal activities. ISO 50001 and SEP provides a structured platform to make this possible. Additionally, our customers value and commend our commitment to sustainability, improving customer satisfaction and brand image.

## Plan

In early 2000, an EnMS for 3M was modelled by Georgia Institute of Technology and deployed across all 3M global sites. The model included a dedicated corporate energy team coordinating with local energy leaders at each facility. The central function provides awareness training, employee reward programs, and resources for energy-saving projects, instilling an energy-conscious culture at 3M. These existing structures became the backbone for ISO 50001 and instituted a rigid EnMS. For the first few sites certified, third-party resources propelled the implementation process until 3M had the necessary tools and procedures built.

**“Thanks to the EnMS and ISO 50001, we’ve formed a unified team that recognizes the importance of directing, managing, and improving energy efficiency and has led to an increased awareness of energy as a topic within all of our plants.”**

—Jose Solis, LATAM Energy Manager

The Energy Review process is completed at each site and identifies their significant energy uses. Most 3M sites have electrical metering at the sub-station level as well for large natural gas consumers. Metering and monitoring systems allow sites to identify inefficient processes, and plant baseloads which then lead to recognizing operational control projects, optimization projects and equipment upgrades.

Once there are identified projects and opportunities for improvement in the energy hopper, 3M evaluates for financial and technical feasibility. Resources for implementation upon selection are allocated by local facilities. Local utilities and other incentive programs reduce the simple payback, making these projects more attractive. Should the energy-related project meet the cost-benefit requirements of the dedicated Centrally Coordinate Investment (CCI) Fund, 3M is able to provide additional support and resources to the site.

The ISO 50001 certified sites demonstrate continuous energy efficiency improvements over the five-year improvement period. The realized savings and sustainability goal alignment from our ISO 50001 certified sites continue to fortify Top Management commitment for the EnMS across the organization. In 2020, 3M’s VP in Enterprise Operations mandated that all sites contributing to 85% of global energy consumption to be certified to ISO 50001 by 2025. As of 2022, 3M has certified 67% of these sites and continues to expand over the coming years.

## Do, Check, and Act

Building channels to share information and maintain consistent communication ensures that 3M achieves our corporate sustainability goals. Standardization of tools and resources sets 3M up for success.

**The Energy Teams** – Forming a concrete structure to involve individuals from top management to operators allows 3M to easily coordinate ISO 50001 implementation. Figure 3 outlines the key cross-functional teams involved in the Enterprise. Site-level energy teams typically include an Energy Leader, Plant Leadership Committee Members, Engineering/ Maintenance and personnel, LSS Black Belts, Environmental, Health & Safety Representatives, and Operators.

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3M reviews the Strategic Energy Management Plan annually to prioritize programs and meet global goals, utilizing input from stakeholders, including executive management, manufacturing directors, and the energy teams. The goals include to continually improve results, leverage engineering expertise, drive site-level efficiency improvements, and continue top management support.

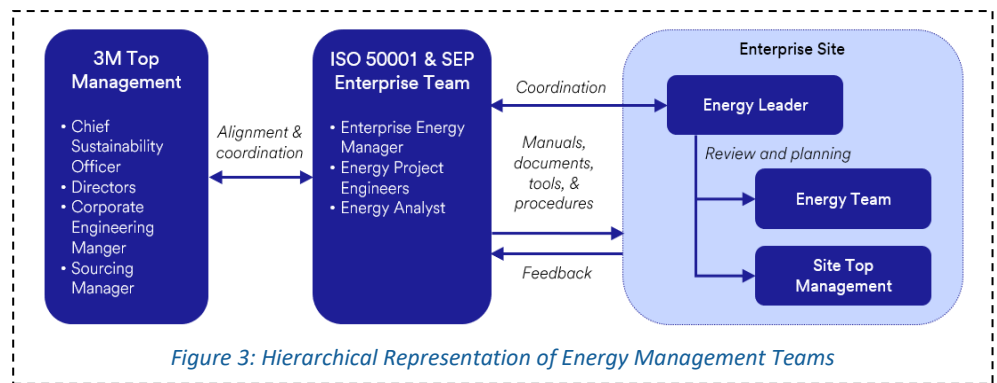


Figure 3: Hierarchical Representation of Energy Management Teams

**Energy Performance Derivation and Validation** – 3M measures energy performance utilizing three key factors: measured energy use normalized for weather, production, and/or occupancy; energy savings from energy projects implemented; and the effectiveness of the EnMS. These factors are included on the energy dashboard for each facility and are part of each site’s management review.

