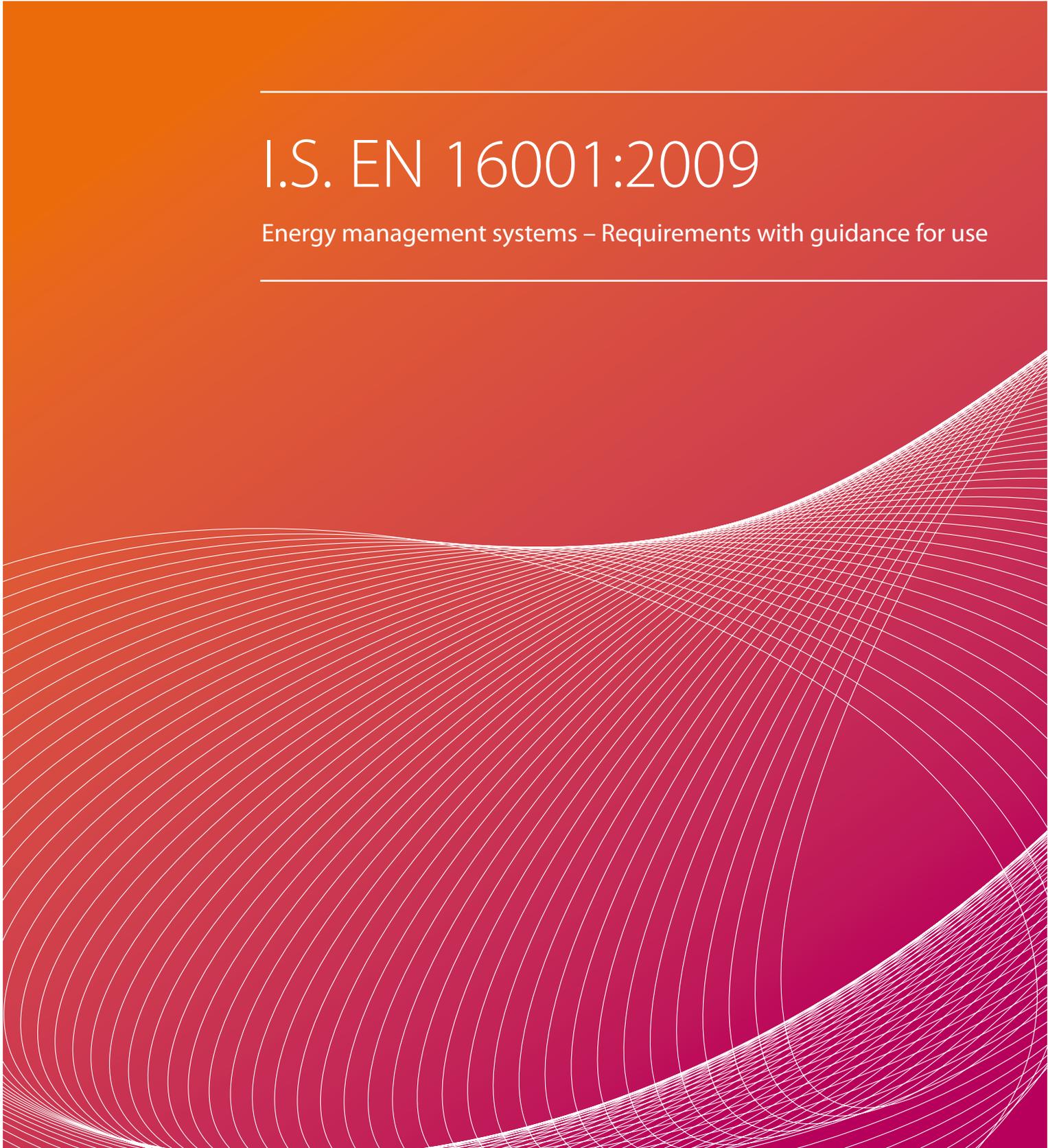


Implementation Guide

I.S. EN 16001:2009

Energy management systems – Requirements with guidance for use



I.S. EN 16001:2009 Implementation Guide

November 2009

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Introduction

THE Irish Energy Management System Standard (I.S. EN 16001:2009) has been developed to help organisations to improve their energy efficiency in a logical, controlled and systematic way, thereby saving energy and reducing costs.

The standard is focused on promoting the analysis of energy usage data, and identifying the exact locations, times and underlying reasons behind current and past energy use, so that your organisation can accurately identify, understand and prioritise opportunities for improving energy efficiency.

This analysis, coupled with a 'management system' approach, has a long and proven success record in all industry sizes and sectors. The Irish energy standard has been structured to align with other popular industry management system standards such as those for quality, health & safety and environmental management. Organisations can thus, if appropriate, integrate an energy-management system (EMS) with their existing management system(s).

This implementation guide has been developed to provide a recommended approach to implementing an EMS to meet the requirements of I.S. EN 16001 in your organisation. As each organisation's needs are different, the guide does not purport to be a 'one fix' solution for all, nor does it provide a template by which you should develop your own EMS. However, it does explain how to go about implementing an EMS and provides a planned, logical and informed approach to energy management, to improve energy efficiency and reduce operating costs.

The benefits of implementing I.S. EN 16001

The requirements of I.S. EN 16001 can be applied to and met by any organisation that wishes to improve its energy efficiency. When this manual was being developed, several organisations that have already implemented the EMS confirmed that they had seen many direct and indirect benefits attributable to implementing I.S. EN 16001, including:

- energy cost savings
- reduced greenhouse-gas emissions
- reduced carbon footprint
- increased energy awareness among staff
- greater knowledge of equipment efficiencies
- informed decision-making processes
- structured approach to the Right First Time methodologies

Other indirect benefits that organisations cited are:

- positive publicity
- improved corporate image
- improved operational efficiencies
- improved maintenance practices

Pitfalls to avoid when implementing I.S. EN 16001

While the challenge in successfully implementing I.S. EN 16001 varies from organisation to organisation, a number of common pitfalls have been identified. The following list is indicative only but may help in your implementation programme:

1. *Making your system too complex:* eg, documenting all the requirements of the standard and your activities into a set of rigid procedures that require multiple approvals to change
2. *Focusing on doing and not recording:* eg, identifying improvement opportunities, and indeed implementing them, but not recording them in the Register of Opportunities
3. *Focusing on the technical aspects and ignoring the system:* eg, making efficiency changes to processes without updating the process descriptions/controls and neglecting to retrain operatives
4. *Maintaining two systems* – one for use, the other for external auditors to see
5. *Not seeing the value in internal audits:* eg, only conducting compliance audits (do we have a policy, is it written down?) as opposed to audits focusing on making improvements (is our policy reflected in what we do and how can we test it?)
6. *Restricting communication:* eg, only a core team is involved and really runs the system, while those outside the team are excluded
7. *Not giving enough resources to the system:* eg, appointing a management representative but not allocating them financial and/or human resources to run the system

The management system approach – background

Several of the organisations that have implemented I.S. EN 16001 found that the standard could be readily integrated with other common international business standards such as ISO 9001, ISO 14001 and OHSAS 18001. This relative ease of integration is a direct result of the energy standard being designed to follow the same structured 'Plan, Do, Check, Act' approach common to all ISO management system standards.

