The INOGATE Programme

BUILDING PARTNERSHIPS FOR ENERGY SECURITY

www.inogate.org
Motto: Energy Efficiency is interest and obligation

- it is our interest
  - to decrease our expenses

- it is our obligation
  - to protect the environment

Preserve the balance that has evolved in nature!
Conducting of energy audits according to the requirements of the Energy Efficiency Directive + ISO 50 001

Motto: Energy Efficiency is interest and obligation

INOGATE Programme
New ITS Project, Ad Hoc Expert Facility (AHEF)
Task MD -120

Slides prepared by:
Albin Zsebik, PhD, CEM
Energy Efficiency Directive - EED

AHEF.120.MD

Outline

- EU climate and energy targets
- Chapters, Articles and Annexes of the EED
- DIRECTIVE on the energy performance of buildings 2010/31/EU
- ISO 50001 - Energy Management System
EU climate and energy targets – 1.

The "20-20-20" targets

Set three key objectives for 2020:

- A 20% reduction in EU greenhouse gas emissions from 1990 levels;
- Raising the share of EU energy consumption produced from renewable resources to 20%;
- A 20% improvement in the EU's energy efficiency.
EU climate and energy targets – 2.

The 2030 framework - „40-27-27“ targets

- Reducing greenhouse gas emissions by at least 40%;
- Increasing the share of renewable energy to at least 27%;
- Increasing energy efficiency by at least 27%.
EU climate and energy targets – 3.

The aim of these targets:

These policy frameworks aims to make the European Union's economy and energy system more competitive, secure and sustainable

Intention:

A 40% energy efficiency target for 2030 would grow Europe’s economy at a rate of 4% a year, spark an annual 3.15% boost in employment and cut fossil fuel imports by €505 billion a year
CHAPTERS and Articles of the EED

The EED has 5 Chapters and 30 Articles

The Chapters:

I. SUBJECT MATTER, SCOPE, DEFINITIONS AND ENERGY EFFICIENCY TARGETS
II. EFFICIENCY IN ENERGY USE
III. EFFICIENCY IN ENERGY SUPPLY
IV. HORIZONTAL PROVISIONS
V. FINAL PROVISIONS
Some of the Articles of the EED

Article 3. Energy efficiency targets

Each Member State shall set an indicative national energy efficiency target, based on either primary or final energy consumption, primary or final energy savings, or energy intensity.

Article 4. Building renovation

Member States shall establish a long-term strategy for mobilizing investment in the renovation of the national stock of residential and commercial buildings, both public and private.
Some of the Articles of the EED

Article 5. Exemplary role of public bodies’ buildings

Each Member State shall ensure that, as from 1 January 2014, 3% of the total floor area of heated and/or cooled buildings owned and occupied by its central government is renovated each year to meet at least the minimum energy performance requirements that it has set in application.

Article 7. Energy efficiency obligation schemes

Member States shall set up an energy efficiency obligation scheme. That target shall be at least equivalent to achieving new savings each year from 1 January 2014 to 31 December 2020 of 1.5% of the annual energy sales to final customers of all energy distributors. The base line is 3 years before 2013.
Some of the Articles of the EED

Article 8. Energy audits and energy management systems

Member States shall promote the availability to all final customers of high quality energy audits which are cost-effective and:

(a) carried out in an independent manner by qualified and/or accredited experts according to qualification criteria; or

(b) implemented and supervised by independent authorities under national legislation.

The energy audits may be carried out by in-house experts.
Some of the Articles of the EED

Article 9. Metering

Member States shall ensure that, in so far as it is technically possible, financially reasonable and proportionate in relation to the potential energy savings, final customers for electricity, natural gas, district heating, district cooling and domestic hot water are provided with competitively priced individual meters that accurately reflect the final customer’s actual energy consumption and that provide information on actual time of use.
Some of the Articles of the EED

Article 10. Billing information

Where final customers do not have smart meters, Member States shall ensure, by 31 December 2014, that billing information is accurate and based on actual consumption, for all the sectors covered by this Directive, including energy distributors, distribution system operators and retail energy sales companies, where this is technically possible and economically justified.
Some of the Articles of the EED

Article 11. Cost of access to metering and billing information

Member States shall ensure that final customers receive all their bills and billing information for energy consumption free of charge and that final customers also have access to their consumption data in an appropriate way and free of charge.

