

# UPSCALE Morocco

UPscaling Sustainability, Competence and Leadership in Energy Excellence

# Implementing ISO 50001 Energy Management System



**Energy Management System Practitioner's Guide**



# UPSCALE Morocco - Project Brief

Being the fifth largest economy in Africa, Morocco is growing steadily experiencing a continuous economic growth of 4.2% annually. Small and medium sized enterprises (SMEs) that make 90% of the total economic enterprises contribute to this growth. The leading contributors to the country's economic growth and primary industries like leather goods, textile and food processing industry etc are high consumers of energy. Morocco at present is the largest energy importer in North Africa, with 97% of the energy supply coming from outside sources. Hence, the expected expansion of the economy would also result to a significant increase in energy demand and would exacerbate the risks to the energy security situation of the country.

UPSCALE Morocco – a Public Private Partnership programme funded by DEG and jointly implemented by DQS Holdings GmbH, UL DQS India and ASSIST (Asia Society for Social Improvement and Sustainable Transformation) in association with CMPP (Centre Marocain de Production Propre) and ADEREE (Agency for Development of Renewable Energy and Energy Efficiency) is a project that helps strengthen the capacity of the energy intensive industries in Morocco enabling them to adopt and implement energy efficient systems and practices to optimize energy consumption. The project has taken initiatives on creating awareness among the stakeholders on efficient use of energy through adoption and implementation of best practices and international standards like ISO 50001 and has built and strengthened local capacity through training programmes on energy efficiency techniques and management systems.



# Table of Contents

1	Introduction Energy Management System (EnMS) Practitioner's Guide	2
2	ISO in brief	3
3	What is ISO 50001?	4
4	Background	6
5	Origins of ISO 50001: 2011	7
6	Why an Energy Management Standard?	8
7	Energy Management Systems as Business Drivers	9
8	Statistics on energy savings from EPA.gov	10
9	How to use the ISO 50001 EnMS Practitioner's Guide	11
10	How Do I Start? - Guide from <a href="http://www.energystar.gov">www.energystar.gov</a>	12
11	Energy Management System Requirements	17
	4.1 General Requirements	17
	4.2 Management Responsibility	18
	4.3 Energy Policy	20
	4.4 Energy Planning	22
	4.5 Implementation and Operation	29
	4.6 Checking	35
	4.7 Management Review	39
12	Correspondence between ISO 50001:2011, ISO 9001:2008, ISO 14001:2004 and ISO 22000:2005	41
13	References	44
14	Acronyms and Definitions	45

## Proprietary Notice

*This document contains proprietary information of UL DQS Inc. In receipt of this document, the recipient agrees to not reproduce or otherwise disclose this information to any person outside the group directly responsible for evaluation of its contents, except that there is no obligation to maintain the confidentiality of any information which was known to the recipient prior to receipt of such information from UL DQS Inc., or becomes publicly known through no fault of recipient, from UL DQS Inc., or is received without obligation of confidentiality from a third party owing no obligation of confidentiality to UL DQS Inc.*

# 1 INTRODUCTION

## ENERGY MANAGEMENT SYSTEM (EnMS) PRACTITIONER'S GUIDE

All societies require energy to meet basic human needs (e.g., lighting, material processing, space comfort, mobility and communication) and to serve productive processes. Since 1859, global use of fossil fuels (coal, oil and gas) has increased, leading to rapid growth in carbon dioxide (CO<sub>2</sub>) emissions.<sup>1</sup>

In order for industry to make significant gains in energy efficiency, there must be greater awareness and knowledge sharing about programs, resources and practical methods that can help industrial plants identify, develop and document energy efficiency/intensity improvements. Historically, energy saving efforts have been delegated to plant engineers, frequently with assistance from consultants or suppliers with highly specialized technical skills, often one project at a time. Quantifying results and measuring progress relies heavily on the presence of individual energy efficiency “champions” within a company and their access to consultants or suppliers. Drawbacks to this approach are that achievements are often not well understood by those without specialized expertise, replication occurs slowly in the market, not a risk based approach over time, and benefits (ROI) may disappear if the champion leaves the company or is relocated.

Energy is an operational expense that has a direct impact on profitability. While the old business model says, “It is a cost of doing business,” the implementation of an EnMS replaces this model with, “How can we be more cost-effective in energy performance, efficiency and service?”



*Reducing energy use and increasing energy efficiency is a proven strategy for cutting and controlling costs with good returns.*

*EPA, 2011*

Energy management, a topic once “owned” by environmentalists, is increasingly one that ranks as “urgent” by senior executives from various industries. There has been a significant shift in business attitudes globally regarding climate change and energy. Companies are beginning to identify the true costs of carbon-centric energy consumption patterns. This congruence of concerns around cost, supply, reliability and environmental impacts of the energy needed to sustain our economies and way of life are increasingly influencing business and planet decisions at the highest levels.<sup>11</sup>

As a result of this rapid change in perceptions, corporate America has reached a tipping point, with companies across a host of industries now making the cost, availability and environmental impact of their end-to-end energy consumption a strategic priority. They are now frequently viewing energy management as a form of risk management. What once was managed as a cost is increasingly being managed as a strategic risk – and as a source of new value and opportunities.



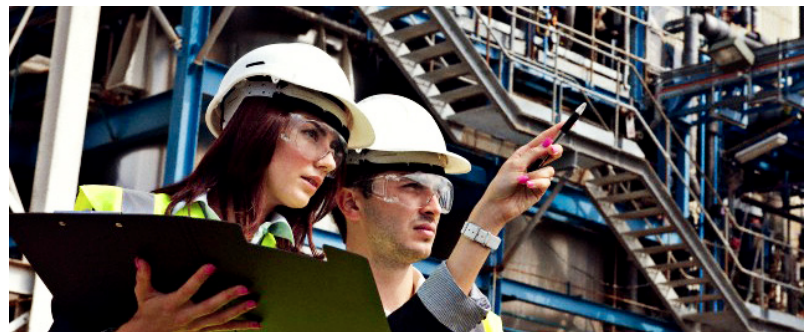
*The bottom line — good energy management is good business, and adopting an energy management strategy is a business decision you cannot afford to ignore.*

*EPA, 2011*



## 2 ISO IN BRIEF

The International Organization for Standardization (ISO) has a membership of some 160 national standards bodies from countries large and small, industrialized, developing and in transition, in all regions of the world. ISO's portfolio of over 18,600 standards provide business, government and society with practical and vetted tools for all three dimensions of sustainable development: economic, environmental and social. ISO standards make a positive contribution to the world we live in. They facilitate trade, spread knowledge, disseminate innovative advances in technology, and share good management and conformity assessment practices. ISO standards provide solutions and achieve benefits for almost all sectors of activity, including agriculture, construction, mechanical engineering, manufacturing, distribution, transport, medical devices, information and communication technologies, the environment, energy, quality management, conformity assessment and services. ISO only develops standards for which there is a clear market requirement. The work is carried out by experts in the subject drawn directly from the industrial, technical and business sectors that have identified the need for the standard, and which subsequently put the standard to use. These experts may be joined by others with relevant knowledge, such as representatives of government agencies, testing laboratories, consumer associations and academia, and by international governmental and nongovernmental organizations.<sup>17</sup>



“ ISO 50001 is based on the ISO management system model familiar to more than a million organizations worldwide who implement standards such as ISO 9001 (quality management), ISO 14001 (environmental management), ISO 22000 (food safety), ISO/IEC 27001 (information security). In particular, ISO 50001 follows the Plan-Do-Check-Act process for continual improvement of the energy management system.

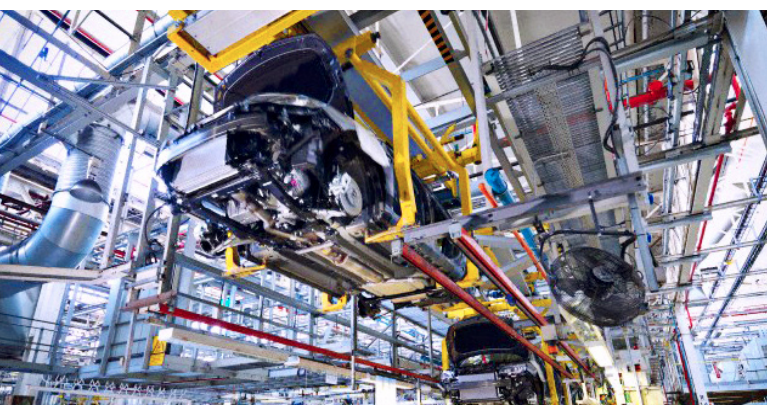
*These characteristics enable organizations to integrate energy management now with their overall efforts to improve quality, environmental management and other challenges addressed by their management systems.*

*ISO 50001 provides a framework of requirements enabling organizations to:*

- *Develop a policy for more efficient use of energy*
- *Fix targets and objectives to meet the policy*
- *Use data to better understand and make decisions concerning energy use and consumption*
- *Measure the results*
- *Review the effectiveness of the policy*
- *Continually improve energy management.*

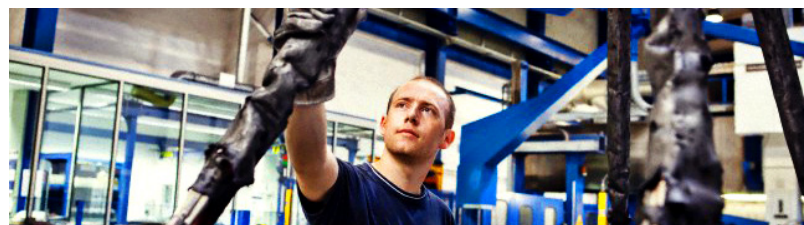
*ISO 50001 can be implemented individually or integrated with other management system standards.”*

*ISO, 2011*



*An ISO International Standard represents a global consensus on the state of the art in the subject of that standard.*

*ISO, 2011*







### 3 WHAT IS ISO 50001?

ISO 50001:2011 is an ISO standard that specifies requirements for establishing, implementing, maintaining and improving an energy management system, whose purpose is to enable an organization to follow a systematic approach in achieving continual improvement of energy performance, including: energy efficiency, energy use and consumption. It specifies requirements applicable to energy use and consumption, including measurement, documentation and reporting, design and procurement practices for equipment, systems, processes and personnel that contribute to energy performance.

The EnMS applies to all variables affecting energy performance that can be monitored and influenced by the organization. ISO 50001 does not prescribe specific performance criteria with respect to energy, i.e. 10% savings. The ISO 50001 standard for energy management systems has been designed to be used independently, but it can be aligned or integrated with other management systems. It is applicable to any organization, building, or manufacturing process that wishes to ensure its conformity to its stated energy policy and wishes to demonstrate this to others. Such conformity can be confirmed by means of self-evaluation and self-declaration of conformity or by certification of the energy management system by an external organization.<sup>8</sup>



## ISO TASK FORCE RECOMMENDATION

“National energy management standards have been developed and are in use in various countries, resulting already in significant savings in energy consumption and reductions in GHG emissions. Regional and national standards development is underway in Europe, China, USA and other countries. The increasing interest in this field and the explicit requests received by ISO, have led the Technical Management Board (TMB) to already address the matter and the Task Force recommends that ISO moves forward expeditiously.”

*International Energy Agency, 2009*



## 4 BACKGROUND

There is a long history to the development of energy management. The American standard on energy management was the first voluntary standard published in 2000. The stakeholder process was expanded to include Italy, Germany and Switzerland in 2005. These discussions continued and further expanded in 2006 with Ireland, China, and Korea. In 2007, through an expert meeting hosted by UNIDO in March a resolution was issued that indicated an International Standard should be established. This resolution was reviewed by the US experts and work began on proposal begun. UNIDO is the United Nations' specialized industrial agency, mandated to promote industrial development and international industrial cooperation.<sup>9</sup>

Industrial energy use represents more than one-third of both global primary energy and energy related carbon-dioxide emissions. For developing countries, this is often in excess of 50% of the total and can produce supply problems. Developing economies lead growth in both industrial energy use and carbon-related emissions.