This approach of using a common management system structure allows organisations to use their existing resources and management systems when implementing their I.S. EN 16001 energy-management system.

Summary of the implementation process

1. Planning your EMS: (Plan)

- *First step:* Formally identify and understand your current energy usage by analysing your energy usage, factors and equipment. Then identify what equipment/process is significant in terms of usage. Finally, pinpoint the opportunities for improving energy efficiency.
- *Second step:* Identify which opportunities for improvement can be realistically achieved, given any requirements for payback and the resources available. You should rank or prioritise these opportunities so that those that promise the greatest potential for increasing energy efficiency and financial payback can be adopted into your organisation's business objectives.
- *Third step:* Schedule a programme of work to ensure that the potential benefits identified in the opportunities for improvement will be realised. In essence, the energy-related objectives and targets that you set will be the foundation and success criteria for your organisation's EMS. Also, it is important to identify roles and responsibilities, operational controls and how progress on planned work is to be measured. This should be documented as a basic project plan, setting out who is to do what, by when, and how. Remember to include anyone working for, or on behalf of, the organisation whose activities have an impact on your energy usage.

2. Implementing your EMS: (Do)

Next, you implement your plan of work to realise the identified objectives and opportunities for improved energy efficiency. The implementation phase of the management system should be coupled with planned interim reviews of the work completed against the identified objectives or plans.

This process will help your organisation to ensure that the programme is successfully implemented and that progress towards the stated objectives is successfully tracked. It will also ensure that any difficulties encountered in the plan can be overcome as they arise.

3. Checking your EMS: (Check/Act)

You need to monitor and measure the progress made in performance against the energy objectives and the requirements of the management system. This will ensure that the system is working as intended and that unnecessary or wasteful energy usage is identified as soon as possible. Such monitoring and measurement activities may include:

- analysis of utility bill information
- sub-metering of significant energy-using processes
- factors affecting usage
- setting and reviewing organisation-specific performance indicators
- internal and external audits
- compliance with relevant obligations (legal and other)
- corrective and preventive action processes

All these monitoring activities can be used to determine the effectiveness of the management system. The results of the monitoring will not only provide evidence that the plan for improved energy efficiency is being achieved; this information can also be used as baseline data for identifying new objectives and opportunities for improvement, ensuring that improvement is made continually.

4. Review and act: (Check/Act)

The standard requires that top management review the EMS at planned intervals. The purpose of this is to ensure continual improvement of the system and to ensure that the system, plans, programmes and personnel all operate in line with policy. This is not a checkbox exercise, but rather a critical analysis of the system to see if it is delivering the results expected. It is also a call to action for agreeing new or revised targets and objectives and allocation of resources, or for assessing the potential impact of any business changes on the EMS.

It can be helpful to compile a summary of all the activities in, and results from operating, the EMS. This can be compiled as a statement of performance against your organisation's goals and objectives. The performance statement is ideally a summary of your organisation's energy performance, the tasks conducted, and the lessons learned.

The senior management team can use the performance statement as a means of assessing the progress achieved to date and schedule new or updated objectives and targets for the future.

Structure of this guide

This Implementation Guide complements existing publications. Material already published is not duplicated, but referenced.

The chapters are aligned with the various sections of the standard (see *Table 1*).

Table 1: The I.S. EN 160001 sections and the corresponding chapters in this guide

Chapter	Title	I.S. EN 16001 section
1	Energy policy	3.1; 3.2
2	Planning	3.3
3	Implementation and operation	3.4
4	Checking	3.5
5	Review of the EMS by top management	3.6

You should use both I.S. EN 16001 and the I.S. EN 16001 Technical Guideline document as support tools when using this implementation guide.

You may also find it useful to read the *Internal Auditor's Guide* published by SEI or to attend the EMS training courses available from SEI (see website: www.sei.ie).

Development of the guide

This guide was developed by I.S. EN 16001 practitioners and informed by both individuals and organisations who have implemented, become certified to and are maintaining energy-management systems conforming to the standard.

Chapter 1: Energy Policy

Senior management commitment

The commitment of the senior management team is essential to achieving increased energy efficiency in your organisation and should be documented in an Energy Policy.

The Energy Policy is a one-page document that clearly and explicitly states the management team's commitment to:

- Continually improve energy efficiency
- Establish a framework for setting and reviewing objectives and targets
- Comply with all applicable requirements, either legal or agreed to by the organisation, with respect to energy aspects
- Investigate renewable and alternative sources of energy
- Communicate the Energy Policy to all employees and subcontractors, and interested parties
- Make the policy available to the public

The Energy Policy should also define the scope and boundaries of the EMS, and state that the management team will provide all necessary information and resources to successfully implement and maintain the EMS.

Senior management should sign the policy to display their commitment to the EMS.

Many organisations set out their policy as a first step in implementing I.S. EN 16001. However, once the organisation knows its energy aspects, legal and best-practice obligations and current opportunities for improvement, it should review the policy.

The management team should review the policy as part of its review of the EMS.

Reference:

General Requirements and Energy Policy – I.S. EN 16001:2009 Sections 3.1, 3.2 and Annex A.2

Chapter 2: Planning

Introduction

Why plan for improved energy efficiency?

PLANNING to improve energy efficiency helps your organisation to establish relevant objectives and the processes necessary to deliver the desired reductions in energy usage. It also enables you to identify and prioritise activities or areas where there is potential to improve your energy efficiency.

The planning section of I.S. EN 16001 requires organisations to:

- Consider their current energy usage and the factors affecting it
- Clarify what is significant
- Identify where improvements can be made

The organisation can then establish a plan of work to achieve the identified energy savings and ensure ongoing improvement in energy performance.

This planning process helps you to identify relevant objective data so as to develop systems and processes to continually improve your energy performance, as committed to by top management in the Energy Policy (see Chapter 1).

How do you plan for energy efficiency?

You begin by assessing and understanding your current energy position. This is achieved by identifying your past and present energy usage. The standard recommends that, in this process, trends in energy usage over previous years be analysed.

