



[Applying Energy Efficient measures for metal and metalworking SMEs and industry \(EE-METAL\)](#)

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Abstract	This document aims to define a methodology for the implementation and adaptation of the ISO 50 001 standard taking into account the specific characteristics of SMEs metallurgy. This version is an update of the deliverable D2.4 following the experimentation of this methodology with 8 SMEs supported through the EE-METAL program.



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1. INTRODUCTION

This document aims to define a methodology for the implementation and adaptation of the ISO 50 001 standard taking into account the specific characteristics of SMEs metallurgy.

ISO 50 001 is an international standard that helps to improve the energy performance of companies through systematic implementation of energy management: monitoring consumption, identification of feasible energy savings, implementation a plan suitable actions... It can work on three performance drivers that are technical, organization and management to sustain the cost containment actions.

This standard is generic in nature, it was written to be applicable to any sector and any company size. However, the metal sector consists mainly of small and medium enterprises that may not have the capacity to overcome the apparent complexity of such a standard.

Inspired by the difficulties encountered by companies that are engaged in an ISO 50 001 certification process, this adaptation aims to make it accessible to small enterprises of metallurgy. The main requirements of the standard are explained and illustrated with examples and implementation tips.

2. OBSERVATIONS ON THE IMPLEMENTATION OF ISO 50 001

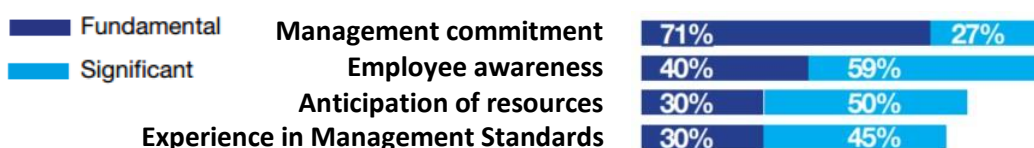
a) International Study on certified energy management practices ISO 50 001 ([AFNOR, September 2015](#))

A study published by the AFNOR Group, in September 2015, reveals the main difficulties encountered by companies but also the conditions of success for the implementation of ISO 50 001.

Difficulties encountered:

- ✓ Lack of time and **workload management**
- ✓ **Availability** and human resource skills
- ✓ Implementation and **interpretation of the standard**
- ✓ Changing the **behavior** of employees

Conditions for success:





Good practices identified:

- Capitalizing on experiences in other management systems (quality, environment...)
- Appoint a representative of the dedicated management who will be the referent power
- Exchange with the certification auditor who sheds light on the interpretation of the standard
- Search simplicity in the approach and actions, particularly in the energy planning step
- Simple approaches also allow all staff to better appropriate actions and to be more involved

b) Benchmark on collective operations support ISO 50 001

To help SMEs to engage in an ISO 50 001 certification, collective operations can be implemented. The analysis of those that have been conducted brings out the following features:

Profile of companies:

- Experience in management systems (ISO 9 001, 14 001...)
- At least 2 employees mobilized by company: often 1 technical manager (maintenance, general services, production...) and 1 manager "system" (QSE)

Format of the support:

- Collective training (2 persons by company) (3-5 days)
- Individual support (until certification) (9-10 days)
- Collective support (technical meetings, exchange meetings) (optional)

3. ADAPTATION OF ISO 50 001 FOR SMEs METALLURGY

Based on these observations, the guidelines for the adaptation of the ISO 50 001 standard for SMEs metallurgy are:

- ✓ ***Pragmatic and lightened approach (taking account of lesser availability of SMEs)***
- ✓ ***Motivation of the players key (identify and train them)***
- ✓ ***Flexible and pedagogic support (combine training and consulting)***

The proposed methodology is inspired by the PDCA approach (Plan, Do, Check, Act), taking into account the specificities related to the size of the companies (small and medium) and their sector (metallurgy). It consists of 4 steps, detailed in chronological order:



STEP 1: Energy Planning

This planning step set the deployment axes and orientations of the energy management system based on objective and hierarchical data.

1	<p>Defining certification perimeter:</p> <p>The scope of certification can be adapted to take account of the size and activity. The activities for which the company has little or no leeway to act on energy efficiency (e.g. in customer response or on site, transport...), can be excluded from the scope of certification.</p> <p>For companies with other certifications, the scope can be chosen identically in the interest of simplification and harmonization (go to an integrated system).</p>
2	<p>Identify and take into account the different requirements (legal and other):</p> <p>In keeping with the scope of certification, a watch on the requirements on energy is assured. These requirements can be related to specific regulations in the company or group... Metallurgy professional organizations can help in identifying these requirements.</p> <p>They are important because they can influence the energy management approach (e.g. legal obligation to achieve energy savings, deregulation of energy prices, the Eco design Directive products related to energy, instructions of the group...).</p>
3	<p>Mobilize all actors of the approach:</p> <p>The success of the approach depends heavily on the motivation of the management and provision made human resources. ISO 50 001 invited the management to appoint one or more representatives responsible for steering the process (energy driver).</p> <p>Because of the specificity of the ISO 50 001, the constitution of a pair is preferred to ensure complementarity between the skills related to "system" and expertise related to energy.</p>



	<p>The prospective profiles are:</p> <ul style="list-style-type: none">- The QSE responsible for the "system" part- The maintenance manager (or general services, production...) for the technical part <p>More broadly, the establishment of an energy management system calls for the mobilization of all of the company's resources.</p> <p>APPENDIX 1 - THE ACTORS OF THE APPROACH AND MISSIONS</p>
4	<p>Draft an energy policy:</p> <p>Signed by management, the policy defines general guidelines and the company's commitment to improving its energy performance. Production activities are naturally targeted because they generally represent a significant energy use in the metallurgical sector. But the policy also encourages all employees and services that can have an impact on the scope of certification, including:</p> <ul style="list-style-type: none">- Purchases for the acquisition of equipment and services takes into account the energy characteristics (machine tools, compressors, aspirations, heaters...)- The design office and/or methods for energy efficiency is taken into account in the design <p>APPENDIX 2 - ENERGY POLICY</p>
5	<p>To evaluate the energy consumption of the company:</p> <p>Also called energy review in the ISO 50 001 standard, this step can analyze usage and energy consumption of the company.</p> <p>Considering the scope of the certification, it should perform an inventory of the energy consumption of the company. It aims to identify the different energy sources and quantify the company's major consumption items (process, heating, lighting...). Factors influencing those consumptions are also identified (outside temperature, occupancy rate of the machines, production level...).</p> <p>This may involve:</p> <ul style="list-style-type: none">- The analysis of energy bills (electricity, gas, fuel oil, other)- The estimate consumption with the theoretical power equipment- Conducting an energy audit (<i>an audit methodology has been specifically adapted for SMEs of the MMA sector in the framework of the EE-METAL program: Deliverable D2.2 "Common audit methodology for determining potential energy saving measures in SMEs of the MMA sector applicable at EU level"</i>) <p>In metallurgy, special attention is paid to the production equipment and support facilities (machines, ventilation, compressed air, heating workshops...).</p> <p>APPENDIX 3 - ENERGY REVIEW</p>