The distribution of costs of billing information for the individual consumption of heating and cooling in multi-apartment and multi-purpose buildings shall be carried out on a non-profit basis.
Some of the Articles of the EED

Article 14. Promotion of efficiency in heating and cooling

By 31 December 2015, Member States shall carry out and notify to the Commission a comprehensive assessment of the potential for the application of high-efficiency cogeneration and efficient district heating and cooling,

Member States shall ensure that a cost-benefit analysis is carried out when,

(a) a new thermal electricity generation installation with a total thermal input exceeding 20 MW is planned,

(b) an existing thermal electricity generation installation with a total thermal input exceeding 20 MW is substantially refurbished,
Some of the Articles of the EED

Article 14. Promotion of efficiency in heating and cooling

(c) an industrial installation with a total thermal input exceeding 20 MW generating waste heat at a useful temperature level is planned or substantially refurbished,

(d) a new district heating and cooling network is planned or in an existing district heating or cooling network a new energy production installation with a total thermal input exceeding 20 MW is planned or an existing such installation is to be substantially refurbished, in order to assess the cost and benefits of utilizing the waste heat from nearby industrial installations.

Member States in some cases may exempt from paragraph.
What Article 14 means for Local Authorities

- Local Authorities will issue permits for installations satisfying the above definitions in the range:
  
  \[ 20 \text{ MW} \leq \text{Thermal Input} < 50 \text{ MW} \]

- Environment Agency, NRW, SEPA or NIEA will issue permits for installations satisfying the above definitions in the range:
  
  \[ \text{Thermal Input} \geq 50 \text{ MW} \]
What Article 14 means for Local Authorities

- The operator of the installation will approach the appropriate regulator (Local Authority) with their permit application.
- The regulator must decide whether the installation is exempt from the Cost Benefit Analysis (CBA) or is subject to it.

If the installation is subject to the CBA requirement, then the operator must undertake the CBA.
ANNEXES of the EED

I. GENERAL PRINCIPLES FOR THE CALCULATION OF ELECTRICITY FROM COGENERATION

II. METHODOLOGY FOR DETERMINING THE EFFICIENCY OF THE COGENERATION PROCESS

III. ENERGY EFFICIENCY REQUIREMENTS FOR PURCHASING PRODUCTS, SERVICES AND BUILDINGS BY ........

IV. CENTRAL GOVERNMENT ENERGY CONTENT OF SELECTED FUELS FOR END USE – CONVERSION TABLE
ANNEXES of the EED

V. Common methods and principles for calculating the impact of energy efficiency obligations

VI. Minimum criteria for energy audits including those carried out as part of energy management systems

VII. Minimum requirements for billing and billing information based on actual consumption

VIII. Potential for efficiency in heating and cooling
Minimum criteria for energy audits – 1.

Shall be based on the following guidelines:

- be based on up-to-date, measured, traceable operational data on energy consumption and (for electricity) load profiles;
- comprise a detailed review of the energy consumption profile of buildings or groups of buildings, industrial operations or installations, including transportation;
- build, whenever possible, on life-cycle cost analysis (LCCA) instead of Simple Payback Periods (SPP) in order to take account of long-term savings, residual values of long-term investments and discount rates;
Minimum criteria for energy audits – 2.

Shall be based on the following guidelines:

- be proportionate, and sufficiently representative to permit the drawing of a reliable picture of overall energy performance and the reliable identification of the most significant opportunities for improvement.

Energy audits shall allow detailed and validated calculations for the proposed measures so as to provide clear information on potential savings.

The data used in energy audits shall be storable for historical analysis and tracking performance.
What is a ‘nearly zero-energy building’?

A ‘nearly zero-energy building’ means:

- A building that has a very high energy performance, as determined in accordance with Annex I. (2010/31/EU directive)
- The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby;
Nearly zero-energy buildings – 1.

1. Member States shall ensure that:
   (a) by 31 December 2020, all new buildings are nearly zero-energy buildings; and
   (b) after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings.

Member States shall draw up national plans for increasing the number of nearly zero-energy buildings.

These national plans may include targets differentiated according to the category of building.
Nearly zero-energy buildings – 2.

2. Member States shall furthermore, following the leading example of the public sector, develop policies and take measures such as the setting of targets in order to stimulate the transformation of buildings that are refurbished into nearly zero-energy buildings, and inform the Commission thereof in their national plans referred to in paragraph 1.
The national plans shall include, inter alia, the following elements – 1.