Your current energy-usage position will form a baseline against which subsequent improvement measures and energy-saving activities achieved by your EMS can be measured.

The standard requires a step-by-step approach for assessing your current energy position:

- (1) Identify past and present energy usage and the factors affecting it – using measurement or other data
- (2) Identify the areas of significant energy usage
- (3) Estimate future energy usage
- (4) Identify and prioritise opportunities for improving efficiency
- (5) Identify all personnel whose actions may/can have a significant impact on energy usage

I.S. EN 16001 refers to *energy aspects* and *significant energy aspects*. As outlined in the standard's definitions section, aspects are simply an element of an organisation's activities, goods or services that can affect energy usage. An aspect may be deemed significant if it accounts for a high proportion of total energy usage and has a potential for:

- (a) more efficient energy use or a high potential for achieving energy savings
- (b) increased use of embedded renewable energy
- (c) increased energy exchange with the rest of society

Note

The definition of 'aspects' used in I.S. EN 16001 is flexible in order to allow an organisation to define the significant energy aspects for its own particular circumstances. However, it is essential to substantiate why a particular aspect is significant.

The process by which steps 1-5 outlined above are to be achieved should be a defined process that occurs at predetermined intervals. It is recommended that this process be documented so that it is transparent and repeatable. This will allow your organisation to apply the same process to subsequent reviews of new facilities, products, services, processes and staff as they are introduced into the EMS. It also makes self-auditing the process easier once the system is established.

Assessing the current situation

Step 1: Identify your past and present energy usage

The aim of this exercise is to identify energy usage and the factors driving it. To assess your current energy-usage position, you need to:

- a) Identify all energy inputs in your organisation (electricity, gas, oil, etc) and chart usage over a period of at least three years to form the baseline data. Meter and sub-meter readings, fuel bills, etc, should also be used where available.
- b) Accumulate this data to identify specific trends or changes to your organisation's energy usage. Also, consider *when* the energy use took place, including shift-patterns, night usage and seasonal variations. These identified trends should form the basis for setting targets and reviewing the organisation's performance against existing targets.
- c) Calculate or estimate the proportion where the final usage of energy took place; lighting, heating, air conditioning, production processing, specific machinery or specific departments as applicable.
- d) Where there is no information on where the energy was ultimately used, conduct a survey of energy-using equipment/processes. This should identify the type and number of pieces of equipment in use, and the equipment nameplate data, with actual or estimated hours-of-use readings.

While nameplate data is rarely accurate, it may be used in the worst case where there is no other means of identifying data.

Here is a practical example of how to estimate the typical energy usage of equipment using basic run-time information as well as nameplate data. This technique can be used in a site-wide survey of energy-using equipment:

EXAMPLE

A particular production line has six 2KW motors, in use for 8 hours per day. The production line operates on average 5 days per week, for 48 weeks in the year.

$$6 \text{ motors} \times 5 \text{ days} \times 8 \text{ hours} = 240 \text{ hours of operation per week}$$

$$240 \text{ hours of weekly use} \times 48 \text{ weeks per annum} = 11,520 \text{ run hours per annum}$$

$$11,520 \text{ hours per annum} \times 2\text{KW} = 23,140\text{KWh or } 23.14\text{MWh per annum}$$

$$23,140\text{KWh} \times \text{€}0.125 \text{ per KWh (the current ESB cost of 1KWh of electricity)} = \text{€}2892.50 \text{ per annum}$$

Therefore, this 23.14MWh of annual electrical energy requirement for the six 2KW electric motors can be compared as a proportion of the organisation's actual total energy usage for the year.

Basic calculations such as this could be used for all your organisation's energy-using equipment.

This information can be used to compare your organisation's actual energy requirement to the overall energy requirement. The contribution of each piece of energy-using equipment can be compared to your organisation's overall energy use for a chosen period. This type of analysis can help you to identify the energy aspects or users.

An analysis of utility-bill and usage data should also be undertaken at this time to determine if your organisation is on the correct billing tariff. The SEI Energy Map guidance document, *How to understand your bills* (Step 6 Guide 1), will help you to do this.

When assessing the current energy usage, the following data sources may be used:

- past utility bills, (electricity, gas, oil, or other)
- electrical MRPN data
- online energy-usage information from power and utility companies
- production data
- people who significantly affect energy use

For analysing the data collected, the following analytical tools may be used:

- annualised trends
- correlation and regression analysis
- Cusum analysis
- weather for heating loads using degree-day calculations
- Sankey diagrams
- statistical analysis
- energy audit(s)
- benchmarking

Assessing the current situation

How do you plan for energy efficiency?

Step 2: Identify your areas of significant usage

After your initial assessment of past and present energy usage, you should identify the energy aspects of your organisation by analysing their affect on energy usage as they are used to deliver your organisation's activities, products or services. These aspects can generally be categorised by:

- fuel/power source
- electrical, thermal or transport processes
- departments or locations within an organisation

After you have identified your energy aspects, you should review these aspects. The purpose of this is to identify the various energy-using equipment and processes as well as the proportion and type of energy they use. Fully understanding your energy usage is crucial for successful implementation.

Fundamental questions to ask when identifying and reviewing your energy aspects include:

Where are you using the energy?

What is/are the factor(s) driving this energy usage?

Do I understand the potential for energy reduction?

Do I know how people affect usage and how best to control this?

Should it cost me less?

EXAMPLE

Q. What energy inputs are used in your organisation?

A. Electricity, heating oil, natural gas, wood, transport fuels, others

Q. Where is each of these power sources/resources used?

A. (using electricity as an example)

- lighting: in the office, stores, yard and workshops
- air conditioning: in the offices and stores
- compressed air in the workshops
- running of production line
- heating, storage heaters in workshop, etc

Organisations often find it beneficial to define their energy aspects as particular buildings, departments, process or locations as opposed to having all energy data mixed in with other high-energy-using processes. The latter method can cause great difficulty in identifying the actual energy use of specific equipment or processes. The only real and practicable solution to this problem is to install a sub-metering system on the applicable energy source. This greatly aids the identification of the specific energy use of the various energy-using processes in an organisation.

Once you have obtained data to help you understand your energy aspects, you can identify which aspects are significant. As explained earlier, a significant aspect accounts for a high proportion of an organisation's total energy usage, and there is potential for increased use of embedded renewable

energy or energy exchange with the rest of society. It is also perfectly acceptable to identify a significant aspect as an area where a substantial energy saving can be made.

The precise methodology for identifying which energy aspects are significant is completely at your or your organisation's discretion, provided that you outline *how* they were identified and *why* they are judged to be significant.