In industry, a missed opportunity for energy efficiency may not reoccur- for decades or at all until the original installation fails or becomes obsolete.

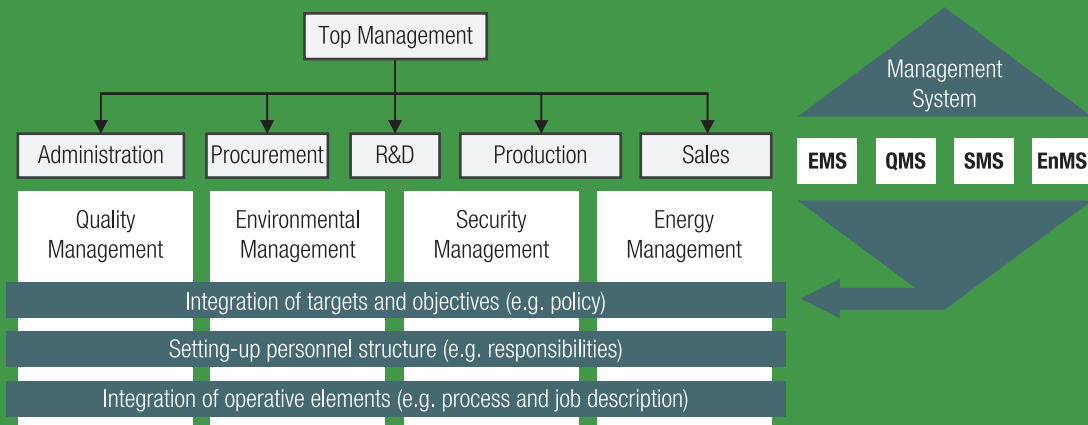
Many countries have developed energy management system standards or other types of national programs to help their industry.

These countries include Denmark, Ireland, China, Korea, Japan, Spain, Thailand, Germany, Sweden, United Kingdom, leading to a ground swell of energy management standards that were developed or are in the process of being developed by each country. This includes the US version "Management System for Energy" (MSE).

Energy issues are globally recognized to be a pertinent concern. Energy management today is a business decision to reduce per unit consumption which affects operational costs, quality, productivity and GHG emissions by reducing their carbon footprint. To support this purpose, ISO 50001:2011 has been developed with a persuasive energy management philosophy.

EnMS offers a systematic and structured approach to identify, measure, and manage critical energy inputs to our workplace. This approach includes dissection of energy quality in order to prioritize and improve an organization's energy performance. The standard is flexible, fitting any size or type of organization, manufacturing, or service industry. It provides a built in mechanism for continual improvement of energy management.

### ► INTEGRATION OF EnMS



Please refer to reference number 6.



# 5 ORIGINS OF ISO 50001: 2011

## ▶ ISO 50001 TIMELINE



*ISO 50001 was formally released June 14, 2011*

# 6 WHY AN ENERGY MANAGEMENT STANDARD?

Most energy efficiency is achieved through changes in how energy is managed in an industrial facility, a LEED certified Green Building or manufacturing process, rather than through installation of new technologies. An energy management standard, such as ISO 50001, provides a tool for integrating energy efficiency into existing organizational management systems for continuous improvement. Companies who have voluntarily adopted an energy management plan (a central feature of an EnMS) have achieved major energy intensity and use improvements. It is also applicable to commercial, institutional, and transportation sectors. All existing and planned energy management standards are compatible with ISO 9001 and ISO 14001.

There are many benefits to an organization for implementing an EnMS:

- Broad applicability
- Applies to all sectors of business
- Applies to all sizes of organizations
- Leverages existing management systems
- Leverages existing continual improvement

processes

- Develops a baseline of energy use
- Actively manages energy use and costs
- Reduce emissions without a negative impact on operations
- Continual improvement of energy use versus product output over time
- Potential for savings to be used for emission credits

In addition, most countries offer financial incentives for compliance, usually as part of a target-setting agreement, provide training on standards compliance and provide opportunities for companies to network and learn from each other. Several countries also offer system optimization training.

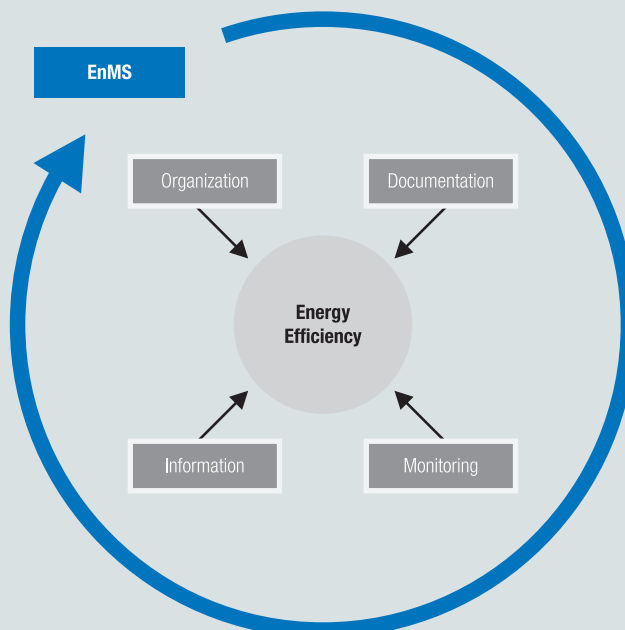
The end product of the EnMS standard is to provide measurable results. Improvements are achieved in changes to how energy is managed. Organizations who have adopted energy management plans have achieved major improvements.



*The value of strong energy management as a proxy for overall organizational management is increasingly recognized by financial analysts.*

*Energystar.gov, 2011*

## ▶ MOST IMPORTANT ASPECTS OF AN EnMS



*Please refer to reference number 6.*

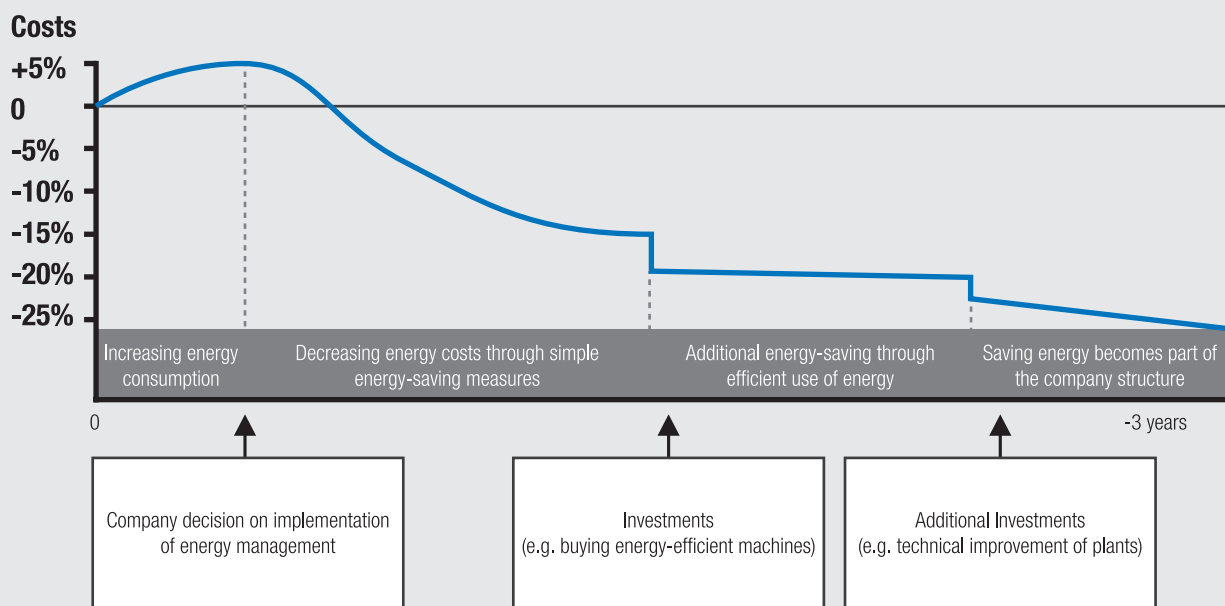


# 7 ENERGY MANAGEMENT SYSTEMS AS BUSINESS DRIVERS

Management Systems favor shareholder value by driving ROI (Return On Investment). Thus, it is always advantageous for any organization implementing it because:

- It provides a process in the level of execution critical to performance.
- It continuously manages energy processes.
- It reduces exposure to energy costs (Internal hedging and volatility management)
- It reduces carbon control investment and alternatives without negative effects on operations.
- Provides continual improvement of energy intensity and use.
- It values both avoidance & savings for internal and external metrics (e.g. emissions, utility credits, reduced labor intensity, CAPEX, etc.) over time rather than one off projects

## ▶ CONTINUOUS COST REDUCTION WITH EnMS



Please refer to reference number 6.

## ▶ PRACTICAL EXAMPLES ON ENERGY CONSERVATION IN COMPANIES FROM DIFFERENT SECTORS

Measures	Sectors	Investment in USD	Cost Reduction in USD per year	Payback time (statistics)	Savings in Mwh and tons of CO <sub>2</sub>
Installation of heat exchanging device at different locations	Construction material industry / Brick production	925,000	around 450,000	around 2 years	3,225 t CO <sub>2</sub>
Checking the lighting situation in the furniture hall buildings	Mail order selling	0	5,500	0	48 MWh and 30t CO <sub>2</sub>

Please refer to reference number 6.

## 8 STATISTICS ON ENERGY SAVINGS FROM EPA.GOV

Even with good returns, energy waste is still prevalent throughout organizations. Consider that:

- A 400% variation in energy use intensity of buildings in the United States exists that is not explained by age, technology, hours, size, climate.
- Little improvement of overall energy consumption has been seen although building components are 30% more efficient since 1980.
- Oversizing building fan systems, on average, occurs by 60%.
- Most chillers are oversized by 50–200%.

Unfortunately, capturing energy waste has been hampered by a lack of focus on energy management. Too often energy management is characterized as:

- Decentralized
- Poorly-coordinated
- Focused on paying bills & running the powerhouse
- Reactive
- Undervalued
- Considered capital intensive

Organizations that have adopted effective energy management strategies and built successful energy programs have had different results. Consider the following:

- Ford Motor Company has saved over \$75 million through effective energy management.
- USAA Real Estate has realized a 5% annual energy savings and increased the asset value of a California building by \$1.5 million due to energy efficiency upgrades.
- Eastman Kodak saved more than \$8.6 million in operating costs in 2002 from its energy management efforts.
- Hines estimates the difference in operational costs between its energy efficient buildings and inefficient buildings at more than \$13 million.
- Fairfax County Public Schools estimates an annual energy savings of \$4.5 million from energy efficiency improvements.

Recent studies by Innovest Strategic Value Advisors (see below) found that leaders in energy management achieved superior stock and financial performance over laggards in energy management. The difference between the leaders and laggards is significant:

- Real estate investment sector — over 3,400 basis points difference
- Retail food sector — 1700 basis points difference
- Retail merchandising — 7100 basis points difference



## 9 HOW TO USE THE ISO 50001 EnMS PRACTITIONER'S GUIDE

This Practitioner's Guide is intended to help organize and streamline an organization's effort to become an ISO 50001 Energy Management System (EnMS) Registered Firm. The information gathered here may be useful in determining the organization's state of readiness for an EnMS evaluation.

The use of this guide is to increase the understanding of ISO 50001 as it applies to organizations. We encourage you to share this within your organization to enhance everyone's understanding of EnMS requirements and the assessment process.