6	<p>Identify the Significant Energy Uses (SEU):</p> <p>To achieve energy savings and improved energy efficiency, the next step is to identify Significant Energy Uses. Those are the modes or types of energy use (ventilation, lighting, heating, process...) which represent a significant share of consumption (e.g. + 10%) and/or that have significant potential energy saving.</p> <p>The principle of Pareto chart (80/20) can be used to define what is significant. However, this does not prevent action from also being taken on SEUs for which actions are simple, effective and inexpensive (e.g. compressed air, lighting, behavioural changes etc.).</p> <p><i>Deliverable D3.3 " Report on the potential energy saving measures in SMEs of the metalworking sector of 4 EU countries: a cross-country benchmarking"</i> identifies and quantifies the main recurrent energy uses in metalworking sector.</p>
7	<p>Set goals for improving energy efficiency:</p> <p>From the energy review and in coherence with the energy policy, the company sets goals to improve its energy performance. Those general objectives are broken down into targets for each relevant sector or sub-sector (business area, activity, process...).</p> <p>Then an action plan is defined to meet the objectives. It draws on elements of the energy review and potential of identified energy savings.</p> <p><i>There is a gradation between different terms:</i></p> <ul style="list-style-type: none">- <i>The objectives are generic. They give a direction and vision in the long or medium term.</i>- <i>Targets are the offshoot of these objectives in short-term vision (they are quantifiable)</i>- <i>The action plan describes the actions planned to reach those goals and targets in a very operational way.</i> <p>To concentrate the efforts where they will be the most effective, the focus is on the Significant Energy Uses.</p> <p>Achieving those objectives and targets is assessed through indicators of energy performance.</p> <p><i>The implementation of energy performance indicators and the setting of objectives and targets can be done in connection with the deliverable D2.1 "EE Benchmarking methodology". This document makes it possible to evaluate its energy performance according to its activity and its energy uses.</i></p> <p>APPENDIX 4 - ENERGY PERFORMANCE INDICATORS</p> <p>APPENDIX 5 - ENERGY ACTION PLAN</p>



STEP 2: Implementation and operation

The implementation step is to deploy the action plan defined in the previous step (energy planning). For the proper functioning of the energy management system, other points need special attention.

1

Skills, training and raising awareness:

To ensure the achievement of objectives requires that all employees, service providers or subcontractors whose work has an influence on one of the identified significant energy uses, have the necessary skills (e.g. be aware of the impact of his actions or behavior on energy consumption).

Particular attention is retained for certain functions:

- The pair responsible for steering and management of the energy management system. They should be advised to undergo training providing them strong skills on energy management and the ISO 50 001 (type of training: Becoming energy referent).
- The employees in charge of purchasing and design-industrialization (design office, methods, industrialization, maintenance...). Their skills to enable them to take account of energy issues for purchases (machines, lighting...) and equipment design, new projects of facilities in general, including work.
- The managers. They must ensure that the knowledge of regulations and their application by its employees, promotion of good practices in their team...
- Internal auditors. They should be trained to conduct internal audits.

These specific skills can be integrated into job descriptions and/or mission. Attendance sheet or training plan contribute to traceability requirements.

*The content of the training "Become an energy referent" deployed within the framework of the EE-METAL program is specified in the **deliverable D4.1 "SMEs professionals training"**.*

APPENDIX 6 - EXAMPLE OF TRAINING PROGRAM "ENERGY REFERENT"

APPENDIX 7 - RESPONSABILITES MATRIX EXAMPLES AND FUNCTION SHEETS

2

Communication:

To involve staff it is necessary to animate the process through appropriate communication whose purpose is:

- ✓ Transmit instructions, best practices and good behavior
- ✓ Reporting on the progress and results
- ✓ Allow everyone to participate and promote exchanges

Communication can be understood in different ways: top-down (dissemination of information to employees), bottom (convey of information, suggestions) and external.

Due to the companies' size, it is recommended that communication remains modest and understandable by all employees. Communication can be integrated into existing documents and media. It is the same for the time dedicated to communication (team meetings...).

APPENDIX 8 – COMMUNICATION



3	<p>Documentation:</p> <p>Due to the size of the companies, the documentation can be limited to a minimum.</p> <p>In this case, ISO 50 001 imposes only one mandatory procedure: the documentary control. This procedure aims to organize the documentation: content, frame, indexing, validation, distribution, archiving...</p> <p>Apart from this procedure, other documentary requirements are mainly records, that is to say, the working documents that constitute proofs of an action performed (e.g. attendance sheet for training).</p> <p>APPENDIX 9 – DOCUMENTARY CONTROL</p>
4	<p>Operational control:</p> <p>A simplified action plan must organize actions being performed and maintenance operations that avoid energy drifts.</p> <p>The standard leaves the choice between "centralized" action plan, which is shared between different actors or a specific action plan directly managed by the actors.</p> <p>Production and maintenance procedures can also be reviewed to take into account energy control (e.g. management of equipment operation/heating times, pressure level of the compressed air network, production scheduling, etc.).</p> <p>APPENDIX 5 - ENERGY ACTION PLAN</p>
5	<p>Design and procurement:</p> <p>The energy efficiency criterion is taken into account in the purchasing and design processes of new installations (e.g. production line), in particular when it concerns the most significant energy uses. This criterion is then shown in the specification and/or included in the project through: energy performance indicators, the energy saving devices, valuing Energy Saving Certificates (ESC)...</p> <p><i>The good practices presented on the website www.ee-metal.com can guide the choice of technical solutions to implement. Deliverable D2.3 "Database of Best Available Techniques (BATs) applicable in the MMA sector" can also guide the choice of energy-efficient technologies.</i></p>



STEP 3: Verification

To avoid drift and ensure the achievement of the objectives, the company evaluates the effectiveness of actions implemented and the effectiveness of the energy management system.