A useful starting point is to identify which energy aspects:

- Use the highest proportion of energy
- Determine your core energy requirement
- Offer the greatest potential for improvement

Several organisations are using Pareto analysis or the 80%/20% rule when identifying significant energy aspects. Other organisations link them to the register of opportunities and identify as their significant aspects those projects where the greatest energy reduction and financial payback are achievable.

Organisations may also consider identifying as significant aspects:

- the installation of onsite renewable-energy production technologies to supply energy to their embedded process
- the reusing of waste heat and steam for other processes
- the exporting of excess renewable energy, waste heat or steam to users outside the organisation

Assessing the current situation

How do you plan for improved energy performance?

Step 3: Identify opportunities for improvement

The review of past and present energy use (Step 1) along with the identification of significant energy aspects (Step 2) will help identify opportunities for improvement. Next, based on the data and analysis carried out to date, you should conduct a study to determine opportunities for reducing energy usage by using either low-cost inspection and operational control activities or by improving or upgrading existing equipment.

All the identified opportunities for improving energy performance should be assessed to determine:

- the potential energy reduction
- the financial payback
- their practicality
- their relevance to legal requirements
- the timeframe to implement

The identified opportunities for improvement must be ranked in order of greatest benefit. The most promising and achievable opportunities should form the core of the objectives and targets adopted by your organisation.

Your existing energy-improvement projects should also be adopted as objectives. In many cases the greatest energy-improvement programmes come from low-cost control and housekeeping measures such as turning off equipment when not in use.

The thought process which should be followed when identifying opportunities for improvement is as follows:

- Can the energy usage be broken down into different areas of responsibility in the organisation – stores, offices, workshops, etc?
 - If so, where are the areas of greatest energy usage?
- Can energy usage be determined for hours outside operational hours?
 - If so, is this energy usage necessary?
- Can energy usage outside the hours of operations be reduced?
- If energy usage can be reduced, how can these energy reductions be realised?
- How much energy can be saved?
- What are the financial payback and benefits?
- Do the financial benefits outweigh the cost of this project?

Your organisation needs to create a documented register of these opportunities and update this on a predefined basis; however, applying a continuous-improvement methodology will enable opportunities for improvement to be identified and assessed as they arise.

Note:

As you assess your situation and identify opportunities, you may find improvements or savings that can be made very easily and at small cost. Naturally, you should make these 'low-hanging fruit' changes immediately.

Assessing the current situation

How do you plan for improved energy efficiency?

Step 4: Predicting future energy usage

Once you have identified past and present energy usage, identified your energy aspects and the significant areas, and developed the prioritised list of opportunities for improvement, your organisation will be in a position to predict its future energy requirements based on forecasted, production/sales and other data. The predicted energy use should also reflect the various levels of implementation of the identified opportunities for improvement.

The energy standard requires that this predicted energy use be communicated to top management at the management review meetings. They can consider this information when developing the energy objectives and allocating resources to the system.

Assessing the current situation

How do you plan for improved energy efficiency?

Step 5: Identify personnel who have a significant impact on energy usage

The roles and responsibilities of all individuals with respect to energy usage must be clearly defined and documented. This includes those who have either a direct or an indirect effect on energy usage, such as staff involved in operating processes and equipment, technical staff involved in maintenance or design engineers responsible for new processes or facilities.

You may find it helpful to identify and rank the job roles in your organisation according to the level of impact on energy usage. This will help you to prioritise your training and awareness activities.

Identification and the communication of the roles and responsibilities of these personnel can help identify specific opportunities for improvement and programmes for the future.

The activities of staff who can have a direct effect on energy usage can be regarded as 'significant staff'. It is critical to the success of any EMS that these staff are aware of their 'energy roles and responsibilities' and buy into the concept of increasing efficiency and reducing usage. Invariably, these significant staff will possess knowledge about several processes as well as know-how on overcoming difficulties as they arise.

Some practical ways to ensure staff awareness are:

- Train staff on the purpose of the EMS
- Train staff on the objectives of the EMS
- Provide energy-awareness training on their roles and responsibilities for carrying out the various energy-saving tasks and procedures activities
- Form and train specific energy teams or energy committees
- Consult with staff on improvements to processes, duties or responsibilities
- Train staff on their roles and responsibilities within the EMS
- Monitor adherence to procedures and ensure the planned activities are acknowledged, understood and implemented

How will you know when the Review of Energy Aspects is complete?

- You will understand how and why energy is used in your organisation
- You will know where up to 80% of your energy is actually being used
- You will understand the areas of significant energy usage
- You will know what the impact of people and their roles is on your energy usage
- You will know what you need to know in order to set your objectives and targets
- You will know what you do not know (helping you to understand where to conduct further investigation as part of your energy-management programme).

References:

Identification and review of energy aspects – I.S. EN 16001:2009 Section 3.3.1 and Annex A.3.1; Technical Guideline, section 3.3.1

Assessing the current situation

Step 6: Identify and evaluate legal obligations and other requirements

One of the important clauses of I.S. EN 16001 is that organisations ensure they comply with all energy-related legislation and other requirements which are applicable to their energy aspects, such as:

- national legal requirements
- emission trading requirements
- product energy-efficiency requirements
- emission trading requirements
- non-regulatory guidelines
- voluntary agreements and codes of practice

It is recommended that you initially consider these legal and other requirements when first identifying your energy aspects (see preceding section) and record a preliminary list for further evaluation. The process by which you do this should be defined and include how:

- You communicate this information
- You stay up to date on the development of relevant requirements
- You update your documented list of requirements

The process by which you identify and evaluate legal compliance must be clear and include a description of how compliance is assessed and identify who is responsible for monitoring, reviewing and ensuring compliance. It is critical to keep records of the periodic evaluations of compliance.

Information on what legal and other requirements are applicable to your organisation's energy aspects can be obtained from several sources, such as in-house compliance/legal departments, state websites, consultants, professional bodies and various regulatory bodies.

Useful websites with information on legal and other requirements:

Sustainable Energy Ireland: www.sei.ie

Environmental Protection Agency: www.epa.ie

The Irish Statute Book: www.irishstatutebook.ie

Enterprise Ireland: www.envirocentre.ie

The most practical way that your organisation can evaluate its compliance with legal and other requirements is to:

- a) Gather the information you have accumulated when determining which legislation is applicable to your organisation, as well as any energy agreements to which your organisation subscribes
- b) Perform a check on the controls that your organisation has in place to ensure that the requirement is being adhered to in practice
- c) If you find that the controls to ensure compliance are not in place or that they are not being followed as required by legislation, a *corrective or preventive action* should be raised to address the problem.
- d) Should a lengthy period of time be required to address the problem, your organisation may consider it more practical to address the legal non-compliance within the organisation objectives and targets programme.