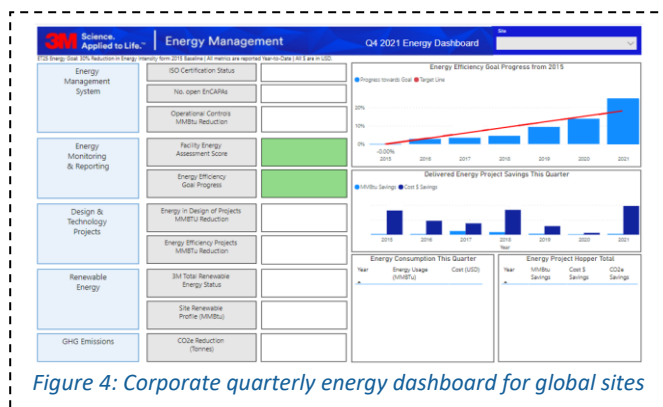


Figure 4: Corporate quarterly energy dashboard for global sites

The baseline year for energy modelling is 2015 with a timeframe of 1 year (the reporting period is from 2016 to 2021). RETScreen Expert energy modelling software provide a top-down verification, while a bottom-up approach is used to tabulate savings through completion of energy actions. SEP Measurement and Verification Protocol and IPMVP international standard is used to verify energy performance. The effectiveness of the EnMS is measured by completing an EnMS scorecard at each site. The EnMS is evaluated during top management reviews, internal audits, quarterly corporate reporting (Figure 4), and monthly team meetings.

**Projects and Actions** – As a site’s EnMS matures and the low-hanging fruit are addressed, the local energy team will host Energy Treasure (Kaizen) Hunts to identify unique opportunities, from operational controls to more unique CAPEX projects. 3M recognizes that most of the energy is used for process and space heating. Therefore, the focus for projects have been around chillers, boilers, steam systems and process equipment.

- Subscribing to steam trap monitoring services
- Li-ion batteries for material handling equipment
- Optimizing controls in manufacturing processes
- Upgrading end-of-life infrastructure to energy-efficient technologies
- Investigating adsorption chillers and non-chemical treatment for cooling towers
- Improving the building envelope efficiency
- DC to AC motor conversions and drive upgrades
- Continue lighting retrofit upgrades to metal halide and high-pressure sodium lights

**Renewable Energy** – Establishing sources for renewable energy including purchased power agreements and 3M owned on-site generation has been in focus for the last several years. 3M has surpassed the goal for 2020 of 25% by providing 47.6% of global electricity from renewable sources in 2021, and plan to achieve our goal of 50% by 2025 ahead of schedule.

**Operational Control** – Documentation systems such as the Energy Corrective Action/Preventative Action (EnCAPA), the EnMS manual, Standard Operating Procedures (SOP), and associated checklists guide our energy program with

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continuous improvement in mind. 3M strives to adopt engineering and administrative controls in addition to energy projects. Examples include ensuring preventative maintenance is compliant for significant energy uses and establishing 3M-wide standardized 12hr, 24hr, and 48hr shutdown checklists for trained personnel.

**Communication** – Sites utilize a plethora of avenues to motivate employees, increase awareness, and promote engagement such as energy bulletin boards, employee badge informational cards, layered process audits, poster campaigns, leak detection tags, energy treasure hunts, quarterly energy newsletters, annual Earth Day celebrations, energy fairs, and lunch-n-learn activities. At each site, there is an employee suggestion system integrated to the Lean Six Sigma Tier board process.

The Enterprise team provides energy and ISO 50001/SEP awareness training for new employees and site visitors, and 2-year refresher training for existing employees. The Corporate Energy Team provides online webinars, quarterly newsletters, and energy dashboards to show progress towards our corporate energy goals and introduce emerging technologies to the site energy leaders. Top management provides support through promoting different initiatives like presenting ISO 50001 certification during company-wide meetings.

Utility	Threshold Criteria
Chilled Water	> 50 TONS
Compressed Air	> 75 SCFM
Natural Gas/ LP	400 MMBtu/hr
Electrical	35 kW
Steam	900 lbs/hr

Figure 5: Threshold requirements for energy metering

## Energy Manual 81: Energy Design Requirements and Guidelines –

Consideration for energy has been integrated in our design and procurement activities through the implementation of an award-winning 3M Energy Manual 81 released in January 2021. This manual prescribes best practices and guidelines for common workspaces, utilities and process systems found at 3M. Manual 81 also requires metering installments for new equipment exceeding specific thresholds (see Figure 5). The sourcing standard also stipulates that 3M is committed to increasing energy and resource efficiency in manufacturing and supply chain. It is also communicated to our suppliers on the 3M Supplier Direct website.

**Process Integration and Dashboarding** – With the COVID-19 pandemic and meetings going online, 3M sites around the globe increased their focus on energy dashboarding and making energy visible. The local teams have brought process variable data from 3M systems and other required data to build energy performance indicators and normalized site models into Microsoft Power BI (Figure 6)/Grafana software dashboards.