- | | |
|---|--|
| 1 | <p>Monitoring, measurement and analysis:</p> <p>This monitoring goes first by screening energy bills and indicators. It is completed by reporting the progress of the action plan.</p> <p>The frequency of monitoring can be adapted to the needs of the company (e.g. monthly). Monitoring can also be associated with a more comprehensive reporting already established in the company.</p> <p>Due to the size of the companies, the measurement plan may be limited to a measurement counter positioned on the most significant energy use. The establishment of a remote measurement counter facilitate data recording.</p> |
| 2 | <p>Internal audit:</p> <p>Independently of certification audits, the company realizes internal audits that correspond to a self-evaluation of the energy management system. The aim is to ensure that all the provisions and the implementations comply with the requirements of the ISO 50 001 standard.</p> <p>The practice of internal auditing is a common point to all management systems, the company which has other certifications (ISO 9 001, ISO 14 001...) can handle all internal audits in an integrated way (same schedule, same methodology, the same media, same auditors).</p> <p>In small companies, to ensure objectivity and impartiality, crossed audits (between companies), can be realized.</p> <p>In any case, auditors must have been trained on ISO 50 001 standard and to conduct audits.</p> |

APPENDIX 10 - SELF-EVALUATION AND INTERNAL AUDIT



STEP 4: Action

This last step is to take stock of savings and ensure that the energy management system is still relevant and effective. The capitalization of actions and results contribute to the objective of continuous improvement.

1

Management review:

It is the examination of the entire energy management system. This is an opportunity to see not only the goals but also any modifications or changes in a view to continuous improvement.

It should allow to judge:

- The relevance of the EMS (e.g. perimeter, sizing, proportionate in relation to issues?)
- The adequacy of the EMS (e.g. financial, human, technical, consistent with the expected and achieved results)
- The effectiveness of the EMS (e.g. to follow and made action plans, relevance of audits effectiveness of corrective actions?)

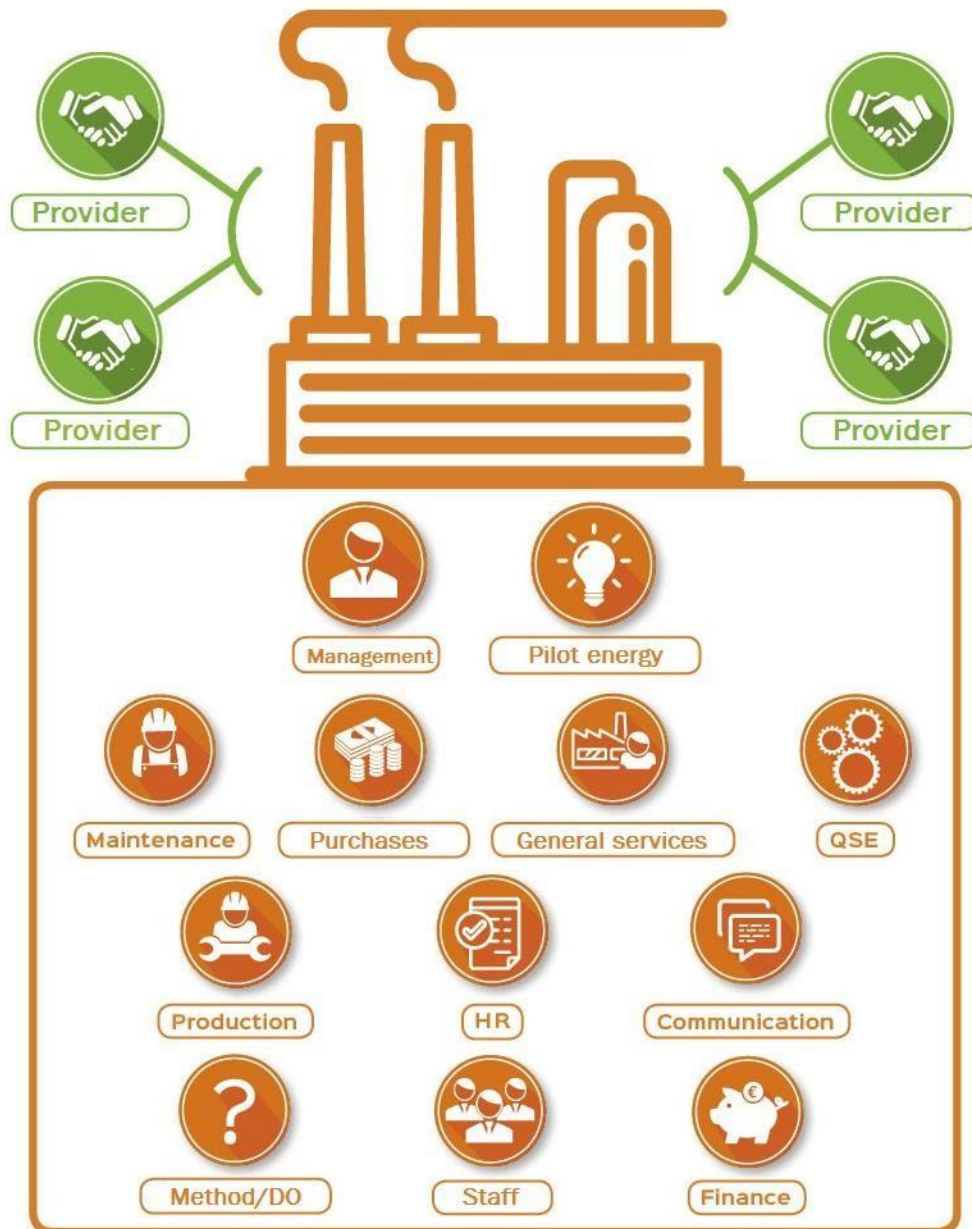
The frequency is left to the free choice of the company. Due to the size of the companies, an annual frequency may be sufficient.

Companies with other certifications (ISO 9 001, ISO 14 001...) can handle this management review similarly or integrated with other management reviews (same frequency, same method, same people).

