

ISO 50001 (EnMS) Energy Management Systems



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TÜV UK Ltd – ISO 50001 Energy Management System (EnMS) - Implementation guide



Executive Summary

Energy management is now in the global spotlight, due to the pressing need to save energy and reduce greenhouse gas emissions worldwide. Energy-saving technologies and facilities are only part of the methodologies for improving energy efficiency.

A more sensible and systematic approach to improve an enterprise's energy performance sustainably is to establish and implement a standardised, process-based energy management structure. Published on 15 June 2011, the ISO 50001 Energy Management System (EnMS) standard is a globally accepted framework for managing energy, providing technical and management strategies for enterprises to increase energy efficiency, reduce costs, and improve environmental performance.

Organisations, by following the ISO 50001 standard, can help to create a viable method for establishing a policy, a program, and a culture of energy and asset management that is accurate, repeatable, timely, and, most importantly, cost effective—both financially and environmentally.

Whilst relevant to any organisation, ISO 50001 certification is particularly relevant to organisations needing to demonstrate compliance with the Energy Saving Opportunity Scheme (ESOS).

The aim of this document is to provide an overview of the ISO 50001 standard, including a summary of the essential requirements of the standard, procedures and skills to identify key processes and to develop controls, documentation and auditing requirements for the management of an EnMS.

<u>Content</u>	<u>Page</u>
1 Introduction	3
1.1 Demand for Energy Management	
1.2 Benefits of Adopting Energy Management System	
1.3 ISO 50001 vs. Other Management System Standards	
2 Overview of ISO 50001 Standard	8
2.1 General Requirements	
2.2 Management Responsibility	
2.3 Energy Policy	
2.4 Energy Planning	
2.5 Implementation and Operation	
2.6 Checking	
2.7 Management Review	
3 Improvement on Energy Performance	27
4 Process and Auditing Requirements of ISO 50001 Certification	28
4.1 Accredited Certification Bodies	
4.2 ISO 50001 Certification Process	
4.3 Certification Requirements	
4.4 Non-conformities	
Reference	
Annex A	33
ISO 50001 Self Evaluation Checklist	
Annex B	45
Energy Saving Opportunity Scheme (ESOS)	
• About	
• Timescales & deadlines	
• Reporting compliance to the Environment Agency	
• Penalties	
• Steps to ESOS Compliance	
• ISO 50001 and ESOS	

Developed by the International Organisation of Standardization (ISO) Project Committee of Energy Management (ISO/PC 242), ISO 50001 Energy Management Systems (EnMS) – Requirements with Guidance for Use was published in June 2011. ISO 50001 standard has been developed based on the common elements that can be found in all of the ISO management system standards such as ISO 9001 quality management system and ISO 14001 environmental management system.

1.1 Demand for Energy Management

Over the recent years, the environment has become a more and more significant concern to the sustainability of global business community, and poses serious challenges to individual organisations, affecting their development in the long run. Out of many factors, the main reasons for the energy issue to draw a serious attention from businesses may come from global government initiatives to mitigate climate change and increasing expenses for obtaining natural resources to support daily operation.

Combating Climate Change

Climate change has caused extreme weather patterns and a rising sea level. The concentration of greenhouse gases (GHG) such as carbon dioxide, methane and nitrous oxide emitted by human activities keeps increasing, which leads to greenhouse effect and global warming. The primary anthropogenic source of carbon emissions is from direct burning of fossil fuels such as coal, oil and gas. Despite the recent development on renewable sources of energy (e.g. solar energy, biofuels, etc.), fossil fuels still play the major role in global energy mix as the primary source for generating electricity.

Since the announcement of Copenhagen Accord and Kyoto Protocol, the international community has been aware of the urgency of reducing GHG in order to limit the increase of global mean temperature below 2°C based on pre-industrial level. To this end, many countries have released new energy saving measures. For example, United States has released new fuel-economy standards, the European Union has established a target to cut down energy demand in 2020 by 20%, China has targeted a 16% reduction in energy intensity by 2015, and Japan has committed to cutting down its electricity consumption by 10% by 2030. Hong Kong, alongside 20 other Asia-Pacific Economic Co-operation economies, has set a target to achieve a reduction in energy intensity of at least 25% by 2030 (using 2005 as the base).

Driven by these national or regional energy targets and supporting policies, some jurisdictions have developed own energy management standards to assist the industries in creating their own strategy and roadmap. For example, there are energy management systems standard EN 16001 in Europe, ANSI/MSE 2000 in US, B0071 in Korea, VD14602 in Germany, DS 2403:2001 in Denmark, SS627750:2003 in Sweden, AS3595:1990 in Australia, PLUS 1140:1995 in Canada, and GB/T-23331 in China. The publication of ISO 50001 helps to synchronize the efforts by many different countries and regions, and to provide businesses with a standard approach to improve their energy management

Sustaining Business

Energy costs have gone through a considerable increase over the past few years. Due to the increasing prices of oil and other natural resources, the global fossil-fuel subsidiaries in 2011 have reached US \$523 billion, close to a 30% increase than previous year. Since modern business operation relies heavily on energy (e.g. electricity, fuel) to carry on, the direct impact of energy price fluctuation to overhead of organisations is not insignificant.

However, these burdens do not fall evenly on all industries or organisations. When there are economic uncertainties, there are also potential business opportunities. Companies that are able to forge their strategic position properly can gain additional competitiveness against their counterparts. In view of the connection between energy efficiency and business competitiveness, many buyers start to set their own targets related to energy performance, encouraging their supply chain to pay more attention to energy management. For example, the large international retailer TESCO aims to reduce its supply chain carbon emissions by 30% by 2020 and reach zero emissions by 2050; while another retailer giant Wal-Mart announced in 2010 to cut down 20 million tonnes of GHG by 2015 and to reduce energy use at stores by 30% by 2017.

Corporate Responsibility

The increasing public awareness on environmental issues is another driving force for businesses to reconsider their energy policy. People are paying more attention on the energy performance of organisations. As part of corporate responsibility, besides making profits, organisations should also practice their due diligence to sustainable development of the environment and community, including addressing the public concerns on climate change and resource depletion.

1.2 Benefits of Adopting Energy Management System

By offering a systematic methodology for any sizes of organisation, including small and medium enterprises (SMEs), to establish own energy management system, ISO 50001 can provide organisations with a number of business benefits. These include:

- Helping to achieve energy use reduction and carbon emissions in a systematic way;
- Creating a clear picture of current energy use status, based on which new goals and targets can be set;
- Evaluating and prioritizing the implementation of new energy-efficient technologies and measures;
- Providing a framework to promote energy efficiency throughout supply chain;
- Providing guidance on how to benchmark, measure, document and report corporate energy use;
- Making better use of energy consuming assets, thus identifying potentials to reduce maintenance costs or expand capacity;
- Demonstrating to the stakeholders that corporate commitment to comply with their best practice to protect the environment; and
- Fulfilling the associated regulatory requirements and responding with confidence to green trade barriers in global market



1.3 ISO 50001 vs. Other Management System Standards

As a new member of international standards family, ISO 50001 has been developed based on the common elements shared by other major ISO management system standards, ensuring a high level of compatibility with them. It is notably aligned with ISO 9001 quality management system and ISO 14001 environmental management system standards. The comparison table below provides a quick overview on the comparison between the main clauses of ISO 50001, ISO 9001 and ISO 14001.

Table 1.1 Comparisons of ISO 50001 vs. ISO 14001 and ISO 9001 Management Systems

Content	ISO 50001	ISO 14001	ISO 9001
Core concept for establishing guidelines	Based on energy consumption of the whole organisation, or a particular production process. For compliance with ESOS your ISO 50001 system must cover all your organisation or groups energy consumption.	Based on relevant environmental aspects	Based on clients' quality requirements
Policy	Energy policy illustrates the strategy of the organisation on energy management. The policy provides the framework for setting up associated objectives and targets to enhance energy performance	Environmental policy illustrates how the organisation handles environmental matters, commitment to environmental protection, as well as associated objectives and targets. Typically the policy will include the organisations commitment to preventing pollution, regulatory compliance and continuous improvement.	Meet the clients' requirements
Strategy	Conducting energy reviews to identify significant energy use activities and set up energy baseline as well as energy performance indicators. Compliance to relevant regulatory requirements and setting up energy objectives, targets and implementation plans.	Compliance to relevant environmental regulatory requirements. Setting up environmental objectives, targets and implementation plans.	Setting up quality objectives, targets and quality management plans.
Baseline	Energy baseline is foundation to establish the system	No such requirement	No such requirement

Overview of ISO 50001

According to the definition stipulated in ISO 50001 standard, energy can be in various forms, such as electricity, fuels, steam, heat, compressed air and renewable, which can be purchased, stored, treated, used in equipment or in a process, or recovered. The main purpose of adopting an Energy Management System (EnMS) is to enable an organisation to improve its energy performance, which generally includes energy use, energy efficiency and energy consumption, in a systematic approach.

Similar to other management system standards published by the International Organisation for Standardization (ISO), ISO 50001 is based on the PLAN-DO-CHECK-ACT approach to achieve continual improvement in energy performance. The relationship between its main elements is illustrated below.