(a) the Member State’s detailed application in practice of the definition of nearly zero-energy buildings, reflecting their national, regional or local conditions, and including a numerical indicator of primary energy use expressed in kWh/m² per year. Primary energy factors used for the determination of the primary energy use may be based on national or regional yearly average values and may take into account relevant European standards;
The national plans shall include, inter alia, the following elements—2.

(b) intermediate targets for improving the energy performance of new buildings, by 2015, with a view to preparing the implementation of paragraph 1;
The national plans shall include, inter alia, the following elements – 3.

(c) information on the policies and financial or other measures adopted in the context of paragraphs 1 and 2 for the promotion of nearly zero-energy buildings, including details of national requirements and measures concerning the use of energy from renewable sources in new buildings and existing buildings undergoing major renovation in the context of Article 13(4) of Directive 2009/28/EC and Articles 6 and 7 of this Directive.
For new buildings, Member States shall ensure that,

before construction starts, the technical, environmental and economic feasibility of high-efficiency alternative systems such as those listed below, if available, is considered and taken into account:

(a) decentralized energy supply systems based on energy from renewable sources;
(b) cogeneration;
(c) district or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources;
(d) heat pumps.
The energy performance of a building shall be determined

- on the basis of the calculated or actual annual energy that is consumed in order to meet the different needs associated with its typical use and
- shall reflect the heating energy needs and cooling energy needs (energy needed to avoid overheating) to maintain the envisaged temperature conditions of the building, and domestic hot water needs
The energy performance of a building shall be expressed

- in a transparent manner and
- shall include an energy performance indicator and
- a numeric indicator of primary energy use, based on primary energy factors per energy carrier, which may be based on national or regional annual weighted averages or a specific value for onsite production.

The methodology for calculating the energy performance of buildings should take into account European standards and shall be consistent with relevant Union legislation, including Directive 2009/28/EC (on the promotion of the use of energy from renewable sources).
The fundamental goal of energy management is to produce goods and provide services with the least cost and least environmental effect.

The judicious and effective use of energy to maximize profits (minimize costs) and enhance competitive positions.
EnMS - Convergence of specialties

- Increasing organizational needs for "generic management system standards"
  - ISO 9001 (quality)
  - ISO 14001 (environment)
  - ISO 50001 (energy)

- Increasing need for interconnecting facilities and accessing real-time data over the Internet

- Use of BAS data for other organizational needs such as facility management
- Increasing machine-to-machine communication

Sustainable development

Building

Standardization

Automation
Energy Management

The objective of Energy Management is:

- to achieve and maintain optimum energy procurement and utilization, throughout the organization and:
  - To minimize energy costs / waste without affecting production & quality
  - To minimize environmental effects
ISO - International Organization for Standardization

- ISO is an independent, non-governmental organization
- made up of members from the national standards bodies of 162 countries
- founded in 1947
- with Central Secretariat in Geneva, Switzerland
- ISO is the world largest standards developing organization

Source: http://www.iso.org/iso/about/discover iso_isos-name.htm
ISO - International Organization for Standardization

An acronym "ISO" was chosen deriving from the Greek isos, meaning "equal" (Whatever the country, whatever the language, the short form of the organization's name is always ISO)

ISO has published more than 19,500 International Standards - covering almost all aspects of technology and business

Source: http://www.iso.org/iso/about/discover-iso_isos-name.htm
Democratic ➔ one country – one vote
Each country is on an equal footing to influence the direction of ISO's work

Voluntary ➔ non governmental organization
ISO standards are voluntary: ISO itself does not regulate or legislate

Market-driven
ISO only develops standards for which there is a market requirement

Consensus ➔ state of the art
ISO standards are based on international consensus by requiring a periodic review of its standards at least every five years

Globally relevant ➔ are relevant everywhere
ISO standards are technical agreements which provide the framework for compatible technology worldwide
ISO - International
What is different from others

The vast majority of ISO standards are highly specific to a particular product, material, or process.

- ISO 9001 (quality),
- ISO 14001 (environment) and
- ISO 50001 (energy)

are "generic management system standards"

Source: http://www.iso.org/iso/about/discover-iso_isos-name.htm
"Generic" means that the same standard can be applied to any organization, large or small, whatever its product or service, in any sector of activity, and whether it is a business enterprise, a public administration, or a government department.