APPENDIX 11 - MANAGEMENT REVIEW



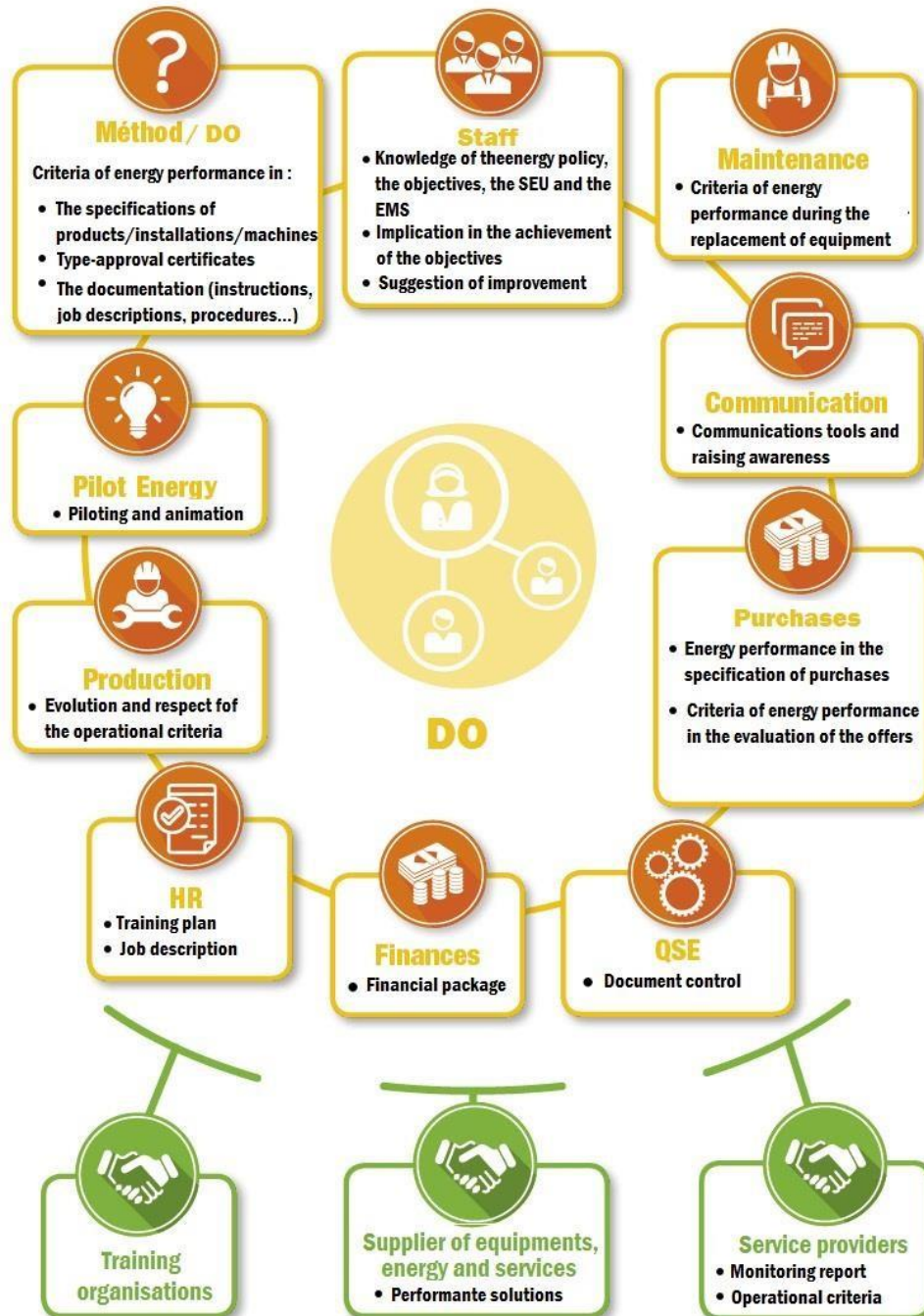
APPENDIX 1 THE ACTORS OF THE APPROACH AND MISSIONS



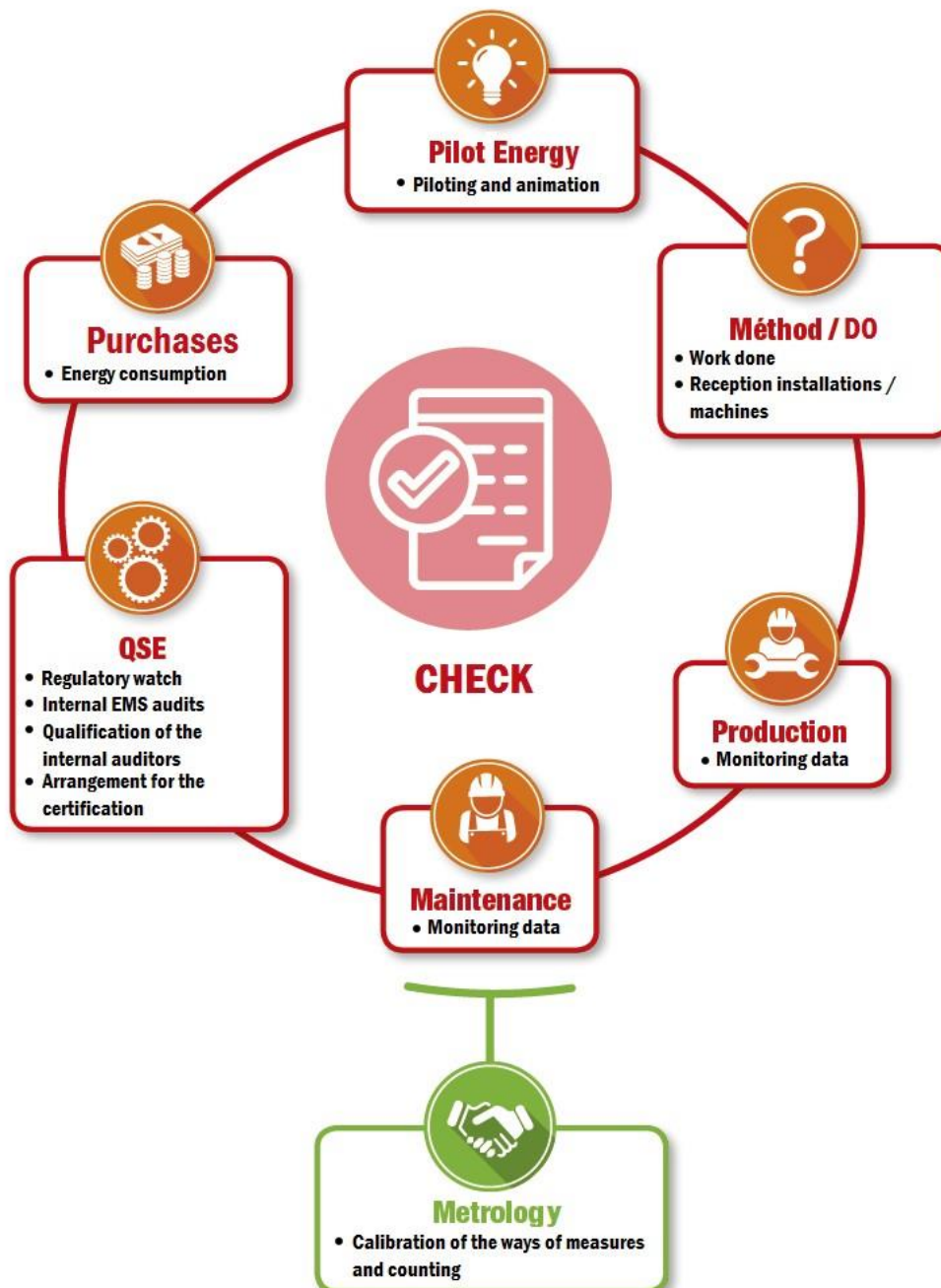
Illustrations : Emmanuel Greget / UIMS / KTT 50001 - mai 2016