Please be aware that although the following sections include all requirements of the EnMS Standard, they do not necessarily cover how the requirements of the Standard relate specifically to your facility or organization. Use of this guide is meant to provide a sample of the effectiveness of your EnMS.

The following section, section 10 presents a strategy for preparing your organization for ISO 50001. It provides a basis for understanding how your system may conform to the Standard. Only the requirements as shown within Clause 4 of the EnMS standard, section 10 of this guide, are auditible.



# 10 HOW DO I START?

## GUIDE FROM WWW.ENERGYSTAR.GOV

### Step

# 1

## Commit to Continuous Improvement

Organizations seeing the financial returns from energy management continuously strive to improve their energy performance. Their success is based on regularly assessing energy performance and implementing steps to increase energy efficiency. No matter the size or type of organization, the common element of successful energy management is commitment. Organizations make a commitment to allocate staff and funding to

achieve continuous improvement. To establish their energy program, leading organizations form a dedicated energy team and institute an energy policy. Effective implementation of an EnMS requires full support and commitment from the highest levels. If employees perceive management is not fully committed to energy management, there is a high potential for failure.

### Step

# 2

## Form a Dedicated Team

- a. Appoint an Energy Director: Sets goals, tracks progress, and promotes the energy management program.
- b. Establish an Energy Team: Executes energy management activities across different parts of the organization and ensures integration of best practices.
- c. Empower energy staff to fulfill fundamentals. Push for strong energy efficiency from all parts of the business. Enable energy investments by valuing them differently from other projects. Educate customers on the value of energy performance in products. Involve yourself.

### ▶ EXAMPLE OF AN INTERNAL JOB DESCRIPTION FOR AN ENERGY MANAGER

Tasks	Qualities
Setting up and leading the energy team in the company	Good knowledge of the operating procedures
Planning and implementing the projects (according to budget, time and quality)	Excellent capabilities in project management, in organisation and communication
Acquisition, processing and communication of energy-related information	Sound knowledge of ISO 50001
Delegating tasks and setting time limits	Basic technical understanding
Supporting the involvement and recognition of the top management	Trust and respect of co-workers
Attaining staff support beyond individual areas and functions	Involvement and enthusiasm for the subject of energy management
Regularly reporting to the top management	Ability to listen to others who, in some cases, have a different opinion and other ideas

*Please refer to reference number 6.*





## Step

# 3 Assess Performance

Understanding current and past energy use is how many organizations identify opportunities to improve energy performance and gain financial benefits. Assessing performance is the periodic process of evaluating energy use for all major facilities and functions in the organization and establishing a baseline for measuring future results of efficiency efforts.

Key aspects include:

- a. Data Collection and Management: Collect energy use information and document data over time.
- b. Baseline and Benchmarking: Determine the starting point from which to measure progress. Compare the energy performance of your facilities to each other, peers and competitors, and over time to prioritize which facilities to focus on for improvements.
- c. Analysis and Evaluation: Understand your energy use patterns and trends.
- d. Technical assessments and audits: Evaluate the operating performance of facility systems and equipment to determine improvement potential.

Assessing your energy performance helps you to:

- Categorize current energy use by fuel type, operating division, facility, product line, etc.
- Identify high performing facilities for recognition and replicable practices.
- Prioritize poor performing facilities for immediate improvement.
- Understand the contribution of energy expenditures to operating costs.
- Develop a historical perspective and context for future actions and decisions.
- Establish reference points for measuring and rewarding good performance.

## Step

# 4 Set Goals

Performance goals drive energy management activities and promote continuous improvement. Setting clear and measurable goals is critical for understanding intended results, developing effective strategies, and reaping financial gains. Well-stated goals guide daily decision-making and are the basis for tracking and measuring progress. Communicating and posting goals can motivate staff to support energy management efforts throughout the organization. The Energy Director in conjunction with the Energy Team typically develops goals.

To develop effective performance goals:

- a. Determine scope: Identify organizational and time parameters for goals.
- b. Estimate potential for improvement: Review baselines, benchmark to determine the potential and order of upgrades, and conduct technical assessments and audits.
- c. Establish goals: Create and express clear, measurable goals, with target dates, for the entire organization, facilities, and other units.

Setting goals helps the Energy Director:

- Set the tone for improvement throughout the organization
- Measure the success of the energy management program
- Help the Energy Team to identify progress and setbacks at a facility level
- Foster ownership of energy management, create a sense of purpose, and motivate staff
- Demonstrate commitment to reducing environmental impacts
- Create schedules for upgrade activities and identify milestones

## → SUGGESTIONS

When setting goals, be sure to use the Energy Team's wide range of knowledge to help set aggressive, yet realistic goals. Have management review your goals to enlist their feedback and support.

## Step 5 Create Action Plan

With goals in place, your organization is now poised to develop a roadmap to improve energy performance. Successful organizations use a detailed action plan to ensure a systematic process to implement energy performance measures. Unlike the energy policy, the action plan is regularly updated, most often on an annual basis, to reflect recent achievements, changes in performance, and shifting priorities. While the scope and scale of the action plan is often dependent

on the organization, the steps below outline a basic starting point for creating a plan:

- a. Define technical steps and targets
- b. Determine roles and resources: Get buy-in from management and all organizational areas affected by the action plan before finalizing it. Work with the Energy Team to communicate the action plan to all areas of the organization.

## → SUGGESTIONS

Creating an inclusive strategy that establishes roles and actions throughout the organization can help to integrate good energy management practices. When developing an action plan, consider:

- Brainstorming with various departments to identify ways they can contribute.
- Holding a competition to seek ideas for energy efficiency from across the organization.
- Gathering recommendations from the Energy Team and other key personnel.





## Step

# 6 Implement Action Plan

People can make or break an energy program. Gaining the support and cooperation of key people at different levels within the organization is an important factor for successful action plan implementation in many organizations. In addition, reaching your goals frequently depends on the awareness, commitment, and capability of the people who will implement the projects.

**To implement your action plan, consider taking the following steps:**

- a. Create a communication plan: Develop targeted information for key audiences about your energy management program.
- b. Raise awareness: Build support all levels of your organization for energy management initiatives and goals.
- c. Build capacity: Through training, access to information, and transfer of successful practices, procedures, and technologies, you can expand the capacity of your staff.
- d. Motivate: Create incentives that encourage staff to improve energy performance to achieve goals.
- e. Track and monitor: Using the tracking system developed as part of the action plan to track and monitor progress regularly.

## Step

# 7 Evaluate Progress

Evaluating progress includes formal review of both energy use data and the activities carried out as part of the action plan as compared to your performance goals. Evaluation results and information gathered during the formal review process is used by many organizations to create new action plans, identify best practices, and set new performance goals.

**Key steps involved include:**

- a. Measure results: Compare current performance to established goals.
- b. Review action plan: Understand what worked well and what didn't in order to identify best practices. Regular evaluation of energy performance and the effectiveness of energy management initiatives also allows energy managers to:
  - Measure the effectiveness of projects and programs implemented
  - Make informed decisions about future energy projects
  - Reward individuals and teams for accomplishments
  - Document additional savings opportunities as well as non-quantifiable benefits that can be leveraged for future initiatives.



## Step

# 8 Recognize Achievements

Providing and seeking recognition for energy management achievements is a proven step for sustaining momentum and support for your program. Providing recognition to those who helped the organization achieve these results motivates staff and employees and brings positive exposure to the energy management program. Receiving recognition from outside sources validates the importance of the energy management program to both internal and external stakeholders, and provides positive exposure for the organization as a whole. Key steps in providing and gaining recognition include:

- a. Providing internal recognition: to individuals, teams, and facilities within your organization.
- b. Receiving external recognition: from government agencies, the media, and other third party organizations that reward achievement.
- c. Partners are also encouraged to promote this notable achievement internally and externally through newsletters and local media.





# 11 ENERGY MANAGEMENT SYSTEM REQUIREMENTS

Section 11 is a discussion of the standard focused on section 4 of the EnMS standard, the auditable clauses. Each clause will have four discussion points:

1. Introduction
2. Requirements of the standard
3. Examples or learning points; and
4. Action items

Specific clauses may have an introduction or opening paragraph. Throughout this section, we will be using a mythical company called “ABC Company (ABCCO).” The company has three buildings: warehouse; administration building and manufacturing. The following sections are numbered as presented in the EnMS Standard. Only Clause 4 is auditable.

For the example used in this Guide, the following information will be useful:

Energy Source	BTU	kWh
Barrel (42 gal) crude oil	5,800,000	1,699.9
Gallon gasoline	124,238	36.4
Gallon diesel fuel	130,500	38.2
Gallon heating oil	138,690	40.6
Barrel residual fuel oil	6,287,000	1,842.6
Cubic Foot of natural gas	1,027	0.3
Gallon propane	91,033	26.7
Short ton of coal	19,977,000	5,854.9
KW-hour electricity	3,412	1.0

## 4.1 General Requirements

### INTRODUCTION:

General Requirements set the stage or foundation for the entire EnMS system. Management must consider how it will address all of the EnMS requirements, develop a strategy and define and document its scope. Much like ISO 14001, the scope is a critical part of the EnMS, as it defines its bounds and limits.

The implementation of an EnMS is intended to result in improved energy performance. This standard is based on the premise that the organization will periodically

review and evaluate its energy management system to identify opportunities for improvement and their implementation. The organization is given flexibility in how it implements the EnMS.

For example:

- a. The rate, extent and timescale of the continual improvement process are determined by the organization
- b. The organization can take into account economic and other considerations when determining the rate, extent and timescale of the continual improvement process
- c. The concept of scope and boundaries allows flexibility to the organization to define what is included within the EnMS

The concept of energy performance includes energy use, energy efficiency and energy consumption. The organization can choose from a wide range of energy performance activities. For example, the organization could reduce peak demand, utilize surplus or waste energy, or improve the operations of its systems, processes or equipment. The intent of this section is to provide a high altitude overview and set the stage for the EnMS. It does not require specific processes or procedures, other than to define and document the scope of your EnMS.

### REQUIREMENTS OF THE STANDARD

The organization shall:

- a. Establish, document, implement, maintain and improve an EnMS in accordance with the requirements of this International Standard
- b. Define and document the scope and boundaries of its EnMS
- c. Determine how it will meet the requirements of this international standard in order to achieve continual improvement of its energy performance and of its EnMS

## EXAMPLES OR LEARNING POINTS

Scope 1. The energy management system of ABCCO, associated with the manufacture of advanced widget component parts, located in Anywhere, AZ, USA.

Scope 2. All energy related activities, products and services of ABCCO, within the bounds of its property in Anywhere, AZ, USA.

Scope 3. The ABCCO energy activities at its 123 Main Street, Anywhere, AZ, USA site.

## ACTION ITEMS

- Define and document the Scope of your EnMS
- Determine how you will meet the requirements of the Standard.
- Establish your EnMS.

# 4.2 Management Responsibility

## 4.2.1 Management Responsibility

### INTRODUCTION:

Top Management or their representative, when communicating to the organization, can support energy management through employee involvement activities such as empowerment, motivation, recognition, training and rewards and participation. When communicating long-term energy management targets, topics may include: energy sources, energy performance, and energy performance improvements in planning activities.