- ISO 9001 Quality Management System
- ISO 14001 Environment Management System
- ISO 50001 Energy Management System

are "Generic sets of requirements to implement"
What ISO 50001 guides you to?

- Imposes “DATA” oriented management practices, thus focuses on performances
- Defines organizations and companies to have a well-recognized framework for integrating energy efficiency into their management practices
- Properly run operational management system that promotes sustainable business development

EnMS is about business development

Produce the best quality product on account of least energy consumption
What ISO 50001 guides you to?

- Have the strong top management involvement & leadership in EnMS operation
- Have the top management to appoint a management representative from higher management level to manage cross over organization
- Encourages organizations to better utilize existing energy consuming facilities, thus reducing operational costs and/or expanding business capacity
- Have a framework to encourage suppliers and customer to better manage their energy, thus promoting energy efficiency throughout the supply chain
Why ISO 50001 EnMS is attractive?

(1) “DATA” Oriented Management System!!
Evaluation of energy “PERFORMANCE” can be measured and quantified by the “DATA”

(2) Managing with EnMS performances
EnMS performances are A + B of the following:
A. Performance of EnMS itself: standard management performance
B. Energy Performance: performance managed with data such as EnPI

(3) Practicality
Regardless of the size and type of organization, regardless of if you are subscribing to the national or local requirements, “data” and “performance” based management method can be properly blended into your operation.

Continual Improvement Process (PDCA)
Continual Improvement

Energy Management System - EnMS

Plan

Do

Check

Act

ISO 50001

Source: http://www.mindtools.com/pages/article/newPPM_89.htm
The ISO 50001

Contents

- Foreword
  - About ISO and positioning of the document
- Introduction
  - Summary of the standard in this document
- 1. Scope
  - Specifying requirements for EnMS
- 2. Normative references
  - Any references to make this document valid
- 3. Terms and definitions
  - Terms and definitions used in this document
- 4. EnMS Requirements
  - Defining the requirements of ISO 50001

Remarks

- Annex A
  - Guidance on the use of Clause 4
- Annex B
  - Comparison Table ISO 50001, ISO 9001, ISO 14001 and ISO 22000
  - Comparison Table for Key Standards of EnMS on the “Energy Review” Criteria of ISO 50001
4. EnMS Requirements
4.1 General requirements
4.2 Management responsibilities
4.3 Energy Policy
4.4 Energy Planning
4.5 Implementation and operation
4.6 Checking (performance)
4.7 Management Review

Annex A Guidance on the use of Clause 4

Strictly informative guide to ensure a proper understanding and appreciation of the contents in Clause 4
EnMS Requirements

Responsibility of top management
Energy policy
Management representative
Energy review
Objectives and action plans

Implementation and realization
Communication
Training
Awareness
Operational control

Plan
Do
Act
Check

Management review
New strategic goals
Optimization

Monitoring
Analysis
Corrective action
Preventive action
Internal audit

Continual improvement cycle
Conceptual Flow of EnMS

Continual improvement

Energy policy

Planning

Implementation and operation

Checking

Management review

Internal audit of the EnMS

Monitoring, measurement and analysis

Nonconformities, correction, corrective and Preventive actions

Source: ISO 50001
What is “ISO 50001 Compliance”

Establish guideline and provisions for EnMS operation
Clause 4, Sub-clause 4.1 - 4.3

Operate business under the established EnMS following ISO 50001
Clause 4, Sub-clause 4.4 & 4.5

Verify if you operate business under established EnMS in conformance to ISO 50001
Clause 4, Sub-clause 4.6

Report the result of verification at Management review
Clause 4, Sub-clause 4.7

Verification is done by actual result written in reports and records as evidences against written guidelines and provisions, procedures and plans

Therefore, documentation is the most important aspect to consider when one seeks efficient operation of EnMS compatible to ISO 50001
Clause 4. EnMS requirements
4.1 General requirements

Establish

Define
Scope and Boundaries

Determine
How it will meet the requirements
To achieve continual improvement of energy performance

Implement

Maintain

Document
4.2 Management Role

4.2.1 Top management commitment

- Define, establish and implement Energy Policy
- Identify scope and boundaries
- Energy Policy
- Scope & Boundary
- Planning initiative
- Provide resources
- EnMS Champion
- Disseminate EnMS
- Management Review
- Provide resources - HR, Skills, technology and finance
- Appoint a Management Representative
Requirements & Interpretation