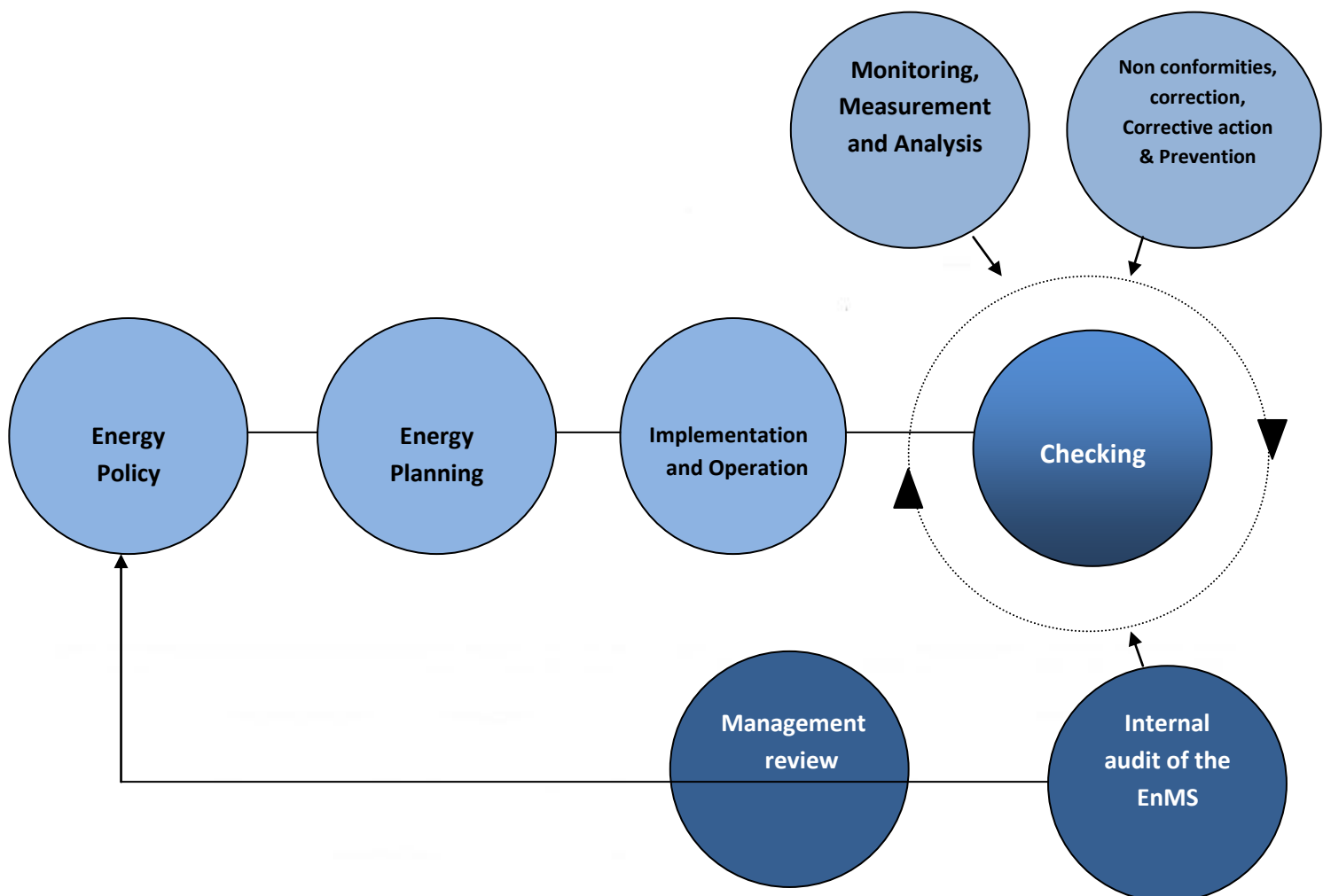


Figure 1: Main elements of an Energy Management System

The next section explains the core requirements of ISO 50001 standard in order to help the user understand and apply these requirements in a systematic manner. A self-assessment checklist is provided in Annex A to enable companies determining their gaps and readiness against the ISO 50001 standard

2.1 General Requirements

The ISO 50001 Standard says...

It requires the organisation to establish, document, implement and improve its EnMS according to ISO 50001 standard. The organisation should define and document the scope and boundaries of its EnMS as well as how to achieve continual improvement of its energy performance and EnMS. (Item 4.1)

The purpose of ISO 50001 standard is to enable organisations to establish systems and processes necessary to improve energy performance. The standard applies to all factors affecting energy use that can be monitored and influenced by an organisation. ISO 50001 standard does not specify energy performance criteria. It provides a general-purpose system that allows organisations to choose performance standards that they deem best meet their requirements.

Prior to developing the EnMS, the organisation should define the scope and boundaries of its management system. The scope refers to the extent of activities, facilities and decisions that the organisation addresses through an EnMS, which can include several boundaries. The boundaries are defined as physical or site limits and / or organisational limits as defined by the organisation that could be a process, a group of processes, a site, an entire organisation and multiple sites under the control of an organisation.

The focus of an ISO 50001 EnMS is on improving management processes, practices, and procedures that control an organisation's functions and activities with significant energy use. The overarching intent is that by implementing a management process and continually improving this management system, it will eventually lead to an improved energy performance.

2.2 Management Responsibility

2.2.1 Management Support and Commitment

The ISO 50001 Standard says...

It requires the top management to demonstrate its commitment to support and continually improve the effectiveness of the EnMS. (Item 4.2.1)

In addition to providing general support, top management should provide the necessary resources such as time, personnel, financial, materials, etc. for the effective implementation of the EnMS. Top management commitment is crucial to the successful implementation of the EnMS. It must be communicated and made visible to the entire organisation to encourage active participation of all staff members in adhering to the EnMS.

Key factors for successful implementation of an EnMS include:

- Top management support;
- Sufficient resources; and
- Management commitment.

To ensure effective operation of the EnMS, top management is required to appoint a management representative and approve the formation of an energy management team. The management representative (MR) is responsible for managing all aspects of the EnMS as it evolves. MR should have sufficient authority, competency and resources to ensure the overall effectiveness of the EnMS. The energy management team is responsible for ensuring the implementation of actions / measures of the energy management decisions. The composition and size of the energy management team should be determined with due consideration of the size and complexity of the organisation.

2.2.2 Management Representative

The ISO 50001 Standard says.....

It requires the top management to appoint a management representative(s) to promote awareness and oversee the implementation of the EnMS. (Item 4.2.2)

The ISO 50001 standard requires an organisation to appoint a management representative to oversee the development and operation of the EnMS. He / she is the key person to help the organisation achieve its energy objectives and targets and for improving energy performance. The management representative should be competent to perform the required duties and be capable of exerting influence throughout the organisation to implement and improve the EnMS.

The selection of this person should be carefully considered in order to fulfil the following responsibilities:

- Selecting, training and leading the energy management team;
- Coordinating energy management team activities;
- Identifying and communicating resources needed for energy management activities;
- Working with senior management for planning of resources;
- Arranging to deliver energy management awareness training in the organisation and for contractors;
- Being involved in drafting the policy and other EnMS documents;
- Providing information for and participating in energy management strategic planning;
- Ensuring appropriate monitoring, data collection and verification activities;
- Ensuring instrument calibration;
- Overseeing internal audit programme;
- Identifying training needs of staff members related to the EnMS; and
- Managing the corrective/preventive action system.

2.3 Energy Policy

The ISO 50001 Standard says.....

It requires the organisation to define an energy policy to state its commitment for achieving energy performance improvement. (Item 4.3)

The energy policy is a cornerstone for implementing and improving an organisation's EnMS and energy performance within its scope and boundaries. The policy provides a statement of the high-level overview of management's intent that members of the organisation should apply to their work activities. The policy also provides a framework for an organisation to set energy objectives and targets and associated energy management action plans to further improve its energy performance. ISO 50001 requires an organisation to at least state the following commitments in the energy policy:

- Continual improvement in energy performance;
- Availability of information and of necessary resources to achieve objectives and targets; and
- Compliance with relevant legislation and other requirements related to energy use, consumption and efficiency.

In addition to these commitments, the policy will include the support for purchasing energy efficient products and services, as well as designing for enhanced energy performance. The policy should be defined and approved by the top management to show its commitment to meet the organisation's goals. In terms of management, the policy must be communicated to all staff and be reviewed and updated in a systematic manner. Unlike other common standards, the organisation can decide whether or not to make the policy available externally.

Example of an Energy Policy

We shall comply with all applicable legal and other requirements related to energy management.

We shall improve energy efficiency as a continuous improvement process.

We shall assure the availability of information and resources to meet our objectives and targets.

We shall incorporate energy efficiency as a key component for new equipment, major renovation, and new design.

We shall promote energy saving awareness to our staff.

Executive Director: _____ Date: _____

2.4 Energy Planning

2.4.1 Legal and Other Requirements

The ISO 50001 Standard says.....

It requires the organisation to identify and have access to the applicable legal and other requirements in relation to its energy uses, consumption and efficiency to which it subscribes. (Item 4.4.2)

The element of legal and other requirements in ISO 50001 is intended to ensure that the organisation complies with applicable legislation and other requirements related to energy use, consumption and efficiency to which it subscribes. Legal requirements include those international, national, regional and local governmental statutory requirements which are applicable to the energy use of the organisation. Other requirements refer to customers' requirements, industry code of practices, government guidelines, voluntary programs, public commitments of the organisation or its parent organisation, and requirements of trade associations and others.

It is suggested that the following issues are addressed when conducting energy planning with regard to legal and other requirements:

- How to identify the applicable legal and other requirements;
- How to ensure the organisation is compliant with applicable requirements;
- How to ensure the key staff members have the necessary knowledge to access legal and other requirements;
- How to communicate relevant information on legal and other requirements to other staff; and
- How to ensure the information on legal and other requirements is up to date.