### REQUIREMENTS OF THE STANDARD

Top management shall demonstrate its commitment to support the EnMS and to continually improve its effectiveness by:

- a. Defining, establishing, implementing, and maintaining an energy policy
- b. Appointing a management representative and approving the formation of an energy

management team

- c. Providing the resources needed to establish, implement, maintain and improve the EnMS and resulting energy performance

Note: Resources include human resources, specialized skills, technology and financial resources

- d. Identifying the scope and boundaries to be addressed by the EnMS
- e. Communicating the importance of energy management to those in the organization
- f. Ensuring that energy objectives and targets are established
- g. Ensuring that EnPIs are appropriate to the organization
- h. Considering energy performance in long-term planning
- i. Ensuring that results are measured and reported at determined intervals
- j. Conduct management reviews

## EXAMPLES OR LEARNING POINTS

1. Meeting minutes where Top Management's commitment to the EnMS process is documented
2. All hands kick-off meetings held by ABCCO where commitments are publicly made by Top Management, EnMS team introduced and support provided by management
3. "Energy Day" celebration to kick off the start of the EnMS

## ACTION ITEMS

- A demonstration of Top Management's commitment to EnMS (See clause 4.2)
- Define, establish, implement and maintain an energy policy (See clause 4.3)
- Appoint a management representative and approve the formation of an energy management team (See clause 4.2.2)
- Providing the resources needed to establish, implement, maintain and improve the EnMS and resulting energy performance (See clause 4.2.1 and 4.3)



- Identify the scope and boundaries addressed by the EnMS (See Clause 4.1)
- Communicate the importance of energy management to the organization (See Clause 4.5.3)
- Ensure energy objectives and targets are established (See Clause 4.4.6)
- Ensure EnPIs are appropriate to the organization (See Clause 4.4.5)
- Consider energy performance in long-term planning (See Clause 4.2.1)
- Ensure results are measured and reported at determined intervals (See Clause 4.6.1)
- Conduct management reviews (See Clause 4.7)

### 4.2.2 Roles, Responsibility and Authority

#### INTRODUCTION:

Successful implementation of an EnMS calls for commitment from all persons working for the organization or on its behalf. Energy roles and responsibilities therefore should not be seen as confined to the energy management function, but can also cover other areas of an organization, such as operational management or other staff functions. This commitment should begin at the highest levels of management. Accordingly, Top Management should establish the organization's energy policy and ensure that the EnMS is implemented.

As part of this commitment, Top Management should designate a specific management representative(s) with defined responsibilities and authority for implementing the EnMS. In large or complex organizations, there may be more than one designated representative. In small or medium-sized enterprises, these responsibilities may be undertaken by one individual. Management should also ensure that appropriate resources, such as organizational infrastructure, are provided to ensure that the EnMS is established, implemented and maintained. Examples of organizational infrastructure include buildings, communication lines, underground tanks, drainage, etc. It is also important that the key EnMS roles and responsibilities are well defined and

communicated to all persons working for, or on behalf of the organization, to ensure that “authority” is defined, documented and communicated.

#### REQUIREMENTS OF THE STANDARD

Top management shall appoint a management representative(s) with appropriate skills and competence, who, irrespective of other responsibilities, has the responsibility and authority to:

- Ensure the EnMS is established, implemented, maintained, and continually improved in accordance with this International Standard
- Identify person(s), authorized by an appropriate level of management, to work with the management representative in support of energy management activities
- Report to top management on energy performance
- Report to top management on the performance of the EnMS
- Ensure that the planning of energy management activities is designed to support the organization's energy policy
- Define and communicate responsibilities and authorities in order to facilitate effective energy management
- Determine criteria and methods needed to ensure that both the operation and control of the EnMS are effective
- Promote awareness of the energy policy and objectives at all levels of the organization

#### EXAMPLES OR LEARNING POINTS

At this point in the process, specific job and implementation requirements are established. It is important to assign the task of “Management Representative” to one or more people, who are competent in the ability to execute the program. A common failure point of many management systems is to appoint a person (or team) who either does not have the knowledge, competency, management support or understanding of the organization.

For purposes of this Guide, the Energy Team is William Robert and Joseph Ray. The both have direct reporting responsibility to the VP of Paperclips and dotted line responsibility to the CEO.

## ACTION ITEMS

Top Management has to appoint a Management Representative or Energy Team, with the responsibilities and activities noted above in the Requirements section.

## 4.3 Energy Policy

### INTRODUCTION:

The energy policy is the driver for implementing and improving an organization's EnMS and energy performance within its scope and boundaries. The policy may be a brief statement (high level overview of management's intent) that members of the organization can readily understand and apply to their work activities. The energy policy dissemination can be used as a driver to manage organizational behavior.

Where transportation is procured or used by the organization, the energy use and consumption of transport can be included in the scope and boundaries of the EnMS.

### REQUIREMENTS OF THE STANDARD

The energy policy shall state the organization's commitment to achieving energy performance improvement.

Top management shall define the energy policy and ensure that it:

- a. Is appropriate to the nature and scale of the organization's energy use and consumption
- b. Includes a commitment to continual improvement in energy performance
- c. Includes a commitment to ensure the availability of information and of necessary resources to achieve objectives and targets
- d. Includes a commitment to comply with

applicable legal requirements and other requirements to which the organization subscribes related to its energy use, consumption and efficiency

- e. Provides the framework for setting and reviewing energy objectives and targets
- f. Supports the purchase of energy-efficient products and services, and design for energy performance improvement
- g. Is documented and communicated at all levels within the organization
- h. Is regularly reviewed, and updated as necessary



## EXAMPLES OR LEARNING POINTS

### ▶ EXAMPLE 1 (FORMAL)

Our Energy Policy: We, the company ABCCO, hereby commit ourselves to the long-term reduction of our energy consumption and to the improvement of our energy efficiency in a continuous improvement process. To fulfill these objectives, we are implementing an energy management system according to ISO 50001 standard. We thereby ensure that all the requirements of this standard are correctly implemented and that there is a continuous improvement of all processes within this energy management system. In addition, we will regularly review that

- the required financial and structural preconditions are met; all employees are integrated into the implementation and operation of the energy management system and responsibilities are established;
- relevant legal obligations and other requirements are taken into consideration;
- energy aspects/energy data are regularly determined and assessed;
- programs promoting energy-efficiency are correctly introduced and conducted;
- the results are measured and evaluated by means of a regular audit;

Date : \_\_\_\_\_ Place : \_\_\_\_\_  
Name : \_\_\_\_\_  
Position : \_\_\_\_\_

### ▶ EXAMPLE 2 (ACRONYM)

The ABCCO Energy Policy is as follows:

- A** – Assure we comply with all our legal and other requirements related to energy
- B** – Be sure information and resources are available to meet our objectives and targets
- C** – Continually improve our efficient use of energy
- C** – Cascade our activities to set and review objectives and targets
- O** – Obtain and purchase energy efficient products and services

CEO : \_\_\_\_\_ Date : \_\_\_\_\_

### ▶ EXAMPLE 3 (INFORMAL)

The ABCCO energy policy is to: do better in energy use all the time; meet our regulatory and corporate issues; do what is necessary to set, review and achieve the stated objectives and targets; and only buy the highest level energy efficient items.

Approved : \_\_\_\_\_ Revision : \_\_\_\_\_

## ACTION ITEMS

Define and document your energy policy



## 4.4 Energy Planning

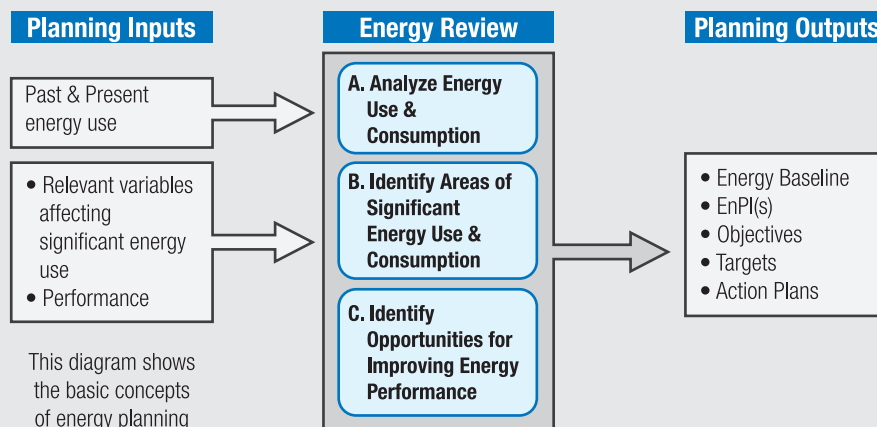
### INTRODUCTION:

Figure 1 is a conceptual diagram intended to improve understanding of the energy planning process. This diagram is not intended to represent the details of a specific organization and there may be other details specific to the organization or particular circumstances.

This section of the standard focuses on the energy performance of the organization and tools to maintain and continually improve energy performance. Benchmarking is the process of collecting, analyzing and relating energy performance data of comparable

activities with the purpose of evaluating and comparing performance between or within entities. Different types of benchmarking exist, ranging from internal benchmarking for the purpose of highlighting good practices within the organization to external benchmarking to establish the "best in industry/sector" performance of an installation/facility or a specific product/service in the same field or sector. The benchmark process can be applied to any or all of these elements. Provided relevant and accurate data is available, benchmarking is a valuable input to an objective energy review (4.4.3), and consequent setting of energy objectives (4.4.6) and energy targets (4.4.6).

► **FIGURE 1 : ENERGY PLANNING PROCESS CONCEPT DIAGRAM**



Please refer to reference number 6.

### 4.4.1 General

#### INTRODUCTION:

Consistent with the standard, this section states the need to establish processes for energy planning.

#### REQUIREMENTS OF THE STANDARD

The organization shall conduct and document an energy planning process. Energy planning shall be consistent

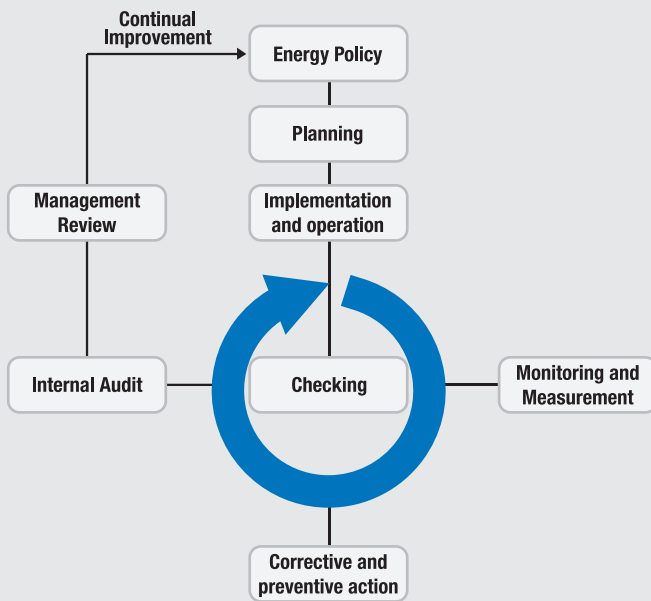
with the energy policy and shall lead to activities that continually improve energy performance. Energy planning shall involve a review of the organization's activities that can affect energy performance.

NOTE 1: A concept diagram illustrating energy planning is shown in Figure 1.

NOTE 2: In other regional or national standards, concepts such as identification and review of energy aspects or the concept of energy profile, are included in the concept of energy review.

## EXAMPLES OR LEARNING POINTS

As with many other clauses, this clause helps set the stage for the Planning Requirements. The planning process is an integral part of the Plan-Do-Check-Act Demming circle common to all management systems.



Please refer to reference number 17.

## ACTION ITEMS

Have a process in place, using the following clauses to demonstrate your planning activities that continually improve energy performance.

### 4.4.2 Legal and Other Requirements

#### INTRODUCTION:

Applicable legal requirements are those international, national, regional, and local requirements that apply to the scope of the energy management system. Examples of legal requirements may include a national energy conservation regulation or law. Examples of other requirements may include agreements with customers, voluntary principles or codes of practice, voluntary programs and others. The organization needs to identify the legal requirements that are applicable to its energy use.