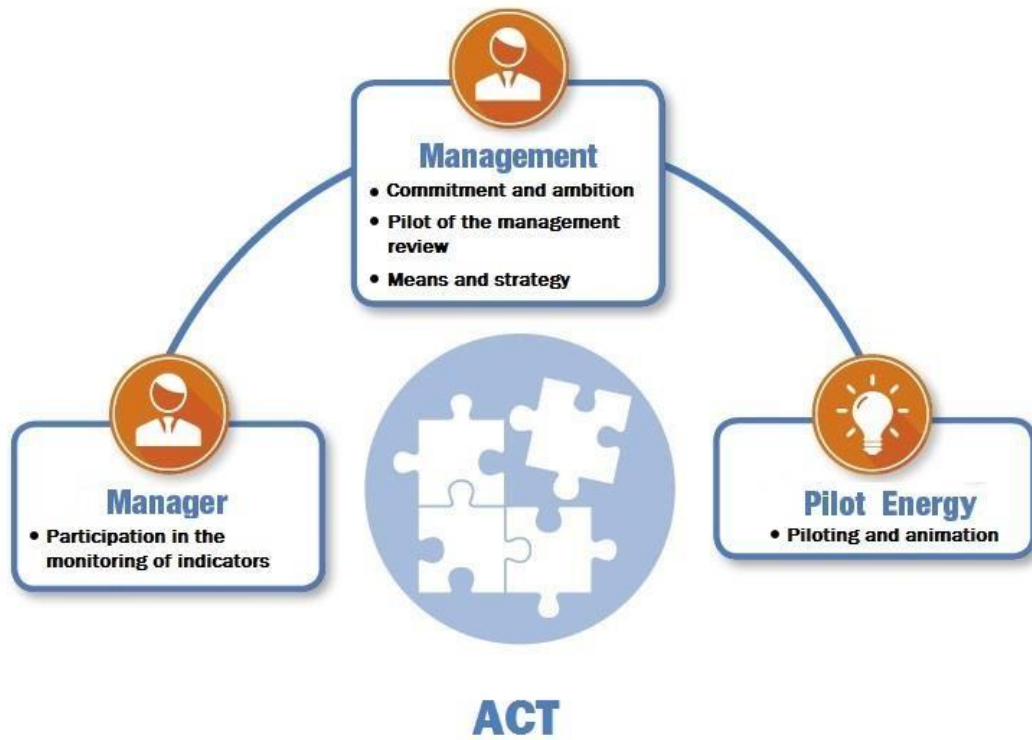
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Illustrations : Emmanuel Greget / UIMS / KTT 50001 - mai 2016

Source: UIMS



APPENDIX 2 ENERGY POLICY

Content:

- A personalized part allowing to recognize the activity of the company and its stakes towards the energy
- The scope and associated energy goals
- The essential requirements of the standard (continuous improvement of energy performance, availability of information and resources, compliance with legal and other requirements, energy criterion for integration in procurement and design)

Tips & Advice:

- Make sure the policy reflects the spirit and vision of the leader
- Use simple words to make it easily understandable
- Use the present and action verbs
- Sign and date the document to formalize the commitment of the leader
- Make the members of the frame sign
- Communicate internally: Post it in the places of attendance or passage (reception, break areas, meeting rooms...)
- Communicate externally: website, mailings to stakeholders...

Example:

Energy policy

The energy performance represent an environmental stake but also in competitiveness for the company. So, the management makes a commitment to give the necessary resources and means to reach the objectives that we settle:

- ✓ **Control our energy expenditure:**
 - By analyzing our consumptions
 - By monitoring the variations of the energy costs
 - By maintaining in good condition our equipment and our buildings
- ✓ **Use with economy the energy:**
 - By communicating with the staff and users
 - By encouraging them to adopt an energy-efficient behavior
 - By involving them in the actions of energy saving to be implemented
- ✓ **Adapt the choice and the use of products and production means:**
 - By choosing adapted equipment
 - By taking advantage of the new technologies
 - By resorting to the appropriate energies
 - By integrating the energy performance into our purchases
- ✓ **Improve continuously our energy performance:**
 - By estimating regularly the efficiency of our actions
 - By collecting the notices and the improvement recommendations

The application of this policy is directly connected to the skills of our collaborators as well as the exemplary nature of our managers. The commitment of all is necessary to reach those objectives.

The management



APPENDIX 3 ENERGY REVIEW

Goal:

The energy review enables the identification of Significant Energy Uses (SEU) that will be the heart of the process since they must imperatively be controlled and reduced their impact. It could be a use with a high consumption, or with a high potential for energy performance improvement. The company is free to choose the method of identification of SEU.

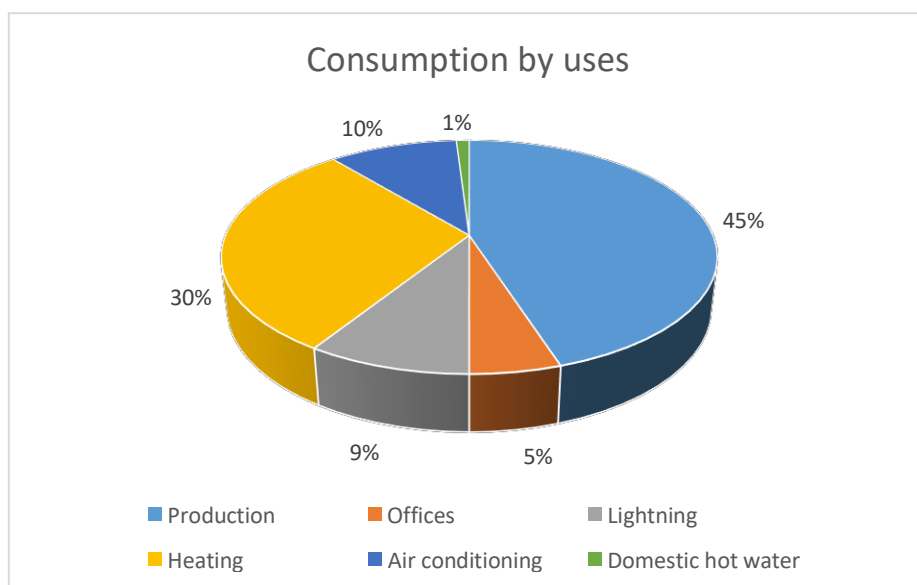
Content:

- An exhaust analysis of energy sources, consumptions, uses (all fluids in connection with the defined scope)
- An exhaust list of potential improvements in energy performance.