Note:

Remember, your objective should be to understand your obligations, not to become an expert on the legislation or other requirements.

References:

Legal obligations and requirements – I.S. EN 16001:2009 Sections 3.3.2 & 3.5.2, Annex A Section A.3.2 & A.5.2

Setting goals and targets

Energy objectives, targets and programme(s)

I.S. EN 16001 requires organisations to identify and document objectives and targets for improving energy efficiency at relevant operating levels. The goals and targets you set are the mechanism for transforming your energy policy into action. Your objectives should address both organisation-wide and specific energy issues relevant to different levels within your organisation.

Targets should be ambitious yet realistic, and have clearly defined success criteria. By being ambitious, you drive your organisation to improve. You can confirm targets are realistic by comparing them with best-available techniques (BAT).

It is important that you set targets for all significant aspects. They can be specific to equipment (motors, boilers and chillers), processes (production, transportation) and departments.

The results of the studies you have completed to date should be used in setting energy objectives. Such studies include:

- The Significant Energy Aspects
- Register of Opportunities for Improvement
- Legal Obligations and Other Requirements

Ideally, each objective will contain parts of one or more of these three studies. The objectives should be focused on maximising the energy performance of your organisation.

Other items you may consider when setting objectives may include:

- the current business conditions and objectives (eg, your organisation may already have a top-level target)
- financial options (eg, cap-ex limitations or return on investment criteria that must be met)
- technological options available (is there an energy-efficient alternative?)

The objectives must be documented and SMART – **S**pecific, **M**easurable, **A**chievable, **R**ealistic and **T**arget-driven. A time-frame for completion must be set.

Measuring achievement of objectives

To measure achievement of these objectives you should consider what energy performance indicators (EPis) to set for each. These controllable, simple, identified parameters will tell you if the system is working as intended. They may be based on the complex data you have gathered, but should be simple enough to let you see instantly if they are within the acceptable range.

They should be easily manageable and understandable, so try to avoid having large quantities of EPIs in your system.

It is important that the company's performance against the stated energy objectives is reviewed on a predetermined basis.

Note:

An energy performance indicator (EPI) is an organisation-specific metric quantifying the amount of energy used per normalised unit of output or other appropriate variable, or a ratio chosen by the organisation to monitor energy performance.

Energy-management programmes

To efficiently achieve your energy objectives and targets, a programme of work to achieve them should be documented. Responsibilities and target dates for achieving these tasks or programmes should also be documented.

Progress towards achieving each of the planned programmes of work should be monitored, reported on and discussed by management on a regular basis. This will help to identify any difficulties in achieving your objectives and allow you to seek assistance from top management (whose commitment is stated in the Energy Policy!) to address any difficulties as they occur. It also ensures that the energy-management programme is aligned with the organisation's overall business plans.

Reference

Energy objectives, targets and programme(s) – I.S. EN 16001:2009 Section 3.3.3 and Annex A.3.3;
Technical Guideline Section 3.3.3 and Annex A Table A.1

Chapter 3: Implementation and Operation

Resources, roles, responsibility and authority

THE successful implementation of an energy-management system will require the commitment and effort of all staff at every level of your organisation.

In the planning phase of implementation (Chapter 2) you will have identified the people who have both a direct and indirect effect on energy usage within your organisation.

To identify the energy roles and responsibility of all staff, you should start with your organisation chart which outlines your organisational and reporting structures – from directors to the CEO, middle management, supervisors, production operators, maintenance staff and security staff.

Remember also to consider any contractors or third parties engaged by your organisation who may have a direct or indirect effect on your energy usage.

For each of the job titles that you have identified, list the roles and responsibilities in terms of the EMS, starting with the top level of management and working through the rest of your organisation.

EXAMPLE:

The Roles and Responsibilities of Organisation Directors will be as follows:

- Establish the Energy Policy
- Designate an Energy Management Representative and members of the Energy Committee
- Ensure adequate resources are available for the EMS to be implemented and maintained

The Energy Management Representative and Energy Committee will be responsible for:

- Ensuring that the EMS is implemented and maintained
- Reporting on the performance of the system at the management review
- Providing recommendations for improvement at the management review

Production Staff will be responsible for:

- Adhering to the energy-efficiency sections of the applicable standard operating procedures
- Turning off machinery and air lines at scheduled breaks and at the end of each shift
- Ensuring all factory doors are kept closed

When documenting energy roles and responsibilities, it is important to define clearly who has authority for which aspects. This will avoid any conflict or misunderstanding between, for example, production and maintenance.

Reference:

Resources, roles, responsibility and authority – I.S. EN 16001:2009 Section 3.4.1 and Annex A.4.1

Awareness, training and competence

All staff in your organisation should be trained in the energy roles and responsibilities associated with their work. This training can be supported by developing an energy-awareness program. Such a programme of training should include information about:

- the organisation's energy policy
- the aim of the organisation's energy objectives and targets
- the progress of the organisation's energy programmes
- the roles and responsibilities of staff in achieving these objectives and their impact on energy usage
- an outline of the procedures for which the employees have direct responsibility
- the consequences of not following these procedures, both for themselves and for the organisation as a whole

I.S. EN 16001 specifically requires organisations to ensure that each level of management is informed and appropriately trained in the field of energy management. The purpose of this training is to ensure that the management team have sufficient understanding of energy management to establish pertinent objectives and targets and to choose the appropriate energy-management methodologies and tools.

The energy standard also specifically requires that the designated EMS representative is appropriately competent and qualified in energy and energy-efficiency improvements.

The organisation is also required to identify the training needs and competency of all staff.

The most common and practical method of meeting these requirements is to construct a training matrix on a spreadsheet or other such application. This matrix will specify:

- the name, role and all required training needs and competencies of all individuals
- the training conducted to date
- the date when refresher or ongoing training is required

Your organisation must keep records of all energy training.

Reference:

Awareness, training and competence – I.S. EN 16001:2009 Section 3.4.2 and Annex A.4.2

Communication

The standard requires that a process be developed to manage effective communication within your organisation to ensure the commitment of employees to the organisation's energy policy and that they are motivated to contribute to achieving the energy objectives and targets.

To fulfil the requirements of the standard, you will need to specify who is responsible for communicating which aspects of the EMS and the communication method that is to be used.

Communication methods you may wish to consider using include:

- organisation intranet sites
- emails and bulletins

- staff noticeboards, staff magazines, energy displays
- periodic communication meetings, seminars and toolbox talks
- awareness days and campaigns

These communication methods can be used for providing information on:

- the performance of the EMS, the energy performance of the organisation and the financial benefits achieved
- progress on achieving the objectives, targets and programmes
- contact points for information

Communication should be seen as a 360° activity. All employees should be encouraged to contribute comments and suggest improvements to the EMS.