1. These may include:
  - a. National and international legal requirements
  - b. State/provincial/departmental legal requirements
  - c. Local governmental legal requirements
2. Examples of other requirements to which the organization may subscribe include, if applicable:
  - a. Agreements with public authorities
  - b. Agreements with customers
  - c. Non-regulatory guidelines
  - d. Voluntary principles or codes of practice
  - e. Requirements of trade associations
  - f. Agreements with community groups or non-governmental organizations
  - g. Public commitments of the organization or its parent organization
  - h. Corporate/company requirements

The determination of how legal and other requirements apply to an organization's EnMS is usually accomplished in the process of identifying these requirements. It may not be necessary, therefore, to have a separate or additional procedure in order to make this determination.

## REQUIREMENTS OF THE STANDARD

The organization shall identify, implement, and have access to the applicable legal requirements and other requirements to which the organization subscribes related to its energy use, consumption and efficiency. The organization shall determine how these requirements apply to its energy use, consumption and efficiency and shall ensure that these legal requirements and other requirements to which it subscribes are considered in establishing, implementing and maintaining the EnMS. Legal requirements and other requirements shall be reviewed at defined intervals.

## EXAMPLES OR LEARNING POINTS

- a. Title V - Fuels and Emissions
- b. Air and Boiler Regulations
- c. Federal Tax Policy – Incentives and Penalties
- d. Executive Orders, such as EO 13514

- e. Utility Incentives
  - i. Source
  - ii. Capital Expenses
  - iii. Rate Reductions
- f. DOT Fleet Requirements ( $\geq 10$  vehicles)
- g. Security and Access Regulations
- h. Rate Structure Issues (Interruptible Power Rates v Non-Interruptible)

## EXAMPLES OF OTHER REQUIREMENTS

Examples of other requirements that encompass non-regulatory issues:

- a. Corporate Mandates
- b. Trade Associations
- c. Voluntary Agreements
- d. Non-regulatory Agreements with Utility or other Energy Suppliers

## ACTION ITEMS

Identify and have access to your legal and other energy related requirements. There may be some value in taking the energy source, use and consumption activities identified in the following clauses and cross reference any legal and other requirements to them. This approach can facilitate the identification of the requirements to what you are doing at your site.



## 4.4.3 Energy Review

### INTRODUCTION:

The process of identification and evaluation of energy use should lead the organization to define areas of significant energy use and identify opportunities for improving energy performance.

Potential sources of energy can include conventional sources that have not been previously used by an organization. Alternative energy sources can include fossil or non-fossil fuels. Updating the energy review means updating the information related to the analysis, determination of significance and determination of improving energy performance opportunities. An energy audit or assessment comprises a detailed review of the energy performance of an organization, of a process, or both. It is typically based on appropriate measurement and observation of actual energy performance.

Audit outputs typically include information on current consumption and performance and can be accompanied by a series of ranked recommendations for improvement in terms of energy performance. Energy audits are planned and conducted as part of the identification and prioritization of opportunities to improve energy performance.

### REQUIREMENTS OF THE STANDARD

The organization shall develop, record, and maintain an energy review. The methodology and criteria used to develop the energy review shall be documented. To develop the energy review, the organization shall:

- a. analyze energy use and consumption based on measurement and other data, i.e.
  - i. identify current energy sources
  - ii. evaluate past and present energy use and consumption
- b. based on the analysis of energy use and consumption, identify the areas of significant energy use, i.e.:
  - i. identify the facilities, equipment, systems, processes and personnel working for, or on



behalf of, the organization that significantly affect energy use and consumption

- ii. identify other relevant variables affecting significant energy uses
  - iii. determine the current energy performance of facilities, equipment, systems and processes related to identified significant energy uses
  - iv. estimate future energy use and consumption
- c. identify, prioritize and record opportunities for improving energy performance.

NOTE: Opportunities can relate to potential sources of energy, use of renewable energy, or other alternative energy sources, such as waste energy.

The energy review shall be updated at defined intervals, as well as in response to major changes in facilities, equipment, systems, or processes.

## EXAMPLES OR LEARNING POINTS

The facility has noted the following energy use data:

Source	Amount	BTU (x10 <sup>6</sup> )	KWhr (x10 <sup>3</sup> )
Fuel Oil	3,000 Gal	416.070	121.800
Propane	15,000 Gal	1,365.495	400.500
Diesel	4,000 Gal	522.000	152.800
Electric	1,500,000 KWhr	5,118.000	1,500.000
Total 2010		7,421.565	2,175.100 (+15%)
Total 2009		6,308.330	1,848.835 (+15%)
Total 2008		5,362.080	1,571.510

- a. While a steady 15% increase in energy was noted for the past two years, management has estimated a 5% increase in KWhr for 2011 = 2,393 x10<sup>3</sup> KWhr.
- b. Energy Uses for purposes of this discussion, the key focus areas are:
  - i. Propane forklifts
  - ii. Warehouse Lighting
  - iii. Manufacturing use of Fuel Oil
- c. The facility has determined that propane forklifts, warehouse lighting and fuel oil use are the

significant energy uses

## ACTION ITEMS

- Opportunities may relate to potential sources of energy, use of renewable energy, or other alternative energy sources such as waste energy. The energy review shall be updated at defined intervals and in response to major changes in facilities, equipment, systems, or processes.
- What are your methods for energy reviews?
- What are your current energy sources (including any energy generated on-site)?
- What is your past and present energy use and consumption?
- What are your areas of significant energy use?
- How do you identify the facilities, equipment, systems, processes and personnel working for or on behalf of the organization that significantly affect energy use and consumption?
- How do you identify other relevant variables affecting significant energy uses?
- How do you determine the current energy performance of facilities, equipment, systems, and processes related to identified significant energy uses?
- How do you estimate future energy use and what are those values?
- How do you identify, prioritize, and record opportunities for improving energy performance?

### 4.4.4 Energy Baseline

#### INTRODUCTION:

The energy baseline is maintained and recorded as a means for the organization to determine the records maintenance period. a "suitable data period" means the organization accounts for regulatory requirements, or variables that affect the energy use and consumption. Variables can include weather, seasons, business activity cycles and other conditions. The adjustments to the baseline are also considered

maintenance and the requirements are defined in this standard.

## REQUIREMENTS OF THE STANDARD

The organization shall establish an energy baseline(s) using the information in the initial energy review, considering a data period suitable to the organization's energy use and consumption. Changes in energy performance shall be measured against the energy baseline(s).

Adjustments to the baseline(s) shall be made in the case of one or more of the following:

- EnPI's no longer reflect organizational energy use and consumption
- Major changes to the process, operational patterns, or energy systems
- Changes according to a predetermined method

The energy baseline(s) shall be maintained and recorded.

## EXAMPLES OR LEARNING POINTS

From the example above, Top Management has decided to use the 2009 energy data as its base line. Some energy reduction efforts were made in 2010, and management wanted to see the long term effects of the efforts. 2009 was selected in this case for the reasons stated. There is nothing wrong with using 2008 or 2010 data as the baseline. Management has implemented a triennial review period for the baseline. The next review (pending any major changes) will be related to the 2012 data.

## ACTION ITEMS

- Identify, document and maintain your energy baseline
- Use your Energy Review
- Identify and document your data period
- Are there processes to identify changes to measure against the baseline?
- What are the trigger limits for EnPIs requiring change to the baseline?

- Is there a predetermined method to address major changes to the process, operational patterns, energy systems?
- What currently influences changes to your Energy baseline?

## 4.4.5 Energy Performance Indicators (EnPI's)

### INTRODUCTION:

EnPI's can be a simple parameter, a simple ratio or a complex model. Examples of EnPI's can include energy consumption per time, energy consumption per unit of production, and multi-variable models. The organization can choose EnPI's that inform the energy performance of their operation, and can update the EnPI's when business activities or baselines change that affect the relevance of the EnPI, as applicable.

## REQUIREMENTS OF THE STANDARD

The organization shall identify EnPI's appropriate for monitoring and measuring its energy performance. The methodology for determining and updating the EnPI's shall be recorded and regularly reviewed. EnPI's shall be reviewed and compared to the energy baseline as appropriate.

## EXAMPLES OR LEARNING POINTS

In our case, management has decided to use KWhr's the EnPI. While many different EnPI's could be used, for the sake of simplicity, this will be the only one. This is not to say multiple EnPI's can be an integral part of your system. The facility could "normalize" them relative to:

- a. Headcount (KWhr / employees)
- b. Production (KWhr / unit, KWhr / \$MM sales, or KWhr / 1,000 pieces)
- c. Use per day (KWhr / operating day)
- d. Total Energy Use (KWhr)

## ACTION ITEMS

- Identify and document your EnPI's
- What is the methodology for determining and





updating, recording and regularly review the EnPI's?

- What is the frequency for EnPI's to be reviewed and compared to the energy baseline as appropriate?

#### 4.4.6 *Energy Objectives, Energy Targets and Energy Management Action Plans*

##### **INTRODUCTION:**

In addition to action plans focused on achieving specific improvements in energy performance, an organization may have action plans that focus on achieving improvements in overall energy management or improvement in the processes of the EnMS itself. Action plans for these types of improvements also can state how the organization will verify the results achieved by the action plan. For example, an organization may have an action plan designed to achieve increased employee and contractor awareness of energy management behaviors. The extent to which the action plan achieves the increased awareness and other results should be verified using the method determined by the organization and documented in the action plan.

The creation and use of one or more action plan is important to the successful implementation of an EnMS. Each action plan should describe how the organization's objectives and targets will be achieved, including timescales, necessary resources and personnel responsible for implementing the action plan(s). The action plan(s) may be subdivided to address specific elements of the organization's operations.

##### **REQUIREMENTS OF THE STANDARD**

The organization shall establish, implement and maintain documented energy objectives and targets at the relevant functions, levels, processes or facilities within the organization. Time frames shall be established for achievement of the objectives and targets.

The objectives and targets shall be consistent with the energy policy. Targets shall be consistent with the objectives.

When establishing and reviewing objectives and targets, the organization shall take into account legal requirements and other requirements, significant energy uses and opportunities to improve energy



performance, as identified in the energy review. It shall also consider its financial, operational and business conditions, technological options and the views of interested parties.

The organization shall establish, implement and maintain action plans for achieving its objectives and targets. The action plans shall include:

- Designation of responsibility;
- The means and time frame by which individual targets are to be achieved;
- A statement of the method by which an improvement in energy performance shall be verified;
- a statement of the method of verifying the results;
- The action plans shall be documented, and updated at defined intervals.

### EXAMPLES OR LEARNING POINTS

ABBCO's Objective and Target: Reduce energy use and consumption by 10% of the 2010 base line, using KWhr.