Identification of legal and other requirements applicable to energy use, consumption and efficiency is usually demonstrated through the establishment of a register of applicable legal and other requirements. Once identified, the organisation needs to ensure that it has implemented necessary actions to comply with these requirements. Moreover, the organisation should stay abreast of new or revision of legal and other requirements related to energy uses. It involves first a review of such changes for their applicability; and second, if determined to be applicable, an evaluation of what those specific changes mean for the organisation's facilities, processes, systems and / or equipment. Once the evaluation is completed and the impacts of the changes are understood, the organisation should implement actions to ensure compliance with those new or changed requirements. This may include additional or modified training, operational controls, reporting, etc. depending on the nature of the new or changed requirements.

2.4.2 Energy Review, Baseline and Performance Indicators

The ISO 50001 Standard says.....

It requires the organisation to develop record and maintain an energy review as well as document the methodology and criteria used to develop the review. (Item 4.4.3)

It requires the organisation to establish an energy baseline(s) for the measurement of the energy performance. (Item 4.4.4)

It requires the organisation to identify appropriate energy performance indicators to monitor and measure its energy performance. (Item 4.4.5)

The organisation must record and maintain an energy review with certain documented methodology and criteria. An energy review is a process to determine an organisation's energy performance based on data and/or actual measurement, leading to identification of opportunities for improvement. The review provides useful information for the development of the energy baseline and the selection of energy performance indicators (EnPIs). It also establishes the monitoring capability to support effective continuous improvement of the EnMS in the future.

To conduct the review, the organisation shall establish an equipment list and identify different energy use and obtain energy consumption details for a specified period, normally a full year on a monthly basis.

The following essential information should be available for the energy review:

- Name of equipment;
- Unique ID of major equipment (minor equipment such as fluorescence tubes, desktop PC could be grouped together);
- Equipment location;
- Rated power;
- Type of energy; and
- Measured energy consumption during a particular period (e.g. monthly record).

When conducting the energy review, the following items should be noted:

1. Major equipment with significant energy consumption should be itemized, i.e. energy consumption record should be provided for each piece of equipment;
2. Installation of sub-meter to monitor and record the energy consumption (such as electricity, diesel, gas and steam) of each major equipment;
3. When measurement of actual consumption is not available, estimation of energy consumption by power rating and operating hours may be adopted. However, assumptions and justifications for energy consumption estimation shall be clearly stated;
4. The energy review should be updated when necessary to add new equipment and expel obsolete items; and
5. Replacement of estimation by actual data through measurement as far as possible to enhance the accuracy of the energy profile.

Creating an Energy Profile

An energy profile is a useful tool to allow management to have a closer look at the detailed energy consumption status of the organisation. An example of an energy profile presented in a pie chart format is shown in Figure 2.

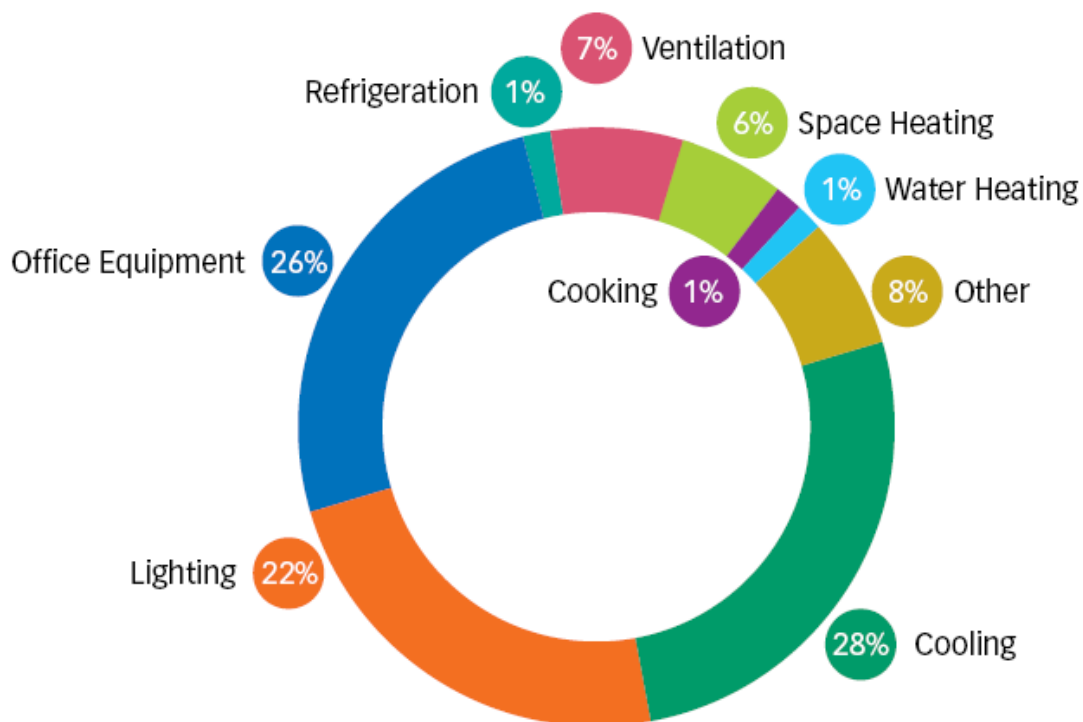


Figure 2: Sample of Energy profile

To prepare an energy profile, comprehensive energy consumption data in relation to an organisation's business operation must be collected. The organisation should consider recoding and maintaining records of all their energy consumption data

Determination of Energy Consumption

Energy consumption can be collected by reviewing energy bills, installing sub-meters and estimating from available technical data.

a. Analysis of energy bills

An organisation may consume different types of energy in its daily operation including electricity, diesel, gasoline, liquefied petroleum gas (LPG), natural gas, coal and steam. All the relevant energy consumption bills should be properly maintained as they are a good source of information to determine the overall energy consumption as well as the consumption of specific equipment for the preparation of an energy profile. For example, an electricity bill provides the energy consumption information of equipment; an oil filling bill tells you the gasoline or diesel consumption of a particular vehicle; a diesel tank filling record / bill provides the fuel consumption of a diesel boiler / emergency generator.

b. Energy measurement by sub-meters

It is necessary to obtain energy consumption data of different types of equipment in order to prepare the energy profile and monitor energy consumption continuously. To measure energy consumption of different equipment, it is suggested to install sub-meters for individual equipment, such as, electricity meters, diesel meters, LPG meters, steam meters, etc for diesel / coal boilers, fossil fuel ovens, burners, diesel generators, production machines and cooking stoves in a canteen kitchen. Reading of sub-meters should be recorded at least once a month. To ensure the accuracy of data, regular maintenance, checking and calibration of the sub-meters shall be arranged at the frequency recommended by the manufacturers or at least once a year. Human error in recording meter reading should also be avoided.

c. Energy estimation

When actual measurement of data is not available, estimation of monthly energy consumption by power rating and operating hours may be adopted for the preparation of energy profile. However, assumptions and justifications for the estimation of energy consumption shall be stated clearly. Nevertheless, energy estimation should be replaced by actual measurement as far as possible to enhance the accuracy of the profile.

After establishing the energy profile, the organisation should identify appropriate Energy Performance Indicators (EnPIs) to monitor and measure its energy performance. EnPIs are useful tools to enable management to assess actual energy performance against expected outcomes. An EnPI can be a simple parameter, a simple ratio or a complex model. Typically, it measures energy use and its efficiency per unit of performance.

EnPIs could be

- Energy consumption per time
- Energy consumption per unit of floor area • energy consumption per unit of production
- Energy consumption per unit of material consumed • energy consumption per unit of material transported

The organisation can select and determine suitable EnPIs according to the operation to better reflect and measure its energy performance. The EnPIs should be updated when business activities or baselines change that affect their relevance. The methodology to determine and update the EnPIs should be recorded and reviewed regularly.

2.4.3 Energy Objectives, Targets and Action Plans

The ISO 50001 Standard says.....

It requires the organisation to establish, implement and maintain documented energy objectives, targets and action plans specified outcome or achievement defined to meet its energy policy related to improved energy performance. (Item 4.4.6)

Documented energy objectives and targets should be established to ensure compliance with the organisation's energy policy, and to facilitate continual improvement in energy performance. Objectives should state what the organisation wants to achieve; while targets should specify how the organisation would achieve those objectives. The objectives and targets should be practical, achievable and measurable, and must conform to the organisation's business objectives and preferably provide some challenge to the organisation.

For example:

	We shall improve energy efficiency as a continuous improvement target
Objective	Reduce overall electricity consumption by 10%
Target	Reduce electricity consumption in production by 15% and in warehouse by 5% by December 2014

Action plans should be developed to address all of the organisation's energy objectives and targets detailing how and when they are to be achieved, which will subsequently facilitate monitoring the progress in achieving the energy objectives and targets. The action plans should include schedules, resources and responsibilities for achieving the objectives and targets. However, they should be flexible and be able to be revised to reflect any changes in the objectives and targets.

2.5 Implementation and Operation

2.5.1 Competence, Training and Awareness

The ISO 50001 Standard says.....