Tips & Advice:

- Take into account all the energy sources (electricity, gas, fuel oil, compressed air, steam...)
- Identify influential factors
- Identify Significant Energy Uses
- Determine the energy performance of facilities and equipment related to SEU
- List all the potential to improve the energy performance relevant (including use of waste energy, renewable energy)
- Estimating uses and future energy consumptions based on the investments made, the actions taken and the evolution of the activity (baseline).
- Do not forget the infrastructure, including heating consumption of buildings and improvement actions in this area (including offices)

Example:





APPENDIX 4

ENERGY PERFORMANCE INDICATORS

Goal:

The Energy Performance Indicators (EPI) can be defined to answer the needs of monitoring and evaluation of energy performance from different stakeholder management system of energy (production manager, maintenance manager...).

Unlike ISO 14 001 where environmental performance indicators measure the achievement of objectives or not, it is requested in ISO 50 001 to define those indicators in the planning stage to emphasize the purpose of a performance energy to achieve. The aim is to engage in an approach rooted in a dynamic performance with clearly displayed and indicators suitable for monitoring and measuring energy performance.

Tips & Advice:

- Ensure that the data needed for EPI readily available (use existing databases or set up automatic extractions).
- Limit the number of indicators
- Focus them on Significant Energy Uses

Examples:

- Indicators related to equipment, for uses or for production (those indicators are useful in particular to line managers or operators):
 - Equipment: coefficient of performance
 - Uses:
 - Lighting: lumen / watt
 - Compressed air: kWh / m³
 - Heating: kWh / m² heated. UDD (Unified Degree Day)
 - Consumption for compressed air per ton produced
- More global indicators for decision-makers:
 - Total consumption per unit area: kWh / m²
 - Total consumption by staff unit: kWh / person
 - Percentage by energy source: consumption by energy source / total consumption
 - Energy ratio: Energy costs (€) / Turnover (€)
 - Specific consumption: total consumption / tons produced



APPENDIX 5 ENERGY ACTION PLAN

Goal:

The energy action plan is an important tool in the process. It describes and plans actions that will achieve the targets for energy efficiency.

Prerequisites:

Before you can define the action plan, it is necessary to have previously established baseline consumption as well as energy performance indicators.

Baseline: *used to compare the expected energy performance and actual performance for a given period (usually the year). It can be determined from the data of previous years (average of the last 2 or 3 years).*

For reference this consumption should be determined by neutralizing the significant factors not related to the energy performance (weather, production...). It represents consumption, all other things being equal. The neutralization of the influence parameters by different corrections sometimes avoids misinterpretations: "gas consumption has increased this season because winter was more severe" or "consumption of electricity has increased, but we had a new important client and more orders to be delivered that last year."

Energy performance indicators: *these encrypted values resulting energy performance. The most commonly encountered in industry being indicator: Energy consumption / production unit (other variants exist: by area, by number of employees...).*

Content:

For each action, we indicate the objectives and targets, the person in charge of the implementation, the deadline, the means...

Tips & Advice:

- Rely on the energy saving potential identified in the energy review
- Also indicate actions that require no hardware investment (e.g. change in the set temperature, integration of best practices...)
- Highlight actions that can benefit from financial assistance (e.g. standardized operations as defined in the ESC system: Energy Saving Certificate)



Example:

Example of list of objectives and energy targets and action plan of management of the energy

Objectives	Targets	Action plan	Cost	Responsible	Dead line	Check
Objective 1 : Reduce the electricity consumption	Improve the consumption of compressed air: reach 120 Wh/Nm ³	Optimize the functioning and the putting on stunt. Set up an engine with variable speed	5 k€	Pilot maintenance	T2	
		Make a campaign of detection of flight	2 k€	Subcontractor maintenance		
	Reduce the consumption in production (established our EPI)	Implementation of ratios for the follow-up of the energy evolutions consumptions with regard to the turnover		Energy dedicated officer	Next management review	
		Follow-up of the ratios of evolution of energy consumptions with regard to the production volume		Energy dedicated officer	Next management review	
	Make lightning saving	Follow-up of the service contract of the air conditioning		Pilot maintenance	See maintenance program	
	Reduce the lightning consumption of 15%	Implementation of occupancy sensors and installation of a timer for the lighting	0,2 k€	Maintenance service	T3	
		Regular replacement of tubes out of services		Subcontractor maintenance	See maintenance program	
		Create a workgroup with purchase and study office		Energy dedicated officer	T3	
		Poster campaign on the extinction of the lights		Communication service	T4	
		Organize the awareness of the staff		Human resources	T3	
Objective 2 : Involve the staff		Recycling the heat on the smoke of the boiler : start a technical study about feasibility with a service provider	10k€	Pilot maintenance	T2	
	Reduce the consumption connecting to the heating process	Insulate all the network	3 k€	Pilot production	T4	



APPENDIX 6

EXAMPLE OF TRAINING PROGRAM "ENERGY REFERENT"

This training helps to provide the person in charge of energy with tools and methods to improve the energy performance of its business. It consists of two related modules:

Module 1: Fundamentals

Energy units:

- Identify and distinguish the different energy quantities
- Convert energy data for electricity
- Convert energy data for fossil fuels

The electrical parameters that characterize the user profile:

- Interpret an electricity bill
- Identify tariff optimization on electricity bill
- Identify technical solutions to reduce the bill

The operation of the company's energy systems:

- Pumping and ventilation
- Cold production
- Air compressed production
- Heating
- Steam production, hot water (for process or sanitary use)

Module 2: Approach and Methodology

Structuring the energy efficiency approach:

- Identify energy referent missions
- To appropriate the energy management process and identify the roles and responsibilities of different actors contributing

The thermal and electrical energy balances:

- Understanding the benefits of energy balances and interpret them
- Understanding the importance of achieving different physical measures
- Identify losses of consumption

Energy purchases:

- Understand and use developments liberalization of energy markets
- Identify the levers available to optimize energy purchases
- Identify opportunities by maintenance contracts



Key areas for improvement of energy performance:

- Identify behavioral actions
- Identify technical actions
- Identify organizational actions

Management of energy saving projects:

- Characterize the actions to reduce energy consumption
- Calculate the economical profitability of actions

Measuring and monitoring of energy performance:

- Identify and select Energy Performance Indicators (EPI)
- Establish a relevant measurement system consumption
- Analyze the data collected
- Identify available monitoring tools

Arguments on the energy performance approach to management and various services:

- Develop a business case, environmental, social and choose the appropriate means
- Associate the climate and energy context of the energy demand