SEI publishes a wide range of support tools, planners and templates to facilitate energy awareness and communication. For more information, visit the SEI website at:

http://www.sei.ie/EnergyMap/Energy_Awareness/

External communications

As part of I.S. EN 16001, the organisation is required to decide whether to communicate externally about its EMS and energy performance. If it intends to do so, you should develop, document and use a communication plan. The external communication plan should detail:

- Who is responsible for communicating the information on the EMS and performance
- What information is communicated
- The means of communication used
- Where and how the records of the communication are retained

Remember that your organisation may be required to communicate externally (regarding its EMS or performance) as a result of a legal requirement (eg, under IPPC licensing) or as part of an external agreement (eg, with SEI).

Records of all communications should be retained.

Reference:

Communication – I.S. EN 16001:2009 Section 3.4.3

EMS documentation

A certain amount of documentation is required to describe how the management system is constructed. For example, documentation is required in order to define, substantiate and record the relevant energy aspects or the roles and responsibilities relating to the management system. Documentation does not need to be hard copy and can be kept in electronic form. In all cases, documentation should be kept to the minimum required but be sufficient to ensure effective operation of the management system. The following are typical documentation elements of an I.S. EN 16001 system.

EMS Manual

A manual or similar top-level document is often used as a road map to identify, describe and explain the interaction of the core areas of your EMS. This may also be shown in diagrammatic form, such as a process flow chart.

This document should reference or provide direction to all your EMS documents or documented processes/registers, including technical documentation.

Documents

All management systems use various procedures, process diagrams or other media to outline the required steps to explain and give guidance to personnel on how to conduct a set of tasks deemed crucial to the continued successful operation of the system. A number of documents are required by I.S. EN 16001. However, if it is decided to include additional documents to meet your organisation's energy objectives and targets, by all means document the process as part of your management system.

Remember, a procedure is a specified way of doing something and can be as simple as a process map or flow chart.

Items required to be documented by I.S. EN 16001 include:

- Energy policy
- Review and identification of energy aspects
- Register of opportunities
- Roles, responsibilities and authorities for energy management
- Legal obligations and other requirements
- Evaluation of compliance with legal obligations and other requirements
- Awareness training and competence needs
- Communication plans
- Document control procedure
- Non-conformities, corrective and preventive actions
- Internal audit reports and schedules
- Activity-specific operational controls (eg, work instructions, procedures)
- Monitoring and measurement activities, including metering plan(s)
- Management reviews

All documents in your management system should follow the same template to ensure ease of use and identification, traceability and retrievability. This can be accomplished with document and/or record lists. You should at a minimum include the following in your process documents and/or procedures:

- the originator of the document
- name or title of the document
- revision version and date
- document approval identification, usually a signature
- short explanation of the purpose of the process
- identification of the persons responsible for carrying out the process
- a description of how the process is to be followed
- a reference section for the documents, records, and monitoring activities associated with the process

- a contact person for clarifications or interpretation of the document

Correct identification of the EMS documents is crucial to ensure that the most up-to-date documents are in use, they can be easily located and all obsolete documents are removed from the point of issue.

Reference:

Energy Management System Documentation – I.S. EN 16001:2009 Section 3.4.4 and Annex A.4.4
Control of documents – I.S. EN 16001:2009 Section 3.4.5 and Annex A.4.5 and Annex A.4.5
Control of records – I.S. EN 16001:2009 Section 3.5.4 and Annex A.5.4

Operational control

The level of operational control required varies from organisation to organisation. I.S. EN 16001 requires that your organisation identifies and establishes operational processes to control activities that, if not controlled, might lead to deviations from the energy policy or from specific energy objectives and targets.

Operations associated with significant aspects should be a priority and should be managed in their totality (eg, operation, maintenance, raw-material selection, design, procurement of plant, etc).

Examples of operational controls include energy-efficient design criteria or purchasing procedures that include energy ratings; preventive maintenance programmes focused on energy efficiency, and process controls to limit energy-inefficient operation of processes.

The energy standard requires that, when purchasing energy-using equipment, raw materials or services that may have a significant impact on total energy usage, the organisation should inform suppliers that purchasing is partly evaluated on the basis of energy efficiency. Therefore, your organisation should establish and implemented within its purchasing policies a method of assessing the energy performance of potentially significant energy-using equipment, raw materials or services, along with other issues such as quality, cost, lead time, warranty, etc.

Operational controls must be communicated internally and externally so that employees, contractors, consultants, suppliers, designers, architects and anyone else who could have an impact on energy efficiency are made fully aware of the controls and requirements in place.

The standard also requires that potential energy usage be evaluated when considering the design, change or restoration of all assets, ie, buildings or plant that might significantly affect energy usage. This requirement is put in place to ensure that those adhering to the standard can identify and plan for future enhanced energy performance when designing and planning new buildings, facilities and processes.

Operational controls are a function of individual organisations. Table A.1 of the I.S. EN 16001:2009 Technical Guideline provides examples of energy aspects and associated objectives, targets, programmes, indicators, operational control and monitoring and measurement arrangements.

Reference:

Operational Control – I.S. EN 16001:2009 Section 3.4.6 and Annex A.4.6; Technical Guideline, Table A.1

Chapter 4: Checking and Corrective Action

Monitoring & measurement

MONITORING and measuring energy performance (as emphasised earlier in this guide) is critical to the successful implementation and operation of an I.S. EN 16001 management system.

Such monitoring and measurement includes indicators of both a technical and systems nature, including:

- energy usage and related factors
- actual versus predicted usage
- performance indicators

The standard requires organisations to, wherever possible, compare their energy performance indicators against similar organisations or situations, provided the operations and/or energy factors are sufficiently similar. This comparison can be established totally within your own company or, if practicable, with an external organisation.

The management system documentation should detail what monitoring and measurement activities are in place, including:

- How usage (including significant areas) is measured and recorded
- The roles and responsibilities of personnel involved
- How usage is related to the factors being monitored
- The required frequency of the monitoring activity

Note:

The relationship between factors and usage should be re-examined periodically so as to ensure that usage is always measured against best achievable performance. It is most practical for this process to be linked directly to the continual review of energy aspects.

Should monitoring and measurement results identify a significant deviation from the predicted energy usage, the organisation is required to retain records of these unexpected results, their causes and remedies. These incidents may hold information critical for the successful implementation of an energy objective or a new opportunity for improvement.