It requires the organisation to ensure all staff and persons related to significant energy uses are competent. (Item 4.5.2)

Competence refers to persons who possess the required skills, knowledge, qualifications, and capacity to perform their duties that can significantly affect energy use or the implementation of the EnMS. It is normally assessed based on a combination of education, training, skills and experience of the relevant person. A competent workforce is essential in successfully implementing the organisation's EnMS and achieving improved energy performance. The knowledge and skills that are necessary to implement the EnMS, ensure control of the significant energy uses and achieve the energy objectives and targets must be addressed.

Basically, appropriate training should be provided to all relevant personnel. This training should include general concept of energy management as well as skills training (usually on-the-job) to allow personnel to carry out their tasks with an awareness of the impact their activities can have on the energy performance. The level and degree of training will inevitably vary according to job function. For instance, general energy awareness training should be provided for all employees; and energy audit training should be provided for those who are responsible for the establishment of energy profile.

Table 2. Examples of EnMS Training Courses

	Targets
EnMS Awareness	<ul style="list-style-type: none"> • All employees
EnMS Implementation Training	<ul style="list-style-type: none"> • Middle Management • Management Representative • Energy Management Team
EnMS Auditor Training	<ul style="list-style-type: none"> • EnMS Internal Audit Team

In the event of any contractors working within the boundary of the organisation, they should be required to provide details of their competence to carry out the work in an energy efficient manner and/or be provided with procedural guidance.

Examples of Competence and Training Records:

- Documented personnel job descriptions that include energy-related competencies;
- Personnel records describing the staff's competencies;
- Records of staff's training and education; and
- Records assessing the staff's competencies based on those required for their job description.

2.5.2 Communication

ISO 50001 Standard says.....

It requires the organisation to address internal communication in relation to its energy performance and EnMS. The organisation should also decide whether to communicate externally about its energy policy, EnMS and energy performance. (Item 4.5.3)

For internal communication, the organisation should clearly demonstrate communication links in both vertical and horizontal directions within the organisation. An internal communication procedure could include how staff members are made aware of energy issues, how decisions are made or information is disseminated to staff etc. This should also make provision for the communication of suggestions / complaints etc. relevant to energy management and how these are dealt with. The communication procedure should also cover the process in responding to comments and suggestions by contractors working for or on behalf of the organisation. Methods for communication include, for example:

- Meetings;
- Videos;
- Briefings;
- E-mails, posters, memos, circulars; and
- Suggestion boxes, employee hotlines.

Externally, the organisation should maintain a documented decision on whether it will communicate its energy policy, EnMS and energy performance. For those who choose to communicate this information externally, they should consider the following aspects:

- Type and level of information to be communicated;
- Targets of communication;
- Mechanisms and responsible parties to handle and respond to enquiries;
- Official response time; and
- Recording system and format of communication and the associated correspondence.

2.5.3 Documentation

ISO 50001 Standard says.....

It requires the organisation to establish, implement and maintain information to describe the core elements of the EnMS and their interaction. (Item 4.5.4.1)

It requires to control all the EnMS documents. (Item 4.5.4.2)

Documentation within a management system will assist in both EnMS implementation and promoting understanding of system implementation. Documentation helps the organisation communicate its intent and ensure that energy-related activities are performed consistently and according to the requirements. It provides information and supporting evidence to demonstrate the effectiveness and efficiency of the EnMS and could be in the form of electronic files or paper copies.

According to the ISO 50001 Standard, organisations are required to document information that describes the core elements of their EnMS. In short, the following should be documented in an EnMS:

- Scope and boundaries of the system;
- Energy policy;
- Energy planning process including methodology and criteria used to develop the energy review, energy baselines and methodology for determining and updating the EnPIs;
- Energy objectives, targets and action plans; and
- Decision whether to communicate externally about information of energy performance.

In addition to the above specific documentation requirements referred to in the ISO 50001 Standard, the organisation may consider developing other documents that are deemed necessary to support the implementation of the EnMS, as documentation is the most easiest and effective method of achieving this. Nevertheless, it should be borne in mind that the primary focus of the organisation should be on effective implementation of the EnMS instead of creating a complex documentation system.

To ensure that there are no out-of-date or obsolete documents and valid version of each document is readily identifiable and available; a clear procedure should be established to control all EnMS documents. This should include mechanisms for amending, distributing, maintaining and updating relevant documents. The organisation should first identify the types of information that should be controlled, how these documents will be distributed, and who will need access to them. This requirement is similar to that contained in the ISO 9001 quality management and ISO 14001 environmental management standards and therefore organisations with such management systems in place can base this EnMS requirement on the existing procedures.

2.5.4 Operational Controls

The ISO 50001 Standard says.....

It requires the organisation to identify and plan operations and maintenance activities which are related to its significant energy uses in order to ensure that they are carried out under specified conditions. (Item 4.5.5)

Implementation of the EnMS is dependent on the establishment and maintenance of operational procedures and controls to ensure that the significant energy uses are being controlled and that the policy, objectives and targets are being met. The organisation should consider the different operations and activities, which contribute to its significant energy uses, and establish / confirm and implement the requisite control procedures.

In order to identify operational controls, the organisation should systematically review all of its significant energy uses to identify those which are not already controlled or where existing controls may be insufficient, and to subsequently ensure that control procedures are in place for all such areas.

It is suggested that the following are considered in relation to the preparation of operational control:

- Level of detail of the control procedures required;
- Target user of the procedures e.g. working level or management supervisory level;
- Distribution to relevant staff and / or contractors, where applicable; and
- developing a matrix to cross check significant energy uses against operational controls to ensure that relevant procedures are in place for controlling each of the significant energy uses.

2.5.5 Design

The ISO 50001 Standard says.....

It requires the organisation to consider energy performance improvement opportunities and operational control in the design of facilities, equipment, systems and processes that can have a significant impact on its energy performance. (Item 4.5.6)

This requirement is applicable to the design of new, modified and renovated facilities, equipment, systems and processes that can have a significant impact on an organisation's energy performance. It requires an organisation to consider energy performance improvement opportunities when performing these activities.

It is recommended to consider and identify energy performance improvement opportunities at the beginning of design, renovation work or modification of any significant energy using facilities, equipment, systems and processes. The whole process involves identifying design inputs, reviewing and verifying the design.

By incorporating the results of energy performance evaluation into the specification, design and procurement activities of relevant project(s), management can ensure that a sustainable design or an aggressive energy retrofit actually leads to targeted energy outcomes.

Examples of Energy Performance Considerations:

The following criteria could be considered in energy performance evaluation process during the design of new, modified and renovated facilities, equipment, systems and processes with significant energy impact:

- Any alternative energy sources?
- Any other possible energy saving measures?
- Energy saving percentage (i.e. compared with the traditional technology), investment cost and payback period
- Power rating, power factor and harmonic distortion
- Energy baseline
- Lifetime (i.e. frequency of replacement)
- Impact on efficiency, product quality, existing manufacturing process and production time
- Technical feasibility
- After-sale maintenance service

2.5.6 Procurements of Energy Services, Products, Equipment and Energy

The ISO 50001 Standard says.....

It requires the organisation to inform suppliers that procurement is partly evaluated on the basis of energy performance when procuring services, products and equipment that have an impact on significant energy use. (Item 4.5.7)

Energy improvement of an organisation could be achieved through procurement in twofold: firstly using more energy-efficient products and services; and secondly influencing supply chain to improve its energy behaviour which may indirectly improve the organisations' energy performance.

ISO 50001 requires an organisation to inform suppliers that energy performance will be evaluated as part of the procurement assessment process when selecting services, products and equipment that have or may have an impact on its significant energy use. This requirement ensures that suppliers are in line with the organisations' energy policy and objectives in addition to the consideration of cost and service / product quality. To this end, organisations should establish energy-related criteria to facilitate the assessment of energy performance over the planned or expected operating lifetime during the procurement process.

These requirements should be included in quotations and tender specification.

Below are three major items that an organisation should consider for the procurement of energy using products, equipment and services which are expected to have a significant impact on energy performance:

- How suppliers are informed that procurement is partly evaluated on a basis of energy performance?
- What are the criteria for assessing energy use, consumption and efficiency over the planned or expected operating lifetime?
- How to define energy purchasing specifications for effective energy use?

The elements of energy purchasing specification could include energy quality, availability, cost structure, environmental impact and renewable sources.

Examples of criteria to be considered when defining energy purchasing specifications for a lighting system:

- Unit cost and total cost
- Number of lighting devices required
- Power rating
- Power factor
- Energy saving percentage (i.e. compared to traditional bulb) and its payback period
- Lifetime (i.e. frequency of replacement)
- Lux level
- Colour rendering index
- Colour temperature
- Luminous efficiency in terms of lm/w
- Lumen depreciation
- Surface temperature (i.e. impact on operating cost of air conditioning system)
- Any stroboscopic effects?
- Any need for special disposal arrangements? Any hazardous materials or heavy metals inside the equipment?
- After-sale maintenance and service

2.6 Checking

To gauge the effectiveness of the EnMS and monitor the actual energy performance, an organisation is required to perform regular checking through energy-related data measurement and analysis, as well as carrying out internal audits.

2.6.1 Monitoring, Measurement and Analysis

The ISO 50001 Standard says.....

It requires the organisation to monitor measure and analyze the key characteristics of its operations that determine energy performance at planned intervals. Equipment used in monitoring and measurement of key characteristics should be calibrated to ensure data are accurate and repeatable. (Item 4.6.1)

With respect to monitoring of the key characteristics, the organisation should review all significant energy uses to determine which aspects should be monitored in order to check that the controls are being effective. The results help management define appropriate energy performance improvement actions. A monitoring schedule could be drafted in order to facilitate the monitoring activities.