Source	Original KWhr (x10 <sup>3</sup> )	Objective KWhr (x10 <sup>3</sup> )	Delta KWhr (x10 <sup>3</sup> )
Fuel Oil	121.8	109.6	12.2 (5.6%)
Propane	400.5	360.4	40.1 (18.6%)
Diesel	152.8	137.5	15.3 (7.0%)
Electric	1,500.0	1,350.0	150.0 (68.9%)
Total 2010	2,175.1	1,957.6	217.5
10% Reduction	1,957.6		

The Action Plan will define the methodology to reach the Objectives of 10% reduction, based on KWhr. In the table above, all energy sources were evaluated for their relative contribution to the energy use and consumption goal (Delta). It was noted that 70% of the reductions could be realized from reduction of electricity, but 19% could be realized with propane use reduction. The Action Plan:

Action – Warehouse Lighting	Responsible Party	To Be Completed
1. Conduct lighting survey, including use of natural and solar lighting	Consultant	3 months
2. Evaluate the lighting survey and determine the re-lamping cost and energy savings.	WR / JR	2 weeks
3. Determine cost and ROI on re-lamping.	WR	5 days
4. Present results to Management Team	JR	Next meeting after ROI determination
5. Upon approval, develop RFP with finance to include energy efficiency requirements	WR / Bob in Finance	1 month
6. Distribute RFP with response in 6 weeks to Finance	Finance	6 weeks
7. Evaluate RFPs and select contractor	WR / Bob in Finance	2 weeks
8. Start project	Contractor	5 weeks
9. Close project	WR / Bob in Finance	9 weeks
10. Monitor energy use relative to lighting	Maintenance	12 months

Action - Forklifts	Responsible Party	To Be Completed (cumulative)
1. Contact forklift leasing company for conversion of forklifts from propane to battery power.	Maintenance	2 weeks
2. Convert them	Forklift Company	4 weeks
10. Monitor energy use relative to PIVs	Maintenance	12 months

Action – Manufacturing Use of Fuel Oil	Responsible Party	To Be Completed
Replace Fuel Oil with Natural Gas	Maintenance	4 months

### ACTION ITEMS

- What are your documented energy objectives and targets within the organization?
- What is the time frame to achieve the objectives

and targets?

- Are the objectives and targets consistent with the energy policy?
- Are the targets consistent with the objective?
- When establishing and reviewing objectives and targets, how do you take into account legal requirements and other requirements, significant energy uses, and opportunities to improve energy performance as identified in the energy review and include consider its financial, operational and business conditions, technological options, and the views of interested parties?
- How are Action Plans established, implemented, and maintained for achieving its objectives and targets, including: designation of responsibility; means and time frame by which individual targets are to be achieved; and statement of the method by which an improvement in energy performance shall be verified?
- What is the method to verify results?
- What is the frequency to review and update documented action plans?



## 4.5 Implementation and Operation

### 4.5.1 General

#### INTRODUCTION:

This clause is an opening statement to address the need to make the EnMS happen. This is the part of the standard where things happen and benefits gained.

#### REQUIREMENTS OF THE STANDARD

The organization shall use the action plans and other outputs resulting from the planning process for implementation and operation.

### 4.5.2 Competence, Training and Awareness

#### INTRODUCTION:

The organization defines competence, training and awareness requirements based on its organizational needs. Competency is based on a relevant combination of education, training, skills and experience. The organization should identify the awareness, knowledge, understanding and skills needed by any person with the responsibility and authority to perform tasks on its behalf.

#### REQUIREMENTS OF THE STANDARD

The organization shall ensure that any person(s) working for or on its behalf, related to significant energy uses, are competent on the basis of appropriate education, training, skills or experience. The organization shall identify training needs associated with the control of its significant energy uses and the operation of its EnMS. The organization shall provide training or take other actions to meet these needs.

Appropriate records shall be maintained.

The organization shall ensure that any person(s)

working for or on its behalf are aware of:

- a. The importance of conformity with the energy policy, procedures and the requirements of the EnMS
- b. Their roles, responsibilities and authorities in achieving the requirements of the EnMS
- c. The benefits of improved energy performance
- d. The impact, actual or potential, with respect to energy use and consumption, of their activities and how their activities and behavior contribute to the achievement of energy objectives and targets, and the potential consequences of departure from specified procedures

#### EXAMPLES OR LEARNING POINTS

##### Operator Competence Training Examples

- Operating procedures
- Testing procedures
- Start-up / shutdown procedures
- Controls & Alarm details
- Maintenance procedures

Do not forget, while focus on operators and maintenance activities are the first to be evaluated, all employees have a contribution to overall energy use and consumption. The standard also requires “those working on our behalf,” which can include contractors, temporary employees, suppliers and visitors, be considered. Training or taking other actions can take many forms, to include, but not limited to: classroom; on-the-job; awareness; off-site courses; and contract requirements.

The level of training will vary by person or job description. Operators and maintenance will probably require a higher level of training, versus an administrative person, who may only require awareness training.

#### ACTION ITEMS

Identify how you will train employees, communicate awareness, define competence and how records of the training will be kept.

### 4.5.3 Communication

#### INTRODUCTION:

Internal communication is important to ensure the effective implementation of the EnMS. Methods of internal communication may include regular work group meetings, newsletters, bulletin boards and intranet sites.

#### REQUIREMENTS OF THE STANDARD

The organization shall communicate internally with regard to its energy performance and EnMS, as appropriate to the size of the organization.

The organization shall establish and implement a process by which any person working for, or on behalf of, the organization can make comments or suggest improvements to the EnMS.

The organization shall decide whether to communicate externally about its energy policy, EnMS and energy performance, and shall document its decision. If the decision is to communicate externally, the organization shall establish and implement a method for this external communication.

#### EXAMPLES OR LEARNING POINTS

Internal communication can take many forms including: All hands meetings (held on some regular frequency); communication boards; monitors placed in lobby or throughout facility promoting energy performance; tri-folds; shirt pocket cards; laminated cards with information next to their employee proximity card; pay check inserts; or posters.

#### ACTION ITEMS

- What are your methods for communication?
- Will you communicate externally your energy policy, system and performance? If so, how?



## 4.5.4 Documentation

### 4.5.4.1 Documentation Requirements

#### INTRODUCTION:

The level of detail of the documentation should be sufficient to describe the EnMS and how its parts work together, and to provide direction on where to obtain more detailed information on the operation of specific parts. This documentation may be integrated with documentation of other systems implemented by the organization. It does not have to be in the form of a manual. The only procedures that have to be documented are ones that are specified as a documented procedure. The organization can develop any documents it determines necessary to effectively demonstrate energy performance and support the EnMS.

#### REQUIREMENTS OF THE STANDARD

The organization shall establish, implement and maintain information, in paper, electronic or any other medium, to describe the core elements of the EnMS and their interaction.

The EnMS documentation shall include:

- a. The scope and boundaries of the EnMS
- b. The energy policy
- c. The energy objectives, targets, and action plans
- d. The documents, including records, required by this International Standard
- e. Other documents determined by the organization to be necessary

Note: The degree of documentation can vary for different organizations for the following reasons:

- The scale of the organization and type of activities
- The complexity of the processes and their interactions
- The competence of personnel

#### EXAMPLES OR LEARNING POINTS

The standard requires a number of documents or documented procedures. In addition, it requires that “other documents determined by the organization to be necessary.” In effect, all documents needed to either conform to the requirements of the standard or to support the EnMS need to be implemented and maintained. Note: Like other standards, records are considered documents, but special types of documents. Records are controlled in clause 4.6.5.

#### ACTION ITEMS

- What is the method (or methods) to establish, implement and maintain information to describe the core elements of the EnMS and their interaction?
- Is there a need to define the media (paper, electronic, or any other medium)?

### 4.5.4.1 Control of Documents

#### INTRODUCTION:

Document control requirements for EnMS are consistent with other ISO standards, such as ISO 9001 and ISO 14001. If you have existing ISO systems, it is relatively easy to integrate EnMS documents into existing document control platforms.



## REQUIREMENTS OF THE STANDARD

Documents required by this International Standard and the EnMS shall be controlled. This includes technical documentation where appropriate.

The organization shall establish, implement and maintain procedure(s) to:

- a. Approve documents for adequacy prior to issue
- b. Periodically review and update documents as necessary
- c. Ensure that changes and the current revision status of documents are identified
- d. Ensure that relevant versions of applicable documents are available at points of use
- e. Ensure that documents remain legible and readily identifiable
- f. Ensure documents of external origin determined by the organization to be necessary for the planning and operation of the EnMS are identified and their distribution controlled
- g. Prevent the unintended use of obsolete documents, and suitably identify those to be retained for any purpose

## EXAMPLES OR LEARNING POINTS

Some companies have a master documents list, noting current version, last review or next review date. It is important to note, the requirement to have them available at the points of use and current. While this is no different than other standards, it is, however, a common audit finding. The concept of “documents of external origin” can take many forms, depending on the definition. If a company chooses to define external documents as anything not controlled by the site, then corporate or documents from other facilities are considered “external.”

## ACTION ITEMS

- Determine the methods or processes to control, approve, review and distribute documents
- Identify the current revision status of your

applicable documents

- Determine how obsolete documents are controlled
- Determine how documents of external origin are identified and controlled

## 4.5.5 Operational Control

### INTRODUCTION:

Evaluations of operations associated with your identified significant energy use ensure that they are conducted in a way that will control or reduce the adverse impacts in order to fulfill the requirements of your energy policy to meet your objectives and targets. This should include all parts of your operations (defined in the scope), including maintenance activities.

## REQUIREMENTS OF THE STANDARD

The organization shall identify and plan those operations and maintenance activities which are related to its significant energy uses and that are consistent with its energy policy, objectives, targets and action plans, in order to ensure that they are carried out under specified conditions, by means of the following:

- a. Establishing and setting criteria for the effective operation and maintenance of significant energy uses, where their absence could lead to a significant deviation from effective energy performance
- b. Operating and maintaining facilities, processes, systems and equipment, in accordance with operational criteria
- c. Appropriate communication of the operational controls to personnel working for, or on behalf of, the organization

Note: When planning for contingency or emergency situations or potential disasters, including procuring equipment, an organization may choose to include energy performance in determining how it will react to these situations.

## EXAMPLES OR LEARNING POINTS

### Examples – Maintenance Controls

Steam trap survey and repair/replacement  
Insulation inspection and repair/replacement  
Boiler tube cleaning, water-side, fire-side  
Steam leak survey and repair  
Combustion tune-up  
Calibration

### Examples of Operational Controls

#### Procedures Based

Procedures or work instructions  
Equipment logbooks or PM Schedule

#### Technology Based

Control, alarm or alert systems  
Computer automated activities  
Preventive maintenance system

#### Training Based

Maintenance training  
Operations training  
Contractor training

## ACTION ITEMS

- How are operations and maintenance activities which are related to its significant energy uses identified?
- Are they consistent with the energy policy, objectives, targets and action plans?
- How do you establish and set criteria for effective operation and maintenance of significant energy uses?
- How are operating and maintaining facilities, processes, systems and equipment, in accordance with established operational criteria?
- How are communications of the operational controls to personnel working for, or on behalf of, the organization conducted?

- How do you plan for contingency, emergency situations or potential disasters, including procuring equipment, to include energy performance in determining how you will react to these situations?

## 4.5.6 Design

### INTRODUCTION:

When considering long-term energy performance, designing energy efficiency into the process from the beginning of any project is important. A significant amount of cost and effort can be lost when energy efficiency input is not part of the initial consideration, but is rather a revision to the initial plan. The standard requires energy to have upfront input and consideration.

### REQUIREMENTS OF THE STANDARD

The organization shall consider energy performance improvement opportunities and operational control in the design of new, modified and renovated facilities, equipment, systems and processes that can have a significant impact on its energy performance.

The results of the energy performance evaluation shall be incorporated where appropriate into the specification, design and procurement activities of the relevant project(s).

The results of the design activity shall be recorded.

## EXAMPLES OR LEARNING POINTS

Many companies have a Management of Change (MOC) process. As projects are developed, the MOC process could have an energy performance component, a place for consideration or sign off that energy considerations were made.

## ACTION ITEMS

- How are energy performance improvement opportunities and operational control in the design of new, modified and renovated facilities,





equipment, systems and processes that can have a significant impact on its energy performance considered or implemented?

- How are the results of the energy performance evaluation incorporated (where appropriate) into the specification, design and procurement activities of the relevant project(s)?
- How are these activities recorded?

#### 4.5.7 Procurement of Energy Services, Products, Equipment and Energy

##### INTRODUCTION:

Procurement is an opportunity to improve energy performance through the use of efficient products and services. It is also an opportunity to work with the supply chain and influence energy behaviors. Applicability of energy purchasing specifications may vary from market to market. Energy purchasing specification elements could include energy quality, availability, cost structure, environmental impact and renewable sources. The organization may use the specification proposed by an energy supplier as appropriate.