Setting up a watch on developments of energy demand:

- Identifying the Best Available Technics
- Identify regulatory specificities

Development of its action plan:

- Prioritize ways of energy improvement
- Build its action plan, incorporating a metering plan and quantified monitoring EPI

Source: CETIM



APPENDIX 7 RESPONABILITIES MATRIX EXAMPLES AND FUNCTION SHEETS

Responsibilities Matrix Example:

	Energy referent	Management	Purchasing Manager	Production Manager
Inputs mapping and monitoring	R	C	C	C
Energy Dashboard	R	C		
Energy management program	R	R		
Evaluation	C	R		
Training	R C	C R	C	C
Purchases of energy efficient components	C	C I	R	
Technical improvement actions	C	C I	R	R
Energy efficiency in production	C	C		R

Legend: R = Responsible; C = Contributor; I = Information

Example of job description of a responsible Quality-Safety-Environment-Energy:

The Responsible Quality-Safety-Environment-Energy:

- Reports to Management
 - o the operation of system of management and any need for improvement
 - o energy performance
- Establishes and monitors QSEE planning elements
- Compiles and analyzes data from dashboard and process reviews and proposes improvements
- Identify the people who bring their support
- Participates in the development of the training plan in collaboration with the Human Resources
- Write and/or valid documents of the management system (manual, instructions) in ensuring their overall consistency
- Is responsible for the regulatory watch and ensures the inclusion of new texts
- Make a communication plan
- Ensures the advancement of the action plan
- Ensure the achievement of the internal audits
- Check the qualification and maintenance of qualification of internal auditors
- Organizes certification
- Increase awareness about policy and energy objectives
- Defines and communicates the responsibilities and authorities in order to promote the energy management system



Example of job description of a responsible maintenance including energy responsibilities:

The Maintenance manager oversees the maintenance and repair of equipment, and participates in the design of new facilities.

Tasks:

- Set priorities and develop the maintenance schedule (in connection with the production department)
- Establish, organize and monitor the preventive maintenance plan
- Fly the CMMS tool
- Manage response teams
- Monitor equipment and spare parts
- Provide expertise available to deal with contingencies in the functioning
- Identify technical solutions to improving equipment and facilities
- Manage outsourcing
- Manage the budget office; provide investment
- Participate in quality actions and the design of new installations
- Integrate research of the energy performance in all activities
- Propose improvements to management for efficiency and effectiveness
- Conduct regulatory and technical watch to ensure the regulatory compliance of facilities and equipment

Skills:

- Knowledge of Quality, Safety, Environment and Energy standards
- Control of the company's technologies
- Managerial capabilities
- Organizational and anticipation skills
- Ability to comply with the objectives
- Fluency in English



APPENDIX 8 COMMUNICATION

Goal:

Communication is an essential point for ensuring the information and involvement of all employees in the process

Content:

The display of the energy policy is the minimum required by the ISO 50 001 standard.

The display of key energy indicators allows to go further without it being too restrictive (adjust the update frequency indicators, e.g. quarterly).

Depending on its capabilities the company can also punctuate its communication by more regular information. In this case it may be useful to establish a communication plan (provisional schedule of themes in the year).

Tips & Advice:

- Reuse existing communication media*
- Ensure that the supports are attractive (simple and visual)
- Personalize communication by integrating photos of the company and its facilities
- Transpose consumption in household equivalent (annual consumption of the company equivalent to XX homes) or cost (equivalent to XX car)
- Enjoy significant events to communicate on energy (e.g. breaking news or news on the installation of new equipment, a new energy contract...)
- Set up a suggestion box to encourage suggestions
- Facilitate the identification of the actors of the approach (e.g.: photos and contacts of the energy team)

* In some countries, national or local energy agencies can provide companies with communication media:

- Spain: [e-learning on energy savings](#) (IDAE)
- Poland: [e-learning on energy savings](#) (Start2Act), [Guide for the implementation of investments improving energy efficiency](#) (PollSeff), [Information on the most energy-efficient products available on the market](#) (TopTen), [good practices on ISO 50001](#) (EMPI Project)
- France: [eco-responsible guide in the office](#) (ADEME), [eco-citizen guide in the office](#) (ADEME), [energy posters: a key position in industry](#) (ADEME), [eco-gestures guide in office 2016](#) (Lyon Local Energy Agency), [eco-gestures guide in office 2017](#) (Lyon Local Energy Agency).

Example:

Internal communication:

Documents	Supports	Time
Booklet home Job descriptions / Safety precautions Performance table with smiley Internal newsletter...	Panels display Intranet Video Monitors Suggestion boxes ...	Meetings team Welcoming new employees Important events...



External communication:

- On Energy Performance: "In one year, we saved 12% of the consumption of the process with our heat recovery investments on our machines."
- On energy management system: "We are the first company in our industry to be certified ISO 50 001," "The certification was granted to us without any non-compliance."

Communication plan:

	January	February	March	April	May	June	July	August	September	October	November	December
Policy												
Indicators	X			X			X			X		
Booklet home												
Breaking news	Heating			Lightning			Air conditioner			Process		



APPENDIX 9 DOCUMENTARY CONTROL

Goal:

Documentary control ensures the successful completion, implementation and conservation information about the energy management system.

Content:

The documents requested by ISO 50 001 and shape are detailed in the matrix below:

Summaring board of documentaries requirements of ISO 50 001			
ISO 50 001 requirements	Procedure	Document	Recording
4.1 overall requirements		EMS "perimeter and scope"	
4.2 management responsibilities			
4.3 energy policy		"documented and communicated"	
4.4 planning		"process of energy plan"	
4.4.3 energy review		"methodology and criterion of design review"	"energy review, periodically realized and keep the recording"
4.4.4 reference consumption			"must be updated and recorded"
4.4.6 objectives, targets and action plans		objectives and targets action plan	
4.5.2 skills, training and awareness			"kept appropriate recordings"
4.5.3 communication		Decision of external communication	
4.5.4.1 documentary requirements			"the documentation has to contain including the recordings of the present standard"
4.5.4.2 documentary control	control of the documentary procedure		
4.5.6 conception			" the results of the conception activities must be recording"
4.5.7 energy purchase		specification of purchase of energy	
4.6.1 monitoring measurement and analyses			"The results of monitoring and measure of the essential characteristics must be registered" "Recording of the calibration and other ways must be kept"
4.6.2 conformity assessment			"recording of the results of conformity assessments kept"
4.6.3 internal audits of EMS			"recording of audits results must be kept and presented to the management"
4.6.4 non-compliance, adjustment, adjustment actions and preventive			"keep the recording of corrective and preventive actions"
4.6.5 recording control			" establish and keep the recording..., measures taken for identification retreat preservation of the recording...readable recording identifications connected with activity"
4.7 management review			"recording of those management review must be kept"

**Tips & Advice:**

Due to the size of the companies, the documentation can be limited to the minimum. Only the procedure that organizes the documentation can be formalized.