According to the standard, key characteristics required monitoring 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. EnPIs;
- d. The effectiveness of the action plans in achieving objectives and targets; and
- e. Evaluation of actual versus expected energy consumption.

Appropriate procedures should be in place to ensure the reliability of the data through the testing of equipment, calibration and sampling. Evaluation of actual versus expected energy consumption as well as review its measurement needs shall be carried out. The organisation shall also investigate and respond to significant deviations in energy performance. These can be easily addressed through periodic meetings of the Energy Management Team or other working groups.

2.6.2 Evaluation of Compliance with Legal Requirements and Other Requirements

The ISO 50001 Standard says.....

It requires the organisation to evaluate compliance with legal requirements and other requirements to which it subscribes related to its energy use and consumption at planned intervals. (Item 4.6.2)

The organisation is required to maintain a process to evaluate compliance with legal and other requirements (identified under Item 4.4.2) regularly so as to enable management to monitor progress against planned milestones that meet all applicable requirements. Evaluation results should be recorded to demonstrate its compliance status.

After collecting all the information on the compliance status, the evaluation can be undertaken through periodic meeting of the Energy Management Team or other working groups.

2.6.3 Internal Audit

The ISO 50001 Standard says.....

It requires the organisation to conduct internal audits regularly to ensure effective implementation of the EnMS. (Item 4.6.3)

According to the ISO 50001 standard, organisations should establish a programme to evaluate periodically on its EnMS implementation and check the effectiveness of the system in fulfilling their energy policy. The programme should include the scope and frequency of the audits. Internal audit of EnMS is different from an energy audit or assessment. The internal audit evaluates the processes, procedures and implementation of the EnMS to determine if they are appropriate to the organisation, implementation status and conforming to requirements of the ISO 50001 standard. It helps identify nonconformities and opportunities for improvement of the EnMS. In practice, it can be performed by either internal or external persons, as long as they are competent, impartial and objective in conducting the EnMS audit.

At the end of the audit, proper records should be maintained and submitted to management for review.

In general, the audit programme and procedures should cover:

- Specific activities / areas of the EnMS to be audited;
- Frequency of audits (different elements of the EnMS may be audited at different frequencies);
- Responsibilities and selection of auditor(s);
- Communication of audit results;
- Auditor competence; and
- Process of conducting audits

2.6.4 Non-conformities, Corrective and Preventative Actions

ISO 50001 Standard says.....

It requires the organisation to address nonconformities by making corrections, and by taking corrective action and preventive action. (Item 4.6.4)

The findings of monitoring and other reviews of EnMS implementation should be documented. In case nonconformities are identified, the necessary corrective and preventive actions must be initiated and implemented. A follow-up system should be maintained by management to ensure that corrective and preventive actions have been completed and effective.

A fundamental principle of the ISO 50001 standard is that organisations are capable of identifying and fixing the problems, as well as taking actions to eliminate the cause of the problem. According to the standard, corrective action refers to action to eliminate the cause of a detected nonconformity; while preventive action refers to action to eliminate the cause of a potential nonconformity. For organisations with ISO 9001 and ISO 14001 in place, addressing non-conformance should be relatively straight forward as the procedures developed under these standards can provide the basis for fulfilling ISO 50001 requirements.

Procedures addressing non conformities should include:

- analysis of the cause of non conformance
- identification and implementation of corrective actions
- modification of existing controls, if necessary
- establishment of preventative measures where appropriate
- recording any changes in written procedures resulting from corrective or preventative actions
- ensuring follow-up actions are in place to ensure satisfactory resolution of the non conformance, and
- Non conformances should be reviewed in the Management Review process and Energy Management Team/Working Group meetings.

2.6.5 Control of Records

The ISO 50001 Standard says.....

*It requires the organisation to establish and maintain records to demonstrate conformity to the EnMS.
(Item 4.6.5)*

In order to demonstrate the effective functioning of the EnMS, organisations are required to keep legible, identifiable and traceable records. Records provide evidence of actions taken to adhere to the EnMS requirements and comply with the ISO 50001 standard. A comprehensive system for managing and maintaining records is necessary to ensure that records are easily identified, collated, indexed, filed, stored, retrieved and maintained for an appropriate length of time.

Records for the EnMS should cover but not necessarily be limited to, the following:

- Methodology, criteria and result of energy review;
- Opportunities for improving energy performance;
- Energy baseline;
- Energy performance indicators;
- Training records;
- Internal communication records;
- Decision on whether to externally communicate its EnMS and energy performance criteria and results;
- Design activity results;
- Monitoring and measurement results of key operational characteristics;
- Calibration records;
- Compliance evaluation results;
- Internal audit programme and results;
- Non conformance records;
- Corrective and preventive action records; and
- Management review agenda and minutes.

When considering the management of EnMS records, the following issues should be addressed:

- a. identifying the nature and extent of energy information that the organisation needs to manage;
- b. what type of information should be made available to internal and external parties; and
- c. location of records and responsibilities for maintenance including period of retention, signatures, dating, review and disposal.

2.7 Management Review

The ISO 50001 Standard says.....

It requires the top management to review the EnMS regularly to ensure its suitability, adequacy and effectiveness. (Item 4.7)

The management review will assist the organisation to achieve continual improvement and to assess the suitability, adequacy and effectiveness of the EnMS. It should be noticed that although management review needs to cover the scope of the whole EnMS, not all the elements in system are required to be reviewed at once. The review process can take place over a period of time.

When conducting management review, the organisation should also take into account the concept of continual improvement, which is achieved by evaluating the energy performance against the policies, objectives and targets. The management review should also address external issues relevant to the energy performance of the organisation and identify opportunities for improvement and where appropriate changes of emphasis or direction.

The Scope of Management Review should cover:

- Review of energy policy, objectives, targets and evaluation of overall progress in achievement;
- Findings of previous management review and EnMS audit;
- Evaluation of the effectiveness of EnMS, EnPIs and energy performance;
- Review of changes in: legislation, expectations and requirements of interested parties, products / activities of the organisation, advances in technology, market preference, etc.
- Evaluation of follow-up actions in relation to nonconformities;
- Projection of energy performance in the next period;
- Revision on policies, objectives, targets, resources or other elements of EnMS, if necessary;
- Review of resources allocation; and
- Identification of room for improvement.

3.0 Improvement on Energy Performance

Continual improvement on energy performance is the ultimate goal of implementing an ISO 50001 Energy Management System (EnMS). In order to achieve it, organisations need to look closely at their specific operation. For the manufacturing sector, a significant amount of energy is consumed by hardware installations, since their operations involve different types of production machines, equipment and auxiliary devices. With the advancement of technologies, production machines and auxiliary equipment with high energy efficiency are available in the market that can help reduce energy consumption and achieve cost saving. There are also quite a number of practical energy-saving measures and techniques applicable to various industrial applications. Organisations should take these technologies and measures into consideration when improving their energy performance.

4.0 Process and Auditing Requirements of ISO 50001

This section details the typical certification process in accordance with the requirements of ISO 50001 and ISO / IEC Guide 62 General requirements for bodies operating assessment and certification / registration of quality systems.

It should be noted that the certification process may vary between different certification bodies.

4.1 Accredited Certification Bodies

Certification of an EnMS will demonstrate to an organisation's customers that the organisation has attained an internationally recognized standard in terms of energy management and is continuously improving its energy performance.

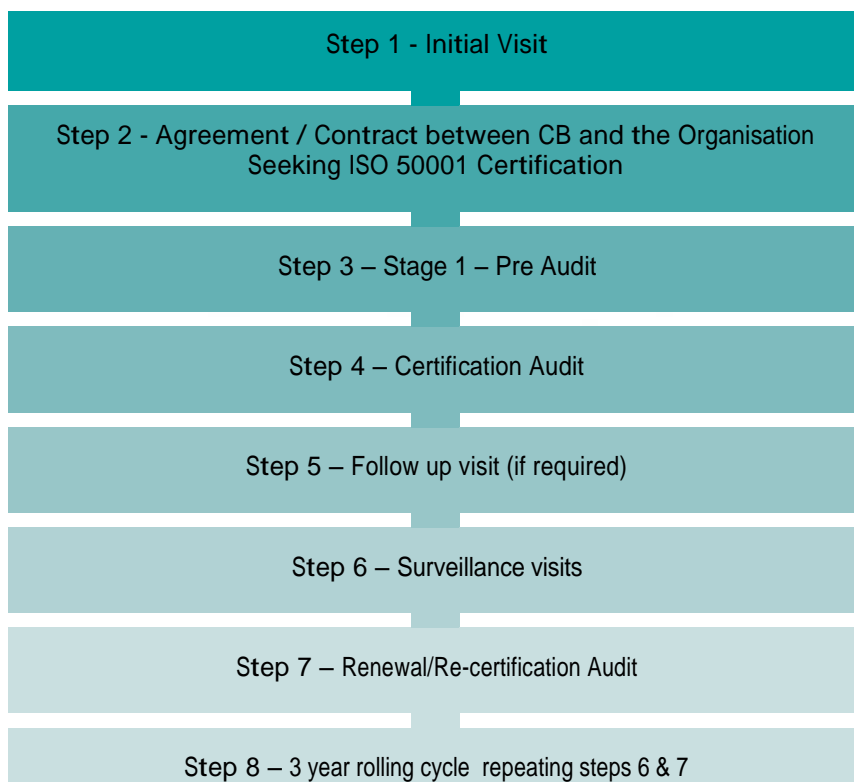
Using a Certification Body (CB) that has been accredited by an International Accreditation Body on ISO 50001 provides international recognition of the EnMS established. Accreditation is a process in which a CB is audited by a third party (e.g. United Kingdom Accreditation Service (UKAS)) in order to ensure the competence of the CB in the provision of relevant certification process.