4.2 Management Role

4.2.1 Top management commitment

- Provide resources
- Disseminate EnMS
- Planning initiative
- Energy Policy
- Consider En performance in a short and a long term planning – based on the Energy Audit

- EnMS Champion
- Disseminate EnMS
- Communicate importance of EnMS
- Management Review

Ensure results measured and reported at determined intervals
4.2 Management Role

4.2.2 Management representative

- Define and communicate responsibilities and authorities
- Identify support members of EnM team
- Define criteria for an effective EnMS
- Promote awareness of EnMS
- Identify support members of EnM team
- Define and communicate responsibilities and authorities

- Appoints & authorizes
  - Top Management
  - EnMS Owner
  - Management rep.
  - EnMS Champion
  - Energy management team
  - EnMS Operation Committee

- Reports performance
- Directs energy management activities
  - Organize the operation unit
  - Define roles & responsibility
  - Appoint members
Requirements & Interpretation

Clause 4. EnMS requirements

4.3. Energy Policy

Commitment to comply with applicable legal and other requirements

Supports the purchase of energy efficient products and services

Documented, communicated, and understood within the organization

Periodically reviewed, and updated as necessary

Name of Top Management

Coherent with the nature and scale of, and impact on, the organization's energy use

Commitment to continual improvement in energy performance

Framework for setting and reviewing energy objectives and targets

Commitment to ensure the availability of information and of necessary resources to achieve objectives and targets
Requirements & Interpretation

Clause 4. EnMS requirements

4.4. Energy Planning

4.4.1 General

Energy Planning Process Concept Diagram
4.4 Energy Planning

**Inputs to Energy Review**
- Energy Annual Report / ENCON Act
- Mid-long Term Plan / ENCON Act
- Updated EnMS Charter
- Energy data
- Production data
- Company organisation
- Energy Policy
- Equipment list
- Energy bills, and contracts
- Factory layout
- Utility systems diagram
- Diagrams (system, wiring, Piping, etc.)
- Daily inspection records
- Operating procedures
- Facility specs & name plates
- And others when applicable

**Scope of Energy Review**

**Planning Output**
- Baseline
- EnPI (s)
- Objectives
- Targets
- Action Plans

**Operation**
- Training
- Communication / engage stakeholders
- Operational Control
- Procurement
- Design

**Tools and Techniques used for Energy Review**
- Graphs
- Charts
- Tables
- Walk-through Energy Audit
- Monitoring System
- Detail Energy Audit
- Feasibility Study
- Financial & Economic Analysis
- SEC Analysis
- Cusum Evaluation

Reference: "ISO/DIS 50001(E)"
Clause 4. EnMS requirements

4.4. Energy Planning

4.4.3 Energy Review

a) Analyze energy use based on measurement and other data
b) Based on energy use analysis, identify the areas of significant energy use and consumption
c) Identify, prioritize, and record opportunities for improving energy performance, including, where applicable, potential energy sources, use of renewables, or alternative energy sources

Energy Conservation Opportunity ECO
Clause 4. EnMS requirements

4.4. Energy Planning

4.4.3 Energy Review

Energy review shall be planned, implemented documented reported. Energy review is to define baseline and target after identifying energy conservation opportunities (ECOs), and will be used as one of evidences for quantifying energy performance improvements.

The energy review shall be updated at defined intervals and in response to major changes in facilities, equipment, systems or processes.
Requirements & Interpretation

Clause 4. EnMS requirements
4.4. Energy Planning
4.4.4 Energy baseline
4.4.5 Energy performance indicators (EnPIs)

From the energy review, energy baseline & EnPI shall be recorded for saving target