It is accepted that in many organisations the level of metering may not be sufficient. I.S. EN 16001 thus requires that an energy metering plan be implemented by the organisation. When constructing this plan, you should assess the costs of implementing and maintaining the metering against the value of the expected improvements that the metering activity will provide.

When determining the accuracy of your current/planned metering system you can simply ensure that the meters in place are calibrated as required, or you could consider conducting a simple risk analysis:

- How will I know my KPIs/EPs and critical parameters are being monitored?
- How can I know if these meters are accurate?
- What are the critical instruments being used?
- Can the instrument have a significant effect on energy usage/energy monitoring results if it goes out of calibration?
- What is the likelihood of the critical instrument going out of calibration?

- Is it possible to ascertain the accuracy of meters using data provided from other meters and including utility bill information?

You can then determine which instruments should have the most frequent maintenance and calibration routine. The records of the metering system calibration or accuracy analysis should be retained; this is required by the standard.

Reference:

Monitoring and measuring – I.S. EN 16001:2009 Section 3.5.1 and Annex A.5.1; Technical Guideline Table A.1

Internal audits

An internal audit of an EMS is an independent, systematic review of part or all of an organisation's EMS. The purpose of the audit is to determine if the plans, activities and procedures described in the system are being conducted in the manner which the management system requires, for example:

- Are the expected targets being achieved?
- Are the plans and controls established by the organisation being followed?
- Is it realistic to suggest that the organisation's procedures and plans will achieve the stated objectives of the EMS?

In your Internal audit process you should describe the following:

- The audit schedule to ensure that all sections of I.S. EN 16001 standard are audited annually
- How areas that contribute most to significant energy usage should be audited more frequently
- The competence requirements for internal auditors
- How audits scopes and objectives are agreed
- How audit findings are recorded, reported and addressed
- How the required corrective action is managed during subsequent audits
- The person(s) responsible for ensuring that follow-up actions are taken without undue delay to eliminate detected non-conformities and their causes
- How verification of the actions taken to address issues were raised in the audit process and the reporting of verification results

The process for internal audits can easily be integrated with other existing management system audit processes.

Reference:

Internal audits of the energy management system – I.S. EN 16001:2009 Section 3.5.5 and Annex A.2
I.S. EN 16001:2009 Internal Auditor's Guide – SEI, 2009

Non-conformity, corrective action and preventive action

A non-conformance can be defined as failure to fulfil a specific requirement. Deviations from specific targets may not necessarily be a non-conformance, but they usually warrant investigation when the deviation is outside existing/planned norms.

For example, a dairy plans to reduce the amount of water required to process 1l of milk from 10l to 8l. It sets this target and monitors fluctuations from it, setting a lower alarm level of 7l:1l water to milk and an upper alarm level of 12l:1l water to milk. It knows from its operational history that these alarm levels represent normal fluctuation related to milk quality and ambient temperature. It is only when the upper or lower limit is breached that a non-conformance is raised. Variations in between are subject to routine investigation.

The corrective and preventive-action process is a means by which you can correct any deviations from the requirements of your EMS, to ensure it meets the requirements of I.S. EN 16001 as well as the commitment to continual improvement in your organisation's energy policy.

Issues that need to be raised in the corrective and preventive-action process can be identified from several sources in your EMS, including:

- results of internal and external audits
- results of evaluations of compliance reviews
- failures to reach specified targets in monitoring and measurement processes
- failures to comply with operational control procedures, as identified in site inspections
- failures to meet target dates relating to the energy management programmes

In the next section of this guide, you will see that you will need to provide at the management review an analysis of the status of corrective and preventive actions. Therefore, you will need to manage these actions to ensure easily accessible data for this reporting process. This is how the corrective and preventive-action process can be managed:

- List each action by source – audits, inspections, evaluations of compliance, etc
- Describe the failure briefly – eg, *the office lights were left on all night, the compressor was running when not needed*
- Identify the locations at which the actions arose – eg, office, compressor room, extruder machine
- Identify the persons responsible for the area concerned – eg, security/process operator
- Identify the person responsible completing the corrective/preventive action
- Identify the agreed date to close the corrective action
- Identify the actual date the corrective action was closed
- Identify the date when the action was reviewed for closure

Reference:

Non-conformance, Corrective Action and Preventive Action – I.S. EN 16001:2009 Section 3.5.3

Chapter 5: Review of EMS by Top Management

THE management review process provides your management team with definitive data, supported by a review of the activities and performance of the management system over a given period of time. This review is also used to plan and identify any required changes to the management system, policy, objectives and targets.

The important question that should inform your management review activity is:

Are we delivering our anticipated energy-management improvements?

To answer this question, consider:

- Is the EMS suitable?
- Is the system providing adequate support in order for improvements to be made?
- Has the system been effective, and is it still effective?

The most common and effective way to conduct a management review is to accumulate all the required information into a single document or presentation. This should be issued to management before the meeting to facilitate an open and informed review of the EMS activities and performance to date.

The information needed for analysis and presentation to management includes summaries of:

- follow-up from the recommendations for improvement raised at the previous management review
- the updated review of the organisation's energy aspects
- details of the results of all internal audits of the management system
- an update on the results of the process to evaluate compliance
- analyses of the energy performance of the organisation from your monitoring and measurement activities
- predicted energy performance for the upcoming period
- the status of the objectives and programmes targets on achieving the planned energy-reduction targets
- the status of corrective and preventive actions
- an update of energy legislation changes applicable to your organisation
- identification of possible changes to the Energy Policy
- any recommendations for improvement

The output from the meeting must be recorded (keep minutes of the meeting) and include decisions made, actions agreed and any required changes to the EMS.

Reference:

Review of the EMS by top management – I.S. EN 16001:2009 Section 3.6 and Annex A.6; Technical Guideline Section 3.6

Chapter 6: Managing and Improving Your EMS

NOW that you have followed a structured and logical approach to implementing your EMS, how do you know when your management system has passed from the *implementation* phase to a point where it is ready to be *managed, maintained and improved*?

Using the checklist below will provide a snapshot of your implementation progress and help you to determine if you are ready to move to ongoing management and improvement of the system – or if there are further implementation activities that you need to undertake or review further.

If you can answer ‘yes’ to the questions in the checklist, you will know that you are at the management and improvement stage.