The Accreditation Body will determine whether the CB has implemented, and is following, its certification management system in accordance with the following international guidelines:

- ISO / IEC Guide 62 General requirements for bodies operating assessment and certification / registration of quality systems; and
- Interpretations by the International Accreditation Forum (IAF) Guidance on the Application of ISO/IEC Guide 62 for bodies operating assessment and certification / registration of quality systems.

4.2 ISO 50001 Certification Process

The ISO 50001 certification process generally includes the following steps:



Step 1 Initial Visit

Some certification bodies may conduct an initial visit to evaluate the complexity of the energy management system to be audited or upon client's request. The initial visit allows certification body to understand the clients' activities, products and services and the potential significant energy use related to different stakeholders of the organisation. In addition, the initial visit can ascertain the readiness of an organisation's EnMS for the certification audit.

Before the initial visit, the certification body will send a preliminary questionnaire to organisation seeking for certification. The questionnaire aims to obtain basic information about the organisation and most importantly the information about the energy uses and consumptions in the organisation. The questionnaire allows the certification bodies to better understand the certification scope and the procedures involved in the energy management system. In addition, it helps determine the audit scope and the durations for the audit.

Step 2 Agreement / Contract Between Certification Body and the Organisation Seeking ISO 50001 Certification

After reviewing the questionnaire and conducting the initial visit, the Certification Body will send a quotation to the client for the certification process. The quotation will specify the number of man-days required to conduct the certification process, the experience of the audit team and the associated fee. An agreement or contract between certification body and the organisation will be signed upon the acceptance of the quotation.

Step 3 Document Review

Certification body will conduct a document review in order to achieve the following objectives:

- To assess the compliance to ISO 50001 in documents and records;
- To verify the comprehensiveness and adequacy of the EnMS; and
- To identify areas to be audited in the First Stage Assessment (FSA).

In general, the following EnMS documentation will be reviewed:

- Energy Manual;
- Energy Policy;
- Energy Review;
- Energy Baseline;
- Energy Objectives, Targets and Action Plans;
- List of Significant Energy Uses;
- List of Legislative Requirements Related to Energy Uses and Procurement;
- Records of the internal audit results;
- Records of corrective and preventive actions;
- Records of management review;
- Complaints received & incidents; and
- Energy procedure and list of operational controls.

Step 4 Stage 1 – Pre-Audit

The Stage 1 usually starts with a site tour to allow the auditor(s) to understand the organisation's operations and identify its potential significant energy uses. The FSA focuses on the system design and the key elements of the EnMS that normally include legal requirements, evaluation of internal audit, management review, training and communication.

It is not uncommon to find out a number of observations or non-conformities which need to be addressed before the Certification Audit during the FSA. Organisation is required to follow up and rectify these observations and non-conformities to proceed with the Certification Audit.

Step 5 Certification Audit

The Certification Audit will be conducted approximately 1 month after the FSA to allow sufficient time for any non-conformities or observations identified in the FSA to be corrected. The Certification Audit focuses on the implementation of the documented system including the control of significant energy uses through various operational controls and the implementation of energy objectives, targets and action plans.

It is important that the EnMS established should meet the basic requirements of ISO 50001 including regulatory compliance and continual improvement in energy performance.

The Certification Body will recommend the organisation to receive the ISO 50001 certification if there is no critical non-conformity identified during the Certification Audit.

Step 6 Follow-up Visit

A Follow-up visit will be conducted if serious NCs are identified in the Certification Audit. An on-site visit will be conducted by the Certification Body to ensure these NCs are effectively addressed by implementing appropriate corrective actions.

Step 7 Surveillance Visit

Depending on the origin of the accreditation, the Certification Body will conduct surveillance visits every 6 months or 1 year to check the EnMS implementation such as progress against objectives and targets. The auditor will also check whether there is any change in significant energy uses, energy baseline and regulatory compliance of the organisation.

The use of the certificate and the certification logo will also be checked.

Step 8 Renewal Audit

The ISO 50001 certificate is issued for 3 years. Before the expiry of the certificate, renewal audit should be carried out. Similar to the FSA and certification audit as described earlier, the focus of the renewal audit will be on how the organisation conduct energy review and the results as well as the identification of significant energy uses and the formulation of proper controls.

An approximate time from commencing system development to achieving certification could be between 6 and 12 months depending on the size and complexity of the organisation and also the current state of the organisations' energy management and their existing management systems.

4.3 Certification Requirements

During EnMS audit, certification can only be granted if all of the criteria indicated below are met:

The EnMS must be effectively implemented at least to the extent that:

- The EnMS has been operational for a minimum of three months;
- The internal audit is implemented and can be shown to be effective;
- One management review has been conducted;
- All staff are aware of the energy policy, objectives and the energy management system; and
- Staff involved in managing significant energy uses and associated impacts have received training according to a training needs analysis.

In addition to the above mandatory requirements in certification, the certification bodies also focus on the following aspects, most of which are related to the energy review.

- The methodology in determining significant energy uses (SEU);
- Prioritization of areas for improvement in energy review;
- The analysis and evaluation of energy review;
- The methodology to determine the energy baseline for the organisation or individual SEU;
- The methodology to determine the energy performance indicator(s) for the organisation or individual SEU;
- The method and result verification for energy objectives, targets and action plans; and
- The operational control related to SEU.

4.4 Non-conformities

Non-conformities (NCs) are generally divided into two categories: major NCs which relate to serious omissions or failures of the EnMS; and minor NCs.

For those related to serious omissions or failures of the EnMS such as the following, a follow-up visit is likely to be required:

- Absence of one or more system elements;
- Ineffective implementation; and / or
- Issues that could seriously affect capability to achieve policy and objectives.

To be classified into major NCs, the omissions or failures of the EnMS are normally associated with any, or a combination of:

- Inadequate identification of significant energy uses;
- Regulatory non-compliances; and / or
- No real policy, objectives and targets which would lead to continual improvement.

For minor NCs of a less serious nature, e.g. an isolated event such as not following a procedure, they can usually be resolved by an acceptable corrective action plan.

Annex A Self Evaluation Checklist

Resources, Roles, Responsibility and Authority

Requirements	Conformity		
	Yes	No	N/A
1. Have the roles, responsibilities and authorities for energy management been defined and documented?			
2. Have a Management Representative and an Energy Management Team been designated?			
3. Have the roles, responsibilities, and authorities for the Management Representative and Energy Management Team been defined?			
4. Have the required resources (e.g. personnel, technology, finance) for implementation and control of the energy management system been provided by the management?			
5. Does the personnel appointed in energy management have the competence required?			

Energy Policy

Requirements	Conformity		
	Yes	No	N/A
1. Has the organisation defined and documented its energy policy?			
2. Is the energy policy appropriate to the nature and the scale of, and the impact on the organisation's energy use and consumption?			
3. Does the policy include commitments to <ul style="list-style-type: none"> • continual improvement of energy efficiency? • Compliance with applicable legislation and other requirements? • support purchase of energy-efficient products and services? 			
4. Does the energy policy provide a framework for setting energy objectives and targets?			
5. Has the energy policy been documented, implemented, maintained and communicated to all persons working for or on behalf of the organisation?			
6. Has the energy policy been regularly reviewed and updated?			

Legal and Other requirements

Requirements	Conformity		
	Yes	No	N/A
1. Has a procedure been developed and implemented to identify applicable regulatory, legal and other requirements?			
2. Has the organisation identified, implemented, and access to the applicable legal requirements and other requirements, which are related to the energy use consumption and efficiency?			
3. Has the organisation determined how the applicable legal requirements and other requirements apply to its energy use, consumption and efficiency?			
4. Are current copies of all applicable regulatory and other requirements accessible to personnel as necessary?			

Energy Review, Energy Baseline, and Energy Performance Indicators (EnPI's)

Requirements	Conformity		
	Yes	No	N/A
1. Has a procedure been established, implemented and maintained to identify the baseline and Energy Performance indicators?			
2. Has energy baseline related to potential significant energy use been considered in establishing and implementing the EnMS?			
3. Has the organisation identified the areas of significant energy use?			
4. Has the organisation determined the current energy performance related to identified significant energy uses?			
5. Are all significant energy uses controlled by objectives, targets, and programmes, procedures or monitoring?			
6. Has the organisation identified other relevant variables affecting significant energy uses?			

Energy Objectives, Energy Targets and Energy Management Action Plans

Requirements	Conformity		
	Yes	No	N/A
1. Have documented energy objectives and targets been established at relevant functions and levels within the organisation?			
2. Are the energy objectives and energy targets specific, measurable, concrete and understandable?			
3. Are the objectives and targets consistent with the energy policy?			
4. Has an energy performance evaluation system been established to periodically review the achievement of the objectives and targets?			
5. Have action plans including the following items for the achievement of energy objectives and targets been established and implemented? <ul style="list-style-type: none"> • Designation of responsibility for achieving objectives and targets at each relevant function and level of the organisation • The means and time-frame by which the programmes are to be achieved • The statement of the method by which an improvement in energy performance³ shall be verified; and • The statement of the method of verifying the results of the action plans 			
6. Have the action plans been documented and updated at defined intervals?			