##### REQUIREMENTS OF THE STANDARD

When procuring energy services, products and equipment that have, or can have, an impact on significant energy use, the organization shall inform suppliers that procurement is partly evaluated on the basis of energy performance.

The organization shall establish and implement the criteria for assessing energy use, consumption and efficiency over the planned or expected operating lifetime when procuring energy using products, equipment and services which are expected to have a significant impact on the organization's energy performance.

The organization shall define and document energy purchasing specifications, as applicable, for effective energy use.

##### EXAMPLES OR LEARNING POINTS

Purchasing RFPs with one of more statements regarding procuring energy services, products and equipment that have, or can have, an impact on significant energy use, informing suppliers that procurement is partly evaluated on the basis of energy performance.

Contract reviews with existing suppliers, informing them that energy performance is now a consideration in the procurement process.

Consultation with energy providers inquiring about rebates related to implementing energy management systems.

### ACTION ITEMS

- How are suppliers informed that procurement is partly evaluated on the basis of energy performance?
- What are the criteria for assessing energy use, consumption, and efficiency over the planned or expected operating lifetime when procuring energy using products, equipment and services which are expected to have a significant impact on energy performance?
- How do you define and document energy purchasing specifications as applicable for effective energy use?
- What are the procurement methods of your energy?

## 4.6 Checking

### 4.6.1 *Monitoring, Measurement and Analysis*

#### INTRODUCTION:

An organization's operations have a variety of characteristics. For example, characteristics related to monitoring and measurement of electricity, fuel use or biomass. Data collected from monitoring and measurement can be analyzed to identify patterns and obtain information. The knowledge gained from this information can be used to implement corrective and preventive action. Key characteristics are those that the organization needs to consider to determine how it is managing its significant energy use, achieving objectives and targets, and improving energy performance. When necessary to ensure valid results, measuring equipment should be calibrated or verified at specified intervals, or prior to use, against traceable international or national measurement standards. If no such standards exist, the basis used for calibration should be recorded. These basic processes are the same as found in ISO 9001 and ISO 14001.





## REQUIREMENTS OF THE STANDARD

The organization shall ensure that the key characteristics of its operations that determine energy performance are monitored, measured and analyzed at planned intervals. Key characteristics shall include at a minimum:

- a. Significant energy uses and other outputs of the energy review
- b. The relevant variables related to significant energy uses
- c. EnPI's
- d. The effectiveness of the action plans in achieving objectives and targets
- e. Evaluation of actual versus expected energy consumption

The results from monitoring and measurement of the key characteristics shall be recorded.

An energy measurement plan, appropriate to the size and complexity of the organization and its monitoring and measurement equipment, shall be defined and implemented.

Note: Measurement can range from only utility meters for small organizations up to complete monitoring and measurement systems connected to a software application capable of consolidating data and delivering automatic analysis. It is up to the organization to determine the means and methods of measurement.

The organization shall define and periodically review its measurement needs. The organization shall ensure that the equipment used in monitoring and measurement of key characteristics provides data which are accurate and repeatable. Records of calibration and other means of establishing accuracy and repeatability shall be maintained.

The organization shall investigate and respond to significant deviations in energy performance.

Results of these activities shall be maintained.

## EXAMPLES OR LEARNING POINTS

Example Key Characteristics

- Regular combustion, flue gas analysis
- Make-up water meter volumes
- Fuel input volumes
- Water quality (Boiler, Cooling tower Make-up)
- De-aerator temperature/pressure
- EnPI's
- Action Plan outputs

Example Equipment Requiring Calibration

- Meters

## ACTION ITEMS

- What items are being tracked, monitored, measured or analyzed?
- What are your key characteristics?
- How are the results recorded?
- What is your energy measurement plan and is it defined and implemented?

### 4.6.2 Evaluation of Legal Requirements and Other Requirements

## INTRODUCTION:

Your organization needs to demonstrate that you have evaluated compliance with the legal and other requirements including applicable permits or licenses and have records of that evaluation. This requirement is similar to clause 4.5.2 of ISO 14001.

## REQUIREMENTS OF THE STANDARD

At planned intervals, the organization shall evaluate compliance with legal requirements and other requirements to which it subscribes related to its energy use and consumption.

Records of the results of the evaluations of compliance shall be maintained.



## EXAMPLES OR LEARNING POINTS

1. Corporate Legal Assurance Audits
2. Internal audit of the Legal and Other Requirements, specifically addressing each requirement and how (or if) the company is in compliance with that requirement
3. Hiring an expert in the energy arena to provide an evaluation of the legal requirements and a corporate support person to conduct an evaluation of the other requirements

For example:

1. There is a corporate mandate to obtain ISO 50001 registration. The evaluation would verify the site has in fact obtained registration, and would be in compliance. If the site was in the process of obtaining registration, then the evaluation would reveal the site is not in compliance with the corporate mandate
2. A legal team or consultants was contracted to conduct the evaluation, in concert with its ISO 14001 requirement

## ACTION ITEMS

- What are the results of your legal and other requirement evaluations?
- What is the defined frequency of the evaluations?

### 4.6.3 *Internal audit of the EnMS*

## INTRODUCTION:

Internal audits of an energy management system can be performed by personnel from within the organization or by external persons selected by the organization, working on its behalf. In either case, the persons conducting the audit should be competent and in a position to do so impartially and objectively. In smaller organizations, auditor independence can be demonstrated by an auditor being free from responsibility for the activity being audited. If an organization wishes to combine audits of its energy management system with other internal audits, the

intent and scope of each should be clearly defined. An energy audit or assessment is not the same concept as an internal audit of an EnMS or an internal audit of the energy performance of an EnMS. (See A.4.3 Energy Review)

## REQUIREMENTS OF THE STANDARD

The organization shall conduct internal audits at planned intervals to ensure that the EnMS:

- Conforms to planned arrangements for energy management including the requirements of this International Standard
- Conforms with the energy objectives and targets established
- Is effectively implemented and maintained, and improves energy performance

An audit plan and schedule shall be developed taking into consideration the status and importance of the processes and areas to be audited as well as the results of previous audits.

The selection of auditors and conduct of audits shall ensure objectivity and impartiality of the audit process.

Records of the audit results shall be maintained and reported to top management.

## EXAMPLES OR LEARNING POINTS

These requirements are similar to those of ISO 9001 and ISO 14001.

## ACTION ITEMS

- When and how are internal audits conducted?
- Are all areas of the facility and all clauses of the standard covered?
- Is there a procedure to describe the internal audit process?
- Does the audit plan taking into consideration the status and importance of the processes and areas to be audited as well as the results of previous audits?

- How are internal auditors selected and are they competent (see 4.5.2)?
- How are records of the internal audit kept?
- How are results reported to management?

#### 4.6.4 *Nonconformities, correction, corrective, and preventive action*

##### **INTRODUCTION:**

With respect to non-conformities, establishing procedures to incorporate requirements - either simple or complex-may help an organization accomplish objectives with a minimum of formal planning. Any documentation should be appropriate to the level of action. This clause is consistent with ISO 9001 and ISO 14001.

##### **REQUIREMENTS OF THE STANDARD**

The organization shall address actual and potential nonconformities by making corrections, and by taking corrective action and preventive action, including the following:

- Reviewing nonconformities or potential nonconformities
- Determining the causes of nonconformities or potential nonconformities
- Evaluating the need for action to ensure that nonconformities do not occur or recur
- Determining and implementing the appropriate

action needed

- Maintaining records of corrective actions and preventive actions
- Reviewing the effectiveness of the corrective action or preventive action taken

Corrective actions and preventive actions shall be appropriate to the magnitude of the actual or potential problems and the energy performance consequences encountered.

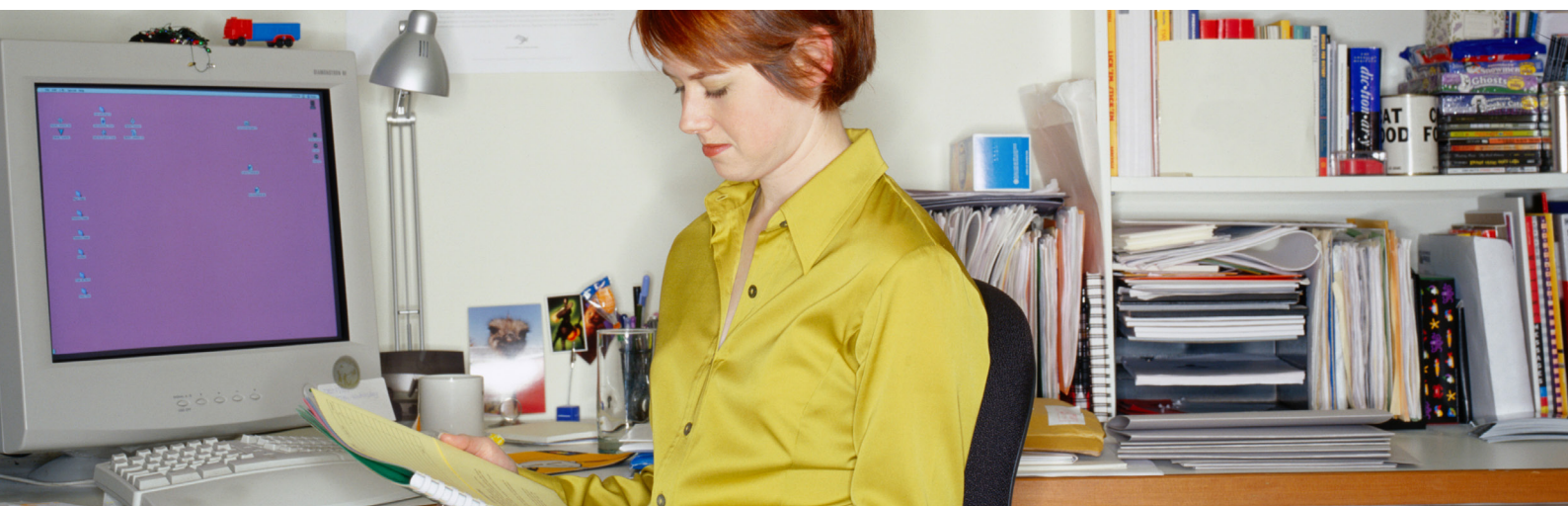
The organization shall ensure that any necessary changes are made to the EnMS.

##### **EXAMPLES OR LEARNING POINTS**

If you have an existing ISO 9001 or ISO 14001 program in place, it is advisable to use that platform to make the process easier.

##### **ACTION ITEMS**

- How are nonconformities identified and introduced into your system?
- How is correction implemented?
- How is a non-conformity determined to require corrective or preventive action?
- How are records kept?
- How is the effectiveness of corrective or preventive actions reviewed?
- How are changes to documentation, resulting



from corrective or preventive action made?

### 4.6.5 Control of Records

#### INTRODUCTION:

This section outlines the Control of Documents (see Clause 4.5.2.2 of the standard for additional information), the control of records is similar to the requirements for ISO 9001 and ISO 14001.

#### REQUIREMENTS OF THE STANDARD

The organization shall establish and maintain records, as necessary, to demonstrate conformity to the requirements of its EnMS and of this International Standard, and the energy performance results achieved. The organization shall define and implement controls for the identification, retrieval and retention of records. Records shall be and shall remain legible, identifiable and traceable to the relevant activity.

#### EXAMPLES OR LEARNING POINTS

Using an existing ISO 9001 or ISO 14001 processes will assist in implementation of this requirement.