<table>
<thead>
<tr>
<th>Monitoring Scope of Energy Consumption</th>
<th>Monitoring Dept.</th>
<th>Output Denominator</th>
<th>Energy Measured</th>
<th>Baseline EnPI</th>
<th>Potential Savings</th>
<th>Target EnPI</th>
<th>Target Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Demand Side</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 09 (Material Handling)</td>
<td>Production #1</td>
<td>Prod-1 production in kg</td>
<td>Electricity (kWh)</td>
<td>y = 0.249 x + 591.59</td>
<td>12.5%</td>
<td>y = 0.224 x + 532.43</td>
<td>10.0%</td>
</tr>
<tr>
<td>Total Electricity</td>
<td></td>
<td>Prod-1 production in kg</td>
<td>Comp. Air (m3)</td>
<td>y = 0.083 x + 734.44</td>
<td>13.3%</td>
<td>y = 0.075 x + 661.00</td>
<td>10.0%</td>
</tr>
<tr>
<td>Total Comp. Air</td>
<td></td>
<td>Prod-1 production in kg</td>
<td>Water (m3)</td>
<td>y = 1.456 x + 210.80</td>
<td>18.9%</td>
<td>y = 1.310 x + 189.72</td>
<td>10.0%</td>
</tr>
<tr>
<td>Total Water</td>
<td></td>
<td>Prod-1 production in kg</td>
<td>Chilled water (m3)</td>
<td>y = 0.762 x + 245.12</td>
<td>17.5%</td>
<td>y = 0.686 x + 220.61</td>
<td>10.0%</td>
</tr>
<tr>
<td>Total Chilled water</td>
<td></td>
<td>Prod-1 production in kg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 10 (Storage)</td>
<td>Utility</td>
<td>Not applicable</td>
<td>Electricity (kWh)</td>
<td>y = 0 x + 1652.32</td>
<td>10.0%</td>
<td>y = 0.000 x + 1487.09</td>
<td>10.0%</td>
</tr>
<tr>
<td>Total Electricity</td>
<td></td>
<td>Not applicable</td>
<td>Electricity (kWh)</td>
<td>y = 0 x + 364.25</td>
<td>20.0%</td>
<td>y = 0.000 x + 291.40</td>
<td>10.0%</td>
</tr>
<tr>
<td>Server Room Electricity</td>
<td></td>
<td>Not applicable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.4.6 Energy objectives, energy targets and energy management action plans
The energy review shall be updated at defined intervals and in response to major changes in facilities, equipment, systems or processes.

<table>
<thead>
<tr>
<th>Action name</th>
<th>Objectives</th>
<th>Targets</th>
<th>By who</th>
<th>By when</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product line Change</td>
<td>• Close the comp. air valve</td>
<td>Reduce power by 720,000kWh</td>
<td>Prod.#1</td>
<td>End March, 2012</td>
</tr>
<tr>
<td>Enhancement</td>
<td>• Review washing cycle</td>
<td>Cost red. 3.3 %</td>
<td>Manager</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Reduce detergent for shorter rinse</td>
<td>CO2 emit. Red. 400 t-CO2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
 Clause 4. EnMS requirements

4.5. Implementation and operation

4.5.1 General

1) Apply additional 6 elements in establishing the plan
2) Implement and operate in accordance with the established plan
Requirements & Interpretation

Clause 4. EnMS requirements
4.5. Implementation and operation
4.5.2 Competence, training and awareness

Competence

EnMS ensures any person or persons working for, or on its behalf related to significant energy uses are competent on the basis of appropriate education, training, skills or experience.
Clause 4. EnMS requirements
4.5. Implementation and operation
4.5.2 Competence, training and awareness

Training - EnMS shall identify training needs associated with the control of its significant energy uses and its operation:

- Workshop
- External training
- Internal training
- Seminar
- Etc
Awareness

EnMS ensures that persons working for or on its behalf are and remain aware of:

1) The importance of conformity with the energy policy, procedures and with the requirements of the EnMS
2) Their roles, responsibilities and authorities in achieving the requirements of the EnMS
3) The benefits of improved energy performance
4) The importance of achieving energy objectives and targets, and the consequences of departure from specified procedures
Requirements & Interpretation

Clause 4. EnMS requirements

4.5. Implementation and operation

4.5.3 Communication

a) Energy Performance & EnMS Operation Communication

b) Awareness and Motivational Communication

- EnMS site and monitoring system links from company portal site
- EnMS proprietary bulletin boards
- Morning meetings
- Training sessions
- Motivation and incentive program
- Suggestion Box
- Etc.
Clause 4. EnMS requirements
4.5. Implementation and operation
4.5.3 Communication
c) External Communication on EnMS

- Press release
- Company newsletter
- Factory tour
- CSR report
- Web: contact us
- Community activities
Requirements & Interpretation

Clause 4. EnMS requirements
4.5. Implementation and operation

4.5.4 Documentation
4.5.4.1 Documentation Requirements
4.5.4.2 Control of Documents
Clause 4. EnMS requirements
4.5. Implementation and operation

4.5.5 Operational control

EnMS Charter
Sets a general guideline and provision for overall EnMS operation
Requirements & Interpretation