Competence, Training and Awareness

Requirements	Conformity		
	Yes	No	N/A
1. Are all the personnel, related to significant energy uses, competent on the basis of appropriate education, training, skills or experience?			
2. Have training needs associated with the control of its significant energy uses and the operation of its EnMS been identified?			
3. Have procedures been established to assure that all the personnel working for or on behalf of the organisation are aware of <ul style="list-style-type: none"> the importance of conformity with the energy policy, procedures and the requirements of the EnMS? their roles, responsibilities and authorities in achieving the requirements of the EnMS? the benefits of improved energy performance? the impacts, actual or potential of their activities and how their activities and behaviour contribute to the achievement of energy objectives and targets and the potential consequences of departure from specified procedures? 			
4. Are training records, certificates and licenses maintained to demonstrate the competence?			

Communication

Requirements	Conformity		
	Yes	No	N/A
1. Does the organisation communicate internally with regard to its energy performance and the EnMS?			
2. Are procedures maintained for communication of energy issues between various levels of the organisation?			
3. Has the organisation established and implemented a process by which any person working for, or on behalf of, the organisation can make comments or suggestions to EnMS?			
4. Has the organisation decided whether its energy policy, EnMS and energy performance should be communicated externally?			
5. If so, are there any documented and implemented external communication plans?			

Documentation

Requirements	Conformity		
	Yes	No	N/A
1. Have the core elements of the EnMS and their interaction been documented in paper and/or electronic form?			
2. Are the following EnMS elements documented? <ul style="list-style-type: none"> • Scope and boundaries of the EnMS • Energy policy • Energy objectives, targets and action plans; and • Documents required by ISO 50001, e.g. energy review 			

Control of Documents

Requirements	Conformity		
	Yes	No	N/A
1. Are procedures maintained to ensure periodic review and appropriate approved distribution and revision of all required documents?			
2. Are current versions and changes of all required documents identified?			
3. Are documents of external origin that are to be necessary for the planning and operation of the EnMS identified and controlled?			
4. Is all documentation legible, readily retrievable and identifiable, and revision level or date identified?			
5. Are obsolete documents promptly removed or otherwise assured against unintended use?			

Operational Control

Requirements	Conformity		
	Yes	No	N/A
<p>1. Have the operations and maintenance activities, which are related to significant energy uses and are consistent with energy policy, objectives and action plans, been identified and planned with the following considerations?</p> <ul style="list-style-type: none"> • Establishing and setting criteria for the effective operation and maintenance of significant energy uses; • Operating and maintaining facilities, processes, systems and equipment in accordance with operational criteria; and • Appropriate communication of the operational controls to personnel working for the organisation. 			

Design

Requirements	Conformity		
	Yes	No	N/A
1. Have procedures been implemented to identify and consider energy performance improvement opportunities and operational controls in the design of new, modified and renovated facilities, equipment, systems and processes?			
2. Are the design considerations documented?			

Procurement of Energy Services, Products, Equipment and Energy

Requirements	Conformity		
	Yes	No	N/A
1. Have the criteria for assessing energy use, consumption and efficiency over the lifetime of the product, equipment or service been established and implemented?			
2. Are specifications for items being purchased clearly defined and documented in the energy performance related requirements?			
3. Have energy performance related requirements been communicated to suppliers?			
4. Have suppliers been made aware that energy performance is part of the evaluation criteria?			

Monitoring and Measurement

Requirements	Conformity		
	Yes	No	N/A
1. Have procedures been documented and implemented to monitor the following key characteristics of operations that can have significant impacts? <ul style="list-style-type: none"> Significant energy uses and other outputs of the energy review Relevant variables related to significant energy uses; Energy performance indicators (EnPIs); Effectiveness of the action plans in achieving objectives and targets; and Evaluation of actual versus expected energy consumption. 			
2. Are records available to track performance and conformity with the key characteristics?			
3. Has the energy measurement plan been defined and implemented?			
4. Are all monitoring equipment appropriately maintained and calibrated?			

Evaluation of Compliance

Requirements	Conformity		
	Yes	No	N/A
1. Are documented procedures established, implemented and maintained for periodical evaluation compliance with relevant energy legislation and other requirements related to energy use and consumption?			
2. Is the compliance status with regard to relevant energy legislation and other requirements related to energy use and consumption evaluated?			

Internal Audit

Requirements	Conformity		
	Yes	No	N/A
1. Have internal audit procedures been developed and implemented?			
2. Has the internal audit schedule been developed?			
3. Are the internal audits conducted to ensure that the EnMS <ul style="list-style-type: none"> conforms to planned arrangements for energy management according to ISO 50001 standard requirements? conforms with the energy objectives and targets established? is effectively implemented and maintained, and improves energy performance? 			
4. Are audit reports and records documented?			
5. Are the auditors conducting the audits competent and in a position to conduct the audits objectively and impartially?			

Non conformity, Corrective Action and Preventative Action

Requirements	Conformity		
	Yes	No	N/A
1. Have procedures been established to define the responsibility for handling, investigating and controlling, and mitigating nonconformity?			
<p>2. Does the organisation address the actual and potential nonconformities by making corrections, and by taking corrective and preventive actions with the following elements?</p> <ul style="list-style-type: none"> • Reviewing nonconformities or potential nonconformities; • Determining the causes of nonconformities or potential nonconformities; • Evaluating the need of action to ensure that nonconformities do not occur or recur; • Determining and implementing the appropriate action needed; • Maintaining records of corrective and preventive actions;and • Reviewing the effectiveness of the corrective and preventive actions taken 			
3. Are procedures changed and / or updated as a result of corrective action and preventive action?			

Control of records

Requirements	Conformity		
	Yes	No	N/A
1. Have procedures been established and implemented for the identification, retrieval and retention of records?			
2. Are records legible, identifiable and traceable to the relevant activities?			
3. Does the organisation retain the following records? <ul style="list-style-type: none"> • Training records; • Audit results; • Management review records; • Information on applicable energy laws and other requirements; • Inspection, maintenance and calibration records; • Information on significant energy use and energy performance indicators; • Procurement records; • Permits; • Monitoring data; • Details of nonconformities, incidents, complaints and follow-up actions; • Contractors and suppliers records; and • Process and product information. 			

Management Review

Requirements	Conformity		
	Yes	No	N/A
1. Do periodic management reviews take place to ensure the continuing suitability, adequacy and effectiveness of the EnMS?			
2. Are management review records retained?			
3. Are the management reviews carried out based on the following documents or information? <ul style="list-style-type: none"> • EnMS audit reports; • Evaluation of compliance with legal requirements and other requirements to which the organisation subscribes; • Achievement of EnMS objectives and targets; • Communications and complaints on EnMS internally; • Energy policy; • Energy performance and related Energy performance indicators (EnPIs) of the organisation; • Status of corrective and preventive actions; • Follow-up actions from previous management reviews; • Projected energy performance of the following period; • Changing circumstances, including developments in legal and other requirements related to its energy use; and • Recommendations for improvement. 			
4. Are the management reviews included in the decisions or actions related to: <ul style="list-style-type: none"> • Energy performance of the organisation; • Energy policy; • Energy performance indicators (EnPIs); • Objectives and targets of the EnMS; and • Allocation of resources. 			

Annex B Energy Saving Opportunity Scheme (ESOS)

The Energy Savings Opportunity Scheme

The EU Energy Efficiency Directive entered into force in November 2012. The Directive aims to drive improvements in energy efficiency across the EU. Article 8(4) includes a requirement that all large (non-SME) enterprises undertake energy audits by 5 December 2015 and every 4 years thereafter. This is the largest new policy within the Directive from a UK perspective.

The Government has developed the Energy Saving Opportunity Scheme (ESOS) in order to comply with the Article 8(4) requirement. On 10 July 2013 the Government launched a 12-week consultation on the proposals for this scheme, seeking the views of business, industry and trade bodies, and other interested parties. The consultation closed on 3 October 2013. The Government contracted independent expert consultants to carry out detailed analysis of consultation responses and has since been developing the legislation and guidance that give effect to the scheme.

The scheme seeks to minimise the administrative burden on business, including by realising synergies with existing policies and requirements, such as the CRC Energy Efficiency Scheme. At the same time, the Government also aims to maximise the energy efficiency and economic gains from the scheme.

Who must comply with ESOS?

Participation in ESOS will be mandatory for any undertaking which carries out business activity within the UK and which meets any one of the following criteria:

1. It has 250 or more staff; or
2. It has fewer than 250 staff but has an annual turnover exceeding €50m and a balance sheet exceeding €43m
3. It is part of a corporate group which includes a large undertaking (as defined by (1) or (2), above).

ESOS Scheme operation and timings

ESOS will operate in four-yearly compliance phases. Organisations in the UK must assess whether or not they are required to participate in ESOS on the qualification date of each phase.

The qualification date for the 1st phase is the 31st December 2014.

The last day of each compliance phase (the compliance date) is the date by which the participant must have undertaken its ESOS Assessment and notified its compliance to the Environment Agency.

For the first phase, this means that activity to support your ESOS Assessment must have been undertaken between the 6 December 2011 and the 5 December 2015 to be considered compliant.

If you remain in scope of the scheme, you must then undertake ESOS Assessments within each subsequent phase.