#### ACTION ITEMS

- How are records identified, with controls for the identification, retrieval and retention of records?
- How are records kept legible, identifiable and traceable to the relevant activity?



## 4.7 Management Review

The management review should cover the scope of the energy management system, although not all elements of the energy management system need to be reviewed at once and the review process may take place over a period of time.

### 4.7.1 General

#### INTRODUCTION:

The requirements of this clause (see section 4.7 of the standard for additional information) are similar to the requirements of ISO 9001 and ISO 14001.

#### REQUIREMENTS OF THE STANDARD

At planned intervals, top management shall review the organization's EnMS to ensure its continuing suitability, adequacy and effectiveness. Records of management review shall be maintained.

### 4.7.2 Input to Management Review

#### INTRODUCTION:

Management review should consist of an agenda which covers, at a minimum, those items listed in the standard. The management review should cover the scope of the energy management system, although not all elements of the energy management system need to be reviewed at once. The review process may take place over a period of time.

#### REQUIREMENTS OF THE STANDARD

Inputs to the management review shall include:

- a. Follow-up actions from previous management reviews
- b. Review of the energy policy
- c. Review of energy performance and related EnPI's
- d. Results of the evaluation of compliance with legal requirements and changes in legal requirements and other requirements to which the organization



subscribes

- e. The extent to which the energy objectives and targets have been met
- f. EnMS audit results
- g. The status of corrective actions and preventive actions
- h. Projected energy performance for the following period
- i. Recommendations for improvement

### 4.7.3 *Output from Management Review*

#### REQUIREMENTS OF THE STANDARD

Outputs from the management review shall include any decisions or actions related to:

- a. Changes in the energy performance of the organization
- b. Changes to the energy policy
- c. Changes to the EnPIs
- d. Changes to objectives, targets or other elements of the EnMS, consistent with the organization's commitment to continual improvement
- e. Changes to allocation of resources

#### ACTION ITEMS

- What are the inputs and outputs of your management reviews?
- Does management evaluate and state the EnMS' state of suitability, adequacy and effectiveness?
- How are outputs from previous management reviews noted as inputs to the next one?
- How are changes to the EnMS implemented, resulting from Management Review?
- How are records of the Management Review kept?



# 12 CORRESPONDENCE BETWEEN ISO 50001:2011, ISO 9001:2008, ISO 14001:2004 AND ISO 22000:2005

ISO 50001: 2011	Criteria	ISO 9001: 2008	Criteria	ISO 14001: 2004	Criteria	ISO 22000: 2005	Criteria
	Forward		Forward		Forward		Forward
	Introduction		Introduction		Introduction		Introduction
1	Scope	1	Scope	1	Scope	1	Scope
2	Normative Reference	2	Normative Reference	2	Normative Reference	2	Normative Reference
3	Terms and definitions	3	Terms and definitions	3	Terms and definitions	3	Terms and definitions
4	Energy Management System Requirements	4	Quality Management System	4	Environmental Management System Requirements	4	Food Safety Management System
4.1	General Requirements	4.1	General Requirements	4.1	General Requirements	4.1	General Requirements
4.2	Management Responsibility	5	Management Responsibility			5	Management Responsibility
4.2.1	Top Management	5.1	Management Commitment	4.4.1	Resources, Roles, Responsibility and Authority	5.1	Management Commitment
4.2.2	Management Representative	5.5.1	Responsibility and Authority Management Representative	4.4.1	Resources, Roles, Responsibility and Authority	5.4	Responsibility and Authority
		5.5.2				5.5	Food Safety Team Leader
4.3	Energy Policy	5.3	Quality Policy	4.2	Environmental Policy	5.2	Food Safety Policy
4.4	Energy Planning	5.4	Planning	4.3	Planning	5.3	Food Safety Management System Planning
						7	Planning and Realization of Safe Products
4.4.1	General	5.4.1	Quality Objectives	4.3	Planning	5.3	Food Safety Management System Planning
		7.2.1	Determination of Requirements Related to the Product			7.1	General
4.4.2	Legal and Other Requirements	7.2.1	Determination of Requirements Related to the Product	4.3.2	Legal and Other Requirements	7.2.2	No Title
		7.3.2	Design and Development Inputs			7.3.3	Product Characteristics
4.4.3	Energy Review	5.4.1	Quality Objectives	4.3.1	Environmental Aspects	7	Planning and Realization of Safe Products
		7.2.1	Determination of Requirements Related to the Product				
4.4.4	Energy Baseline					7.4	Hazard Analysis

## CORRESPONDENCE BETWEEN ISO 50001:2011, ISO 9001:2008, ISO 14001:2004 AND ISO 22000:2005

ISO 50001: 2011	Criteria	ISO 9001: 2008	Criteria	ISO 14001: 2004	Criteria	ISO 22000: 2005	Criteria
4.4.5	Energy Performance Indicators					7.4.2	Hazard Identification and Determination of Acceptable Levels
4.4.6	Energy Objectives, Energy Targets and Energy Management Action Plans	5.4.1 7.1	Quality Objectives Planning of Product Realization	4.3.3	Objectives, Targets and Programs	7.2	Prerequisite Programs
4.5	Implementation and Operation	7	Product Realization	4.4	Implementation and Operation	7	Planning and Realization of Safe Products
4.5.1	General	7.5.1	Control of Production and Service Provision	4.4.6	Operational Control	7.2.2	No Title
4.5.2	Competence, Training and Awareness	6.2.2	Competence, Training and Awareness	4.4.2	Competence, Training and Awareness	6.2.2	Competence, Training and Awareness
4.5.3	Communication	5.5.3	Internal Communication	4.4.3	Communication	5.6.2	Internal Communication
4.5.4	Documentation	4.2	Documentation Requirement	4.4.4	Documentation	4.2	Documentation Requirement
4.5.4.1	Documentation Requirements	4.2.1	General	4.4.4	Documentation	4.2.1	General
4.5.4.2	Control of Documents	4.2.3	Control of Documents	4.5.4	Control of Documents	4.2.2	HACCP Plan
4.5.5	Operational Control	7.5.1	Control of Production and Service Provision	4.4.6	Operational Control		HACCP Plan
4.5.6	Design	7.3	Design and Development			7.3	Preliminary Steps to Enable Hazard Analysis
4.5.7	Procurement of Energy Services, Products, Equipment and Energy	7.4	Purchasing				
4.6	Checking	8	Measurement, Analysis and Improvement	4.5	Checking	8	Validation, Verification and Improvement of the Food Safety Management System
4.6.1	Monitoring, Measurement and Analysis	8.2.3 8.2.4 8.4	Monitoring and Measurement of Process Monitoring and Measurement of Product Analysis of Data	4.5.1	Monitoring and Measurement	7.6.4	System for Monitoring of Critical Control Points
4.6.2	Evaluation of Legal Requirements and Other Requirements	7.3.4	Design and Develop Review	4.5.2	Evaluation of Compliance		
4.6.3	Internal Audit of the EnMS	8.2.2	Internal Audit	4.5.5	Internal Audit	8.4.1	Internal Audit



## CORRESPONDENCE BETWEEN ISO 50001:2011, ISO 9001:2008, ISO 14001:2004 AND ISO 22000:2005

ISO 50001: 2011	Criteria	ISO 9001: 2008	Criteria	ISO 14001: 2004	Criteria	ISO 22000: 2005	Criteria
4.6.4	Nonconformities, Correction, Corrective and Preventive Action	8.3	Control of Nonconforming Product	4.5.3	Nonconformity, Corrective Action and Preventive Action	7.10	Control of Nonconformity
		8.5.2	Corrective Action				
		8.5.3	Preventive Action				
4.6.5	Control of Records	4.2.4	Control of Records	4.5.4	Control of Records	4.2.3	Control of Records
4.7	Management Review	5.6	Management Review	4.6	Management Review	5.8	Management Review
4.7.1	General	5.6.1	General	4.6	Management Review	5.8.1	General
4.7.2	Input to Management Review	5.6.2	Review input	4.6	Management Review	5.8.2	Review Input
4.7.3	Output from Management Review	5.6.3	Review Output	4.6	Management Review	5.8.3	Review Output



## 13 REFERENCES

- 1 Intergovernmental Panel on Climate Change (IPCC), Summary for Policymakers, 11th Session of the Working Group III of the IPCC, Abu Dhabi, UAE, 5-8 May, 2011
- 2 ISO 50001:2011, Energy Management System,
- 3 Superior Energy Performance, Plant Measurement and Verification Protocol, March 7, 2011
- 4 EPA, Guidelines for Energy Management Overview:  
[http://www.energystar.gov/index.cfm?c=guidelines.guidelines\\_index](http://www.energystar.gov/index.cfm?c=guidelines.guidelines_index)
- 5 Energy Strategy for the Future:  
[http://www.energystar.gov/index.cfm?c=business.bus\\_energy\\_strategy](http://www.energystar.gov/index.cfm?c=business.bus_energy_strategy)
- 6 DIN EN 16001: Energy Management System in Practice, A Guide for Companies and Organizations, German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, June 2010.
- 7 ANSI - Accredited Plant Energy - Efficiency Certification Program Plan, September 22, 2008
- 8 ISO Website:  
[http://www.iso.org/iso/iso\\_catalogue/catalogue\\_tc/catalogue\\_detail.htm?csnumber=51297](http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=51297)
- 9 <http://www.unido.org>
- 10 PC 242 ISO 50001, Base Presentation, GA Tech, March 2009
- 11 Energy Strategy for the Road Ahead, Scenario Thinking for Business Executives and Corporate Boards, 2007, Global Business Network
- 12 ISO 14001:2004
- 13 ISO 9001:2008
- 14 EPA, Guidelines for Energy Management Overview:  
[http://www.energystar.gov/index.cfm?c=guidelines.guidelines\\_index](http://www.energystar.gov/index.cfm?c=guidelines.guidelines_index)
- 15 ISO Task Force
- 16 C. Russell, 2010
- 17 Win the energy challenge with ISO 5001, 2011, International Organization for Standardization
- 18 <http://www.iea.org/work/2009/standards/Pinero.pdf>
- 19 Good Energy Management is Good Business: [http://www.energystar.gov/index.cfm?c=business.bus\\_good\\_business](http://www.energystar.gov/index.cfm?c=business.bus_good_business)

## 14 ACRONYMS AND DEFINITIONS

ANSI	American National Standards Institute
CO <sub>2</sub>	Carbon Dioxide
DIS	Draft International Standard
EnMS	Energy Management System (ISO 50001)
EnPI	Energy Performance Indicators
FDIS	Final Draft International Standard
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
MSE	Management System for Energy
TMB	Technical Management Board
UNIDO	United Nations Industrial development Organization





#### **DEG**

Kämmergasse 22  
50676 Köln Germany  
PO Box 10 09 61  
50449 Köln

T : +49 221 4986-0  
F : +49 221 4986-1290  
[www.deginvest.de](http://www.deginvest.de)

#### **ASSIST**

No. 9, Desika Road  
Behind Anjaneya Temple,  
Mylapore, Chennai 600 004

T : +91 44 4550 1102/ 4554 8438  
[www.assistasia.org](http://www.assistasia.org)

#### **DQS Holding GmbH Germany**

August-Schanz-Str.  
21, 60433 Frankfurt,  
Germany

T : +49 (69) 95427-206  
F : +49 (69) 95427-111  
[www.dqs-ul.com](http://www.dqs-ul.com)

#### **UL DQS India**

5th Floor, Anjaneya Techno Park  
No.147, HAL Airport Raod, Kodihalli,  
Bangalore 560 017, India

T : +91 80 6661 6500  
F : +91 80 6661 6530  
[www.ul-dqs.in](http://www.ul-dqs.in)

CO-FINANCED BY



IMPLEMENTING PARTNERS



IN ASSOCIATION WITH