Clause 4. EnMS requirements
4.5. Implementation and operation

4.5.6 Design

Two types of designing effort for energy efficient performance:

- Review energy aspects in design
- Identify as ECO
- Feasibility study
- Review Design
- Financial analysis
- Project proposal

- URS
- Construction or modeling
- Trial / tests
- Acceptance
- Verification

RESULT

Energy Management System
EnMS Energy Review Plan
Baseline ISO50001

EnMS Energy Review Report
Baseline ISO50001

EnMS Action Plan
Baseline ISO50001

Management Review
Approval
Energy Saving Project

EnMS Annual Progress Report
Baseline ISO50001

Product Design (Not mention in ISO 50001 but worth consider)
Clause 4. EnMS requirements

4.5. Implementation and operation

4.5.7 Procurement of energy services, products, equipment and energy

- Supplier quotation
  - Specs on energy type and rating
  - Life cycle energy consumption estimate
  - Life cycle maintenance cost
  - Service availability in case of contingency situations
- Energy efficiency assessment
- Life cycle energy cost vs. maintenance cost assessment
- Service flexibility assessment especially in the time of contingency

- Supplier quotation
  - Composition specifications of fuel energy
  - Composition specifications of water
  - Heat conversion factor per energy unit
  - CO2 emission conversion factor per energy unit
- Perform composition test once every six months
- Check regularly the energy market prices to compare purchase prices
Clause 4. EnMS requirements

4.6. Checking (Performance)

4.6.1 Monitoring, measurement and analysis

Following key characteristics of its operations that determine energy performance shall be monitored, measured and analyzed at planned intervals.

a. significant energy uses and other outputs of the energy review
b. the relevant variables related to significant energy uses;
c. EnPIs
d. effectiveness of the action plans in achieving objectives and targets
e. evaluation of actual versus expected energy consumption.
Clause 4. EnMS requirements
4.6. Checking (Performance)
4.6.1 Monitoring, measurement and analysis

Guideline/procedure are useful to:

a. Define method of treating records
b. Define how to review measurement needs
c. Define method to maintain quality of monitoring equipments and records
d. Define procedure to identify and act against deviations in energy performance
e. Define procedure for consistent monitoring and action operation
Clause 4. EnMS requirements
4.6. Checking (Performance)
4.6.2 Evaluation of compliance with legal requirements and other requirements

- EnMS is to stay alert and at planned interval evaluate compliance with legal and other requirements to which EnMS subscribes that are relevant to its energy uses.
Requirements & Interpretation

Clause 4. EnMS requirements

4.6. Checking (Performance)

4.6.2 Evaluation of compliance with legal requirements and other requirements

The updates and results of evaluation can be consolidated as records in a document containing following information:

- List of legal and other requirements to which it subscribes that are relevant to its energy uses
- Summary or highlight description of evaluation items for compliance
- Compliance status
- Recommended action
- Additional remarks if necessary

Recorded information can be presented during management review to serve EnMS purpose.
Clause 4. EnMS requirements

4.6. Checking (Performance)

4.6.3 Internal audit of the EnMS

- EnMS audit is to be conducted as part of organisation’s audit programme.

- Define the EnMS audit:
  a) Objective
  b) Scope
  c) Responsibility
  d) Procedure

- Reference ISO19011:2002
  “Guidance on the Principles of Auditing” in conducting EnMS audit.
Clause 4. EnMS requirements

4.6. Checking (Performance)

4.6.3 Internal audit of the EnMS

- EnMS audit is encouraged to conduct in accordance with voluntary documented EnMS audit plan.*

- Audit examines:
  
  a. EnMS conforms to energy objectives and targets established
  
  b. EnMS is properly implemented and energy performance improved

- Record of audit result shall be reported to top management.