**Tools & Resources** – 3M’s has adopted many changes over the decade-long ISO 50001 journey to integrate the EnMS into the business practices. It was of benefit to leverage existing corporate tools and resources for ISO 50001 implementation. This includes the Management of Change (MOC) processes, ISO 9001 and ISO 14001 systems, and our corporate energy data and project databases. An Enterprise-wide SharePoint system was developed to house the EnMS tools & resources, providing easy access and document control. The 3M-developed Energy Review and Planning Tool (ERPT), Site Energy Data System, and Energy Cost Reduction Projects (ECRP) are key to maintaining the EnMS.

**Peer-to-Peer Group** – As legacy sites adopted to the new ISO 50001:2018 standard and onboarding sites were lacking experience in managing the ISO 50001 EnMS. In response, the Enterprise team created an Microsoft Teams “ISO

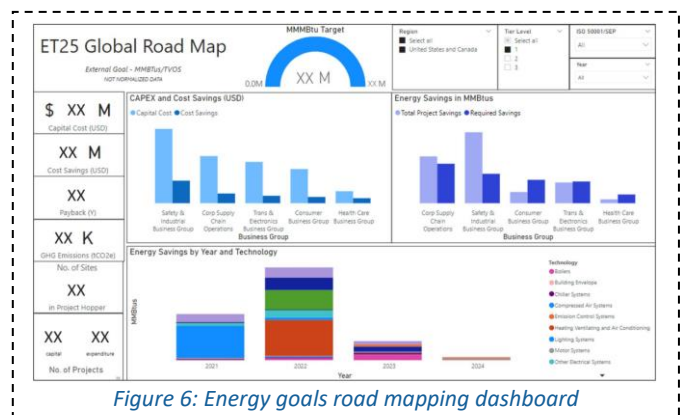


Figure 6: Energy goals road mapping dashboard



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50001/SEP Help Room” as a platform to connect the Enterprise site energy leaders, exchange challenges and best practices, and introduce new technologies for early adoption. This also helps the Enterprise team recognize emerging gaps in the EnMS and address them through bi-weekly meetings.

## Transparency

Our Energy Policy is proudly presented at the entrance of our buildings alongside Quality, Health and Safety, and Environmental policies. 3M’s progress and success stories are published in annual sustainability reports and is represented through numerous awards and organizations:

- *RE100; CE100; Water Resilience Coalition* – corporate partner
- *Clean Energy Ministerial (CEM)* – Award of Excellence in Energy Management for Corporate (2019); National Award for Canada (2019); Corporate Insight Award for US and Canada Enterprise (2021)
- *US DOE Better Plants* – Challenge and Low Carbon Pilot Corporate Partner; 2021 Better Project Award: Steam Trap Monitoring (3M Brookings); 2022 Better Practice Award: Manual 81 (Corporate)
- *Association of Energy Engineers (AEE)* – founding member of AEE (1977); presented at multiple East, West and Global conferences, reaching large audiences annually
- *Dow Jones Sustainability Index* – 3M included for 19 consecutive years (1999-2018)
- *Carbon Disclosure Project* – ranking A- in climate change for 2016; ranking B in climate change for 2021
- *Pilot program for The Commission for Environmental Cooperation (CEC)* – in collaboration with Natural Resources Canada, Canada Brockville PSD, US Cottage Grove & Mexico SLP sites participated as part of Clean Energy Ministerial
- *BASF Canada* – 2022 Customer Sustainability Awards Programme
- *Energy Efficiency National Partnership (EENP)* – Best Practices Award (3M Singapore Tuas, 2019)

*International Energy Agency (IEA), Asia-Pacific Economic Cooperation (APEC) Energy Workshops, Singapore Manufacturing Federation (SMF) and Singapore National Environment Agency* – present EnMS success stories for 3M’s key accounts

## What We Can Do Differently

Things 3M would have done differently with the EnMS implementation and maintenance:

- Standardize processes and systems early on to make implementation easier
- Implement a dedicated energy/sustainability role at the high energy-intensity manufacturing sites
- Establish metering capabilities to better understand real-time site energy consumption
- Early implementation of ISO 50001 at high energy-intensity sites to advance the corporate targets
- Continuously collaborate with internal groups such as corporate engineering, facilities, and Environmental, Health and Safety groups to integrate energy into existing processes
- Early development of an Energy Manual to include best practices and standardized company guidelines
- Explore different methods to secure funding for energy and sustainability projects

**“ISO 50001 was one of the core elements of 3M’s energy management roadmap. We envisaged benefits by operationalizing it for impact to sustainability metrics, improve competitiveness through lower costs, and raise employee awareness on efficient energy usage. We are reaping its benefits.”**

—Ranjit Thakur, Global Disruptive Technology & Energy Management Leader

Strengthening the Enterprise system for ISO 50001 and SEP has built a strong foundation for the 3M sites to achieve their individual goals that ultimately supports the corporate energy targets. In sharing these best practices and lessons learned, 3M hopes to grow together towards a sustainable future.