ESOS Phase Timings

Phase	Qualification Dates	Four Year Compliance Phase	Compliance Date
Phase 1	31/12/2014	6/12/2011 – 5/12/2015	5/12/2015
Phase 2	31/12/2018	6/12/2015 – 5/12/2019	5/12/2019
Phase 3	31/12/2022	6/12/2019 – 5/12/2023	5/12/2023

ESOS Reporting requirements

Participants will be required to notify the Environment Agency of their compliance at the end of each compliance period. The basic notification details will include confirmation of compliance; information on the participant, including the name of the director(s) or equivalent who signed off the report and information on the Lead Assessor, including name and approved qualification (or approved membership of a professional register).

For undertakings that are complying as a group, the participant will also need to provide information on the participant undertakings.

Participants will also have the opportunity to voluntarily disclose additional information about the results of their ESOS Assessment and energy audits, actions taken as a result, and their energy consumption and management in general.

The Environment Agency will publish a list of all participants which have notified that they have complied with ESOS, together with any voluntary information provided by participants.

Reporting your ESOS compliance

You will need to make a notification to the ESOS Scheme Administrator that you have completed an ESOS compliant assessment for your organisation. The notification must be made to the Scheme Administrator on, or before, the compliance date of each phase. As noted above, the compliance date for the first phase is the 5th December 2015.

You will be required to submit this notification to the Environment Agency through an online notification system. This system will become operational in 2015, and details will be published on the ESOS website: <https://www.gov.uk/energy-savings-opportunity-scheme-esos>

Signing off your Assessments

Before you can submit your notification to the Environment Agency, you will need to have your ESOS Assessment signed off by a director or, if your organisation does not have a director, an equivalent senior manager.

The requirement for sign-off and notification applies irrespective of the compliance route, or routes, you've chosen in complying with ESOS – i.e. ESOS Energy Audits, Display Energy Certificate (DEC) reports, Green Deal assessments or an ISO50001 certified Energy Management System.

ESOS Scheme Administrator

The Environment Agency will be the ESOS Scheme Administrator for the United Kingdom. As such, the Environment Agency will be responsible for receiving notifications of compliance from ESOS participants, maintaining guidance on compliance and approving registers of Lead Assessors (see Section 5), as well as other duties.

The Environment Agency will also be the compliance body for participants in England. The Scottish Environment Protection Agency (SEPA), Natural Resources Wales (NRW) and the Northern Ireland Environment Agency (NIEA) will be the compliance bodies for participants in Scotland, Wales and Northern Ireland respectively.

The participant's compliance body is determined by the location of its registered office or where there is no registered office its principal place of activity.

The compliance bodies will be responsible for monitoring the compliance of those in scope of the scheme and will be able to issue penalties for non-compliance

Penalties

The scheme compliance bodies will have the authority to apply civil penalties against an organisation/group found to be required to participate in ESOS and found to be non-compliant

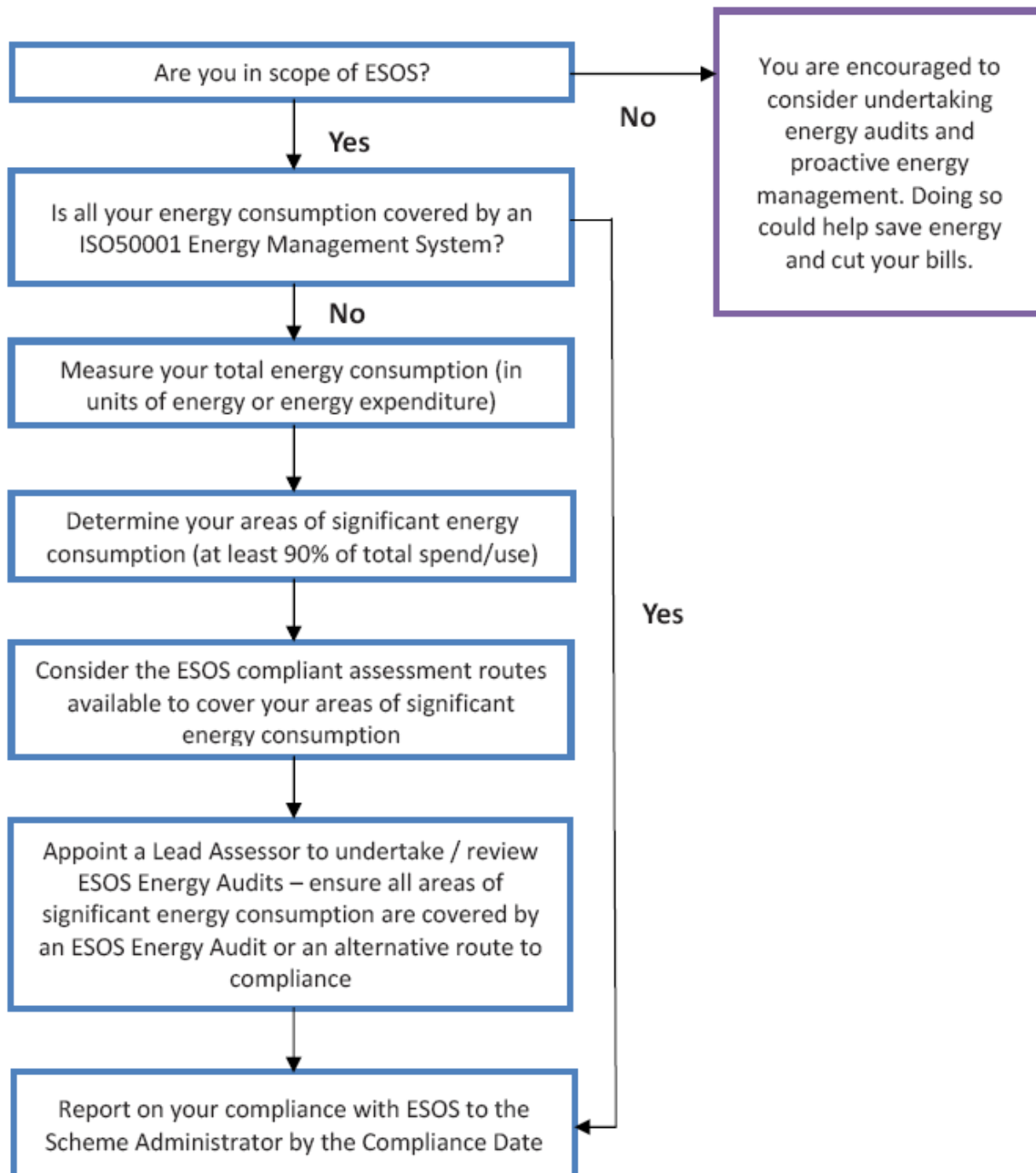
For all non-compliances, the compliance bodies will have the power to publish information on non-compliance on their website. This information, available to the public, will include: The name of the ESOS participant; details of the failure in respect of which a civil penalty has been imposed; and the penalty amount.

Non-compliances include:

- Failure to notify the Scheme Administrator of compliance by the required date;
- and/or failure to provide basic details as part of notification
- Failure to maintain adequate records to demonstrate compliance with ESOS
- Failure to undertake an ESOS Assessment
- Failure to comply with an enforcement, compliance or penalty notice
- Making a statement which is false and misleading

Each non-compliance category carries its own penalties, these range from £5,000 to over £50,000 plus additional non-monetary penalties.

Key Steps to Complying with ESOS



ISO 50001 certification and ESOS

Certification under international standard ISO 50001:2011 (energy management system, EnMS) is permitted as a compliance route under ESOS as an alternative to undertaking ESOS Audits.

ISO 50001:2011 provides a framework of requirements for organisations 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 about energy use;
- measure the results;
- review how well the policy works; and
- continually improve energy management.

A certified ISO 50001 energy management system can be applied across all of the assets and activities of an organisation/group or applied to a specific asset/activity (e.g. utilised to manage a high energy using asset/activity).

To be valid as a route to compliance under ESOS, your ISO 50001:2011 energy management system must be certified by a United Kingdom Accreditation Service (UKAS) accredited certification body, by a body accredited by another EU member states' national accreditation body, or by a body which is a member of the International Accreditation Forum.

If you maintain a compliant but not certified system, you may wish consider seeking certification to permit the use of your energy management system as a route to compliance under ESOS.

Where an ISO 50001 certified system covers all of your organisation or group, at the time the certification was undertaken, this shall constitute compliance with ESOS provided the certification is still valid at the compliance date (5th December 2015 for the first ESOS phase). In this circumstance, there is no requirement for an organisation or group holding such a certification to have its ESOS compliance verified by a Lead Assessor.

Why TÜV NORD

The TÜV NORD GROUP has been conducting ISO 50001 audits since 2011 and currently audits and certifies nearly 300 client sites around the world, giving us a wealth of knowledge & experience.

Clients include:

AVG
Exxon Mobil
Fiat Auto
Dr Oetker
General Motors
Johnson Controls
Mahindra Steel
Mahle
Mars
Mitsubishi Hitech Paper
Outokumpu
Outokumpu Stainless
Siemens AG Energy
Thyssenkrupp Steel
Yokohama Tires

Through our German parent company, our existing ISO 50001 accreditation has been held since 2011 through DAkkS, the German national accreditation body, allowing us to meet the ESOS requirements for an accredited certification body, accredited by an EU member states' national accreditation body, or by a body which is a member of the International Accreditation Forum. We are also currently evaluating the benefit of ISO 50001 accreditation through UKAS.

Contact us to discuss your requirements and we can audit and certify your EnMS system to ISO 50001, enabling you to achieve and declare ESOS compliance.



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ISO 50001: [TUV UK](#) / [TUV NORD CERT](#)