*ISO 50001 does not require audit plan and report per se, however they are highly recommended for efficient and effective audit activities.
Clause 4. EnMS requirements

4.6. Checking (Performance)

4.6.4 Nonconformities, correction, corrective action and preventive action

- Improvement actions:
  Actions for correction, corrective, and preventive as well as actions to counter nonconformities

- EnMS Continual Improvement Guideline (Problem Resolution management Guideline)
  A guideline is useful to identify elements requiring improvement, and to define situations for preventive and corrective actions.
Clause 4. EnMS requirements
4.6. Checking (Performance)
4.6.4 Nonconformities, correction, corrective action and preventive action

EnMS Continual Improvement

Procedure:
A document defining procedure is useful for the entire work force dealing with actual and potential nonconformity, and through corrective and preventive actions to identify opportunities from continual improvement practices.
Requirements & Interpretation

Clause 4. EnMS requirements

4.7. Management review

- Management review is one of the most important EnMS processes
  - a. Reassures top management role and responsibility
  - b. Accelerates the EnMS progress for continual improvement
  - c. Removes members’ wonder
  - d. Evaluate people’s effort & skill
  - e. Understands the changes made

- Defining logistics
  - Purpose
  - Frequency
  - Participants
  - Procedure
Requirements & Interpretation

Clause 4. EnMS requirements

4.7. Management review

- Input to management review
- Output from management review
  - Changes in energy performance or EnPI
  - Changes in energy policy, objectives/
    targets or baseline
  - Allocation of resources.
Annex A is strictly informative
Purpose is to prevent misinterpretation of the requirements contained in Clause 4.
It is not intended to add to, subtract from, or in any way modify these requirements.
It encourages periodically review and evaluate energy performance from EnMS operation in order to identify opportunities for improvement for implementation.
The organization is given flexibility in how it implements the EnMS.
Organization can pursue Continual improvement from a wide range of energy performance activities.

Source: “ISO 50001:2011 (E)” page 13
Annexes & Interpretation

Annex B Comparison of the generic management system standards

Following observation can be stated:

1. All have the same title/clause structure up to clause 3.

2. ISO 50001 and ISO 14001 have identical clause structure which consolidates all the system requirements in clause 4.

Source: “ISO 50001:2011 (E)” page 13
Annexes & Interpretation

Annex B Comparison of the generic management system standards

Following observation can be stated:

3. ISO 9001 with its longer history and revision practiced for improvement, splitting up the clauses for system requirements based on the market needs.

However the contents coverage is uniform to ISO 50001 with difference that ISO 9001 needs to define product quality.

4. ISO 22000 follows ISO 9001 clause structure, with difference of putting emphasis on safety quality.

4.4.3 Energy review -------------> 7.2.1 Determination of requirements . .

4.5.2 Competence, training and -> 6.2.2 Competence, training and . .

4.4.3 Documentation ----------------> 4.2 Documentation requirements

4.4.3 Communication --------------> 5.5.3 Internal communication

4.4.3 Procurement of energy ser.---> 7.4 Purchasing

4.4.3 Monitoring, measurement -> 8.2.3 Monitoring, measurement

4.4.3 Management review ---------> 5.6 Management review

4. ISO 22000 follows ISO 9001 clause structure, with difference of putting emphasis on safety quality.
Summary of Management Principles in EnMS

Following is the list of items necessary to control EnMS operation regardless of what ISO 50001 requires:

1. Operation and Progress Management
   Ensuring operation is making progress according to the plan

2. Change Management
   Ensuring operation is in line with the changes

3. Operational Problem Resolution Management
   Ensuring operation swiftly to problem faced and turn into opportunity for improvement

4. Risk Management
   Ensuring risk factors are evaluated to secure position for continual improvement
Summary of Management Principles in EnMS

Following is the list of items necessary to control EnMS operation regardless of what ISO 50001 requires:

5. Preparation for Contingency
   Ensuring safety is considered in case of emergency situation

6. Document Management
   Ensuring key documents are identified, maintain, updated and available when in need

7. Objective and Target Achievement Evaluation Criteria
   Ensuring objective and target achievement evaluation criteria are defined in order to measure and evaluate progress or result
Summary of Documentation

Documentation is key to the success of EnMS operation

12 Key documents were introduced for ISO 50001 certification

Source: EnMS-Doc Associates  www.enms-doc.com
Conceptual Flow of EnMS

Continual improvement

Energy policy

Planning

Implementation and operation

Checking

Internal audit of the EnMS

Monitoring, measurement and analysis

Nonconformities, correction, corrective and Preventive actions

Management review

Source: ISO 50001
Summary

Energy Management System - EnMS

ISO 50001

Plan
Do
Check
Act

Source: http://www.mindtools.com/pages/article/newPPM_89.htm
Motto: Energy Efficiency is interest and obligation

- it is our interest
  - to decrease our expenses

- it is our obligation
  - to protect the environment

Thank you for your attention!

Preserve the balance that has evolved in nature!