I.S. EN 16001:2009 EMS Implementation Checklist	
<i>Purpose: To determine if an EMS has passed the implementation stage and is ready for first-stage certification audit.</i>	Answer: Yes / No
Planning	
Is there an agreed energy policy in place?	
Have the energy aspects and significant energy aspects been identified and documented?	
Are opportunities for improving energy efficiency identified and documented?	
Are the legal and other requirements applicable to energy identified and documented?	
Has compliance with legal and other requirements applicable to energy been evaluated?	
Have the organisation’s energy objectives and targets been identified and documented?	
Have the associated energy-management programmes been established with suitable EPIs	
Implementation and operation	
Are the roles and responsibilities of everyone affecting energy use identified and documented?	
Are the people who can affect energy performance aware that the organisation is aiming to improve its energy performance and aware of their energy responsibilities?	
Have the operational controls for the significant energy aspects and objectives been identified?	
Required documentation	
Are the following processes in place? <ul style="list-style-type: none"> • Identification of energy aspects – usage and related factors • Identification and evaluation of legal and other requirements • Awareness, training, competence and communication • Document and record control • Operational control • Monitoring & measurement • Non-conformity corrective and preventive action • Internal audits 	
Are the following records in place? <ul style="list-style-type: none"> • Legal requirements and evaluations of compliance 	

<ul style="list-style-type: none"> • Monitoring measurement and calibration records • Training and communication records • Corrective and preventive actions • Management review minutes 	
Does the EMS documentation provide direction to other related documents such as: records, reports, schedules and registers?	
Checking and corrective action	
Does the monitoring documentation state what performance measurement is required?	
Is there detail of what calibration of measurement equipment is required?	
Is there an audit schedule in place?	
Have audits of the EMS taken place?	
Review	
Has a management review of the EMS been carried out?	

If you answered 'yes' to all the checklist questions, you can be confident that your system has now been implemented. You have not reached the management and improvement stage of development. You should also already be starting to see improvements in your energy performance!

To consolidate the progress made to date and to ensure that the system develops further in delivering improved energy performance, you should now consider seeking I.S. EN 16001 certification from an accredited certification body.

Gaining accredited certification will help you to maintain the momentum generated during the development and implementation stages of the management system. Organisations that have certified their energy management systems to I.S. EN 16001 have borne witness to the value of the process.

Certification will provide third-party verification that the management system is functioning correctly. It will also add the assurance that your organisation is meeting its objectives for continual improvement in energy efficiency.

What is an accredited certification body?

An accredited certification body is an organisation deemed competent to certify organisations to national and international standards. Accreditation involves the assessment by a national accreditation body of the competence of the certification body and its management system. Assessment visits to the certification body are performed in order to evaluate how its functions are performed in practice. Part of the assessment includes witnessing the certification body performing audits.

In the case of I.S. EN 16001, the Irish National Accreditation Board (INAB) provides accreditation of certification bodies. A list of accredited EMS certification bodies deemed competent to certify organisations to the standard can be obtained from:

<http://www.inab.ie/directoryofaccreditedbodies/certificationbodiesmanagementsystemscertification>

Annex A (Informative)

Table A.1 – Correspondence between I.S. EN 16001:2009 and IS 393:2005

I.S. EN 16001:2009		IS 393:2005	
Introduction		Introduction Declaration	
Scope	1	Scope	1
		Normative References	2
Terms & Definitions	2	Terms & Definitions	3
EMS Requirements (Title only)	3	EMS Requirements (Title only)	4
General Requirements	3.1	General Requirements	4.1
Energy Policy	3.2	Energy Policy	4.2
Planning	3.3	Planning	4.3
Identification and review of energy aspects	3.3.1	Review of energy aspects	4.3.1
Legal obligations and other requirements	3.3.2	Legal and other requirements	4.3.2
Energy objectives, targets and programme(s)	3.3.3	Objectives and targets Energy management programmes	4.3.3 4.3.4
Implementation and operation (Title only)	3.4	Implementation and operation (Title only)	4.4
Resources, roles, responsibility and authority	3.4.1	Structure and responsibility	4.4.1
Awareness, training and competence	3.4.2	Awareness, training and competence	4.4.2
Communication	3.4.3	Communication	4.4.3
EMS documentation	3.4.4	EMS documentation	4.4.4
Control of Documents	3.4.5	Document Control	4.4.5
Operational control	3.4.6	Operational control	4.4.6
Checking (Title only)	3.5	Checking and corrective action (Title only)	4.5
Monitoring and measurement	3.5.1	Monitoring and measurement	4.5.1
Evaluation of compliance	3.5.2	Evaluation of compliance	4.5.2
Non-conformity, corrective and preventive action	3.5.3	Non-conformity, corrective and preventive action	4.5.3
Control of records	3.5.4	Control of records	4.5.4
Internal audit of the EMS	3.5.5	Internal audit of the EMS	4.5.5
Review of the EMS by top management (Title only)	3.6	Management Review	4.6
General	3.6.1		
Inputs to management review	3.6.2		
Outputs from management review	3.6.3		

Table A.2 – Correspondence between I.S. EN 16001:2009 and ISO 14001:2004

I.S. EN 16001:2009		ISO 14001:2004	
Introduction		Introduction	
Scope	1	Scope	1
		Normative References	2
Terms & Definitions	2	Terms & Definitions	3
Energy Management System Requirements (Title only)	3	Environmental Management System Requirements (Title only)	4
General Requirements	3.1	General Requirements	4.1
Energy Policy	3.2	Environmental Policy	4.2
Planning (Title only)	3.3	Planning (Title only)	4.3
Identification and review of energy aspects	3.3.1	Environmental aspects	4.3.1
Legal obligations and other requirements	3.3.2	Legal and other requirements	4.3.2
Energy objectives, targets and programme(s)	3.3.3	Objectives, targets and programme(s)	4.3.3 4.3.4
Implementation and operation (Title only)	3.4	Implementation and operation (Title only)	4.4
Resources, roles, responsibility and authority	3.4.1	Resources, roles, responsibility and authority	4.4.1
Awareness, training and competence	3.4.2	Competence, training and awareness	4.4.2
Communication	3.4.3	Communication	4.4.3
EMS documentation	3.4.4	Documentation	4.4.4
Control of documents	3.4.5	Control of documents	4.4.5
Operational control	3.4.6	Operational control Emergency preparedness and response	4.4.6 4.4.7
Checking (Title only)	3.5	Checking and corrective action (Title only)	4.5
Monitoring and measurement	3.5.1	Monitoring and measurement	4.5.1
Evaluation of compliance	3.5.2	Evaluation of compliance	4.5.2
Non-conformity, corrective and preventive action	3.5.3	Non-conformity, corrective and preventive action	4.5.3
Control of records	3.5.4	Control of records	4.5.4
Internal audit of the EMS	3.5.5	Internal audit	4.5.5
Review of the EMS by top management (Title only)	3.6	Management Review	4.6
General	3.6.1		
Inputs to management review	3.6.2		
Outputs from management review	3.6.3		



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