All other documentation requirements can be satisfied by registering documentary proof of actions performed (energy policy, sheet registration at awareness, communication plan...).

Example: Documentary control procedure

This procedure aims to organize the documentation:

- In terms of structure: how to call the documents? What forms do they take (procedure / manual, instruction / set...)
- In terms of standard content: what should they contain? What is the typical frame?
- In terms of coding: reference, version, date
- In terms of management: who validates, who diffuses, who archives and how?



APPENDIX 10 SELF-EVALUATION AND INTERNAL AUDIT

Goal:

The purpose of conducting an internal audit is to test the management system before the certification audit in order to increase the chances of success. It consists of verifying that all the measures planned and implemented comply with the requirements of ISO 50 001.

Content:

A self-assessment checklist is provided to guide companies on the issues to be assessed during the internal audit.

An internal audit plan is also proposed in order to better organize it. It specifies the themes or processes evaluated and the people being audited.

Tips & Advice:

Prepare the internal audit well

Rely on people trained in internal audit

Ensure the availability of the persons audited

Take into account feedback from experience (on other repositories or other companies*)

** EE-METAL experience feedback: non-conformities and remarks observed during the certification of the 8 SMEs*

Chapter	NC / REM	Comments
4.4	Minor NC	The energy planning process is not documented
4.4.3	REM	It is suggested to apply more objective criteria for assignment of significance level of potential energy efficiency actions. To be evaluated.
	REM	Cost-effective analysis for an energy efficiency action was not documented. To be done.
	Minor NC	The organization must identify other relevant variables affecting significant energy uses.
4.4.5	REM	Other new adjustment factors have been proposed for some ENPIs. To be evaluated.
4.5.2	REM	Some blue-collar workers (related to significant use of energy) have not been trained. To be done.
	Minor NC	The organization shall ensure that any person(s) working for or on its behalf, related to significant energy uses, are competent on the basis of appropriate education, training, skills or experience.
4.5.3	REM	It is not clearly documented how energy policy is communicated externally. To be done.
4.5.7	Minor NC	The organization shall inform suppliers that procurement is partly evaluated on the basis of energy performance.
4.4.6	Minor NC	Plans, goals and tasks are not documented
4.6.1	REM	No thresholds of significant deviation have been defined for some ENPIs. To be done.
	Minor NC	There are secondary meters not included in the equipment list.
	Minor NC	The monitoring of the objectives is not evident.
	Minor NC	Using gas meters without calibration and verification
	Minor NC	Energy use is not monitored
	Minor NC	The secondary meters used do not have a calibration or verification certificate. To be obtained.
4.6.2	REM	Some legal requirements have not been verified. To be done.
4.6.3	REM	It is recommended to evaluate appropriate criteria of internal auditors, in order to guarantee impartiality of auditing process. To be evaluated.



Example of an internal audit plan:

COMPANY	
Standards: ISO 50001- 2011	Type of audit: INTERNAL
Auditor: First name Last name	Date of audit: XX/XX/XXXX
Site(s) to be audited (address):	
Field of the EMS:	

Hours	Themes / Process	Audited persons
8:30 am	Opening meeting	Management Energy Referent(s) Research Manager Purchasing Manager HR Manager
8:40 am to 9:30 am	4.1 General Requirements 4.2 Management Responsibility 4.2.1 Management 4.2.2 Management Representative 4.3 Energy policy	Management Energy Referent(s)
9:30 am to 11:00 am	4.4.2 Legal and Other Requirements 4.4.3 Energy Review 4.4.4 Reference consumption 4.4.5 Energy performance indicators 4.4.6 Energy objectives and targets, and energy management action plans	Management Energy Referent(s)
11:00 am to 11:30 am	4.5.2 Competence, Training and Awareness 4.5.3 Communication	Management Energy Referent(s) HR Manager
11:30 am to 12:00 am	4.5.4 Documentation 4.6.5 Control of Records	Energy Referent(s)
12:00 am	<i>Lunch break</i>	
1:30 pm to 3:00 pm	4.5.5 Operational control	Energy Referent(s)
3:00 pm to 3:30 pm	4.5.6 Design 4.5.7 Purchases of energy and energy services, products and equipment	Energy Referent(s) Research Manager Purchasing Manager
3:30 pm to 4:30 pm	4.6.1 Monitoring, Measurement and Analysis 4.6.2 Assessment of compliance with legal and other requirements 4.6.3 Internal Audit of the EMS 4.6.4 Non-conformities, corrections, corrective actions and preventive actions 4.7 Management review	Energy Referent(s)
4:30 pm to 5:00 pm	Drafting of the audit report	Auditor
5:00 pm	Closing meeting	Management Energy Referent(s) Research Manager Purchasing Manager HR Manager
5:30 pm	End of the audit day	



Example of a self-evaluation checklist:

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

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

Legal and Other requirements			
Requirements	Conformity		
	Yes	No	N/A
1. Has a procedure been developed and implemented to identify applicable regulatory, legal and other requirements?			
2. Has the organisation identified, implemented, and access to the applicable legal requirements and other requirements, which are related to the energy use consumption and efficiency?			
3. Has the organisation determined how the applicable legal requirements and other requirements apply to its energy use, consumption and efficiency?			



4. Are current copies of all applicable regulatory and other requirements accessible to personnel as necessary?			
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Energy Review, Energy Baseline, and Energy Performance Indicators (EnPI's)			
Requirements	Conformity		
	Yes	No	N/A
1. Has a procedure been established, implemented and maintained to identify the baseline and Energy Performance indicators?			
2. Has energy baseline related to potential significant energy use been considered in establishing and implementing the EnMS?			
3. Has the organisation identified the areas of significant energy use?			
4. Has the organisation determined the current energy performance related to identified significant energy uses?			
5. Are all significant energy uses controlled by objectives, targets, and programmes, procedures or monitoring?			
6. Has the organisation identified other relevant variables affecting significant energy uses?			

Energy Objectives, Energy Targets and Energy Management Action Plans			
Requirements	Conformity		
	Yes	No	N/A
1. Have documented energy objectives and targets been established at relevant functions and levels within the organisation?			
2. Are the energy objectives and energy targets specific, measurable, concrete and understandable?			
3. Are the objectives and targets consistent with the energy policy?			
4. Has an energy performance evaluation system been established to periodically review the achievement of the objectives and targets?			
5. Have action plans including the following items for the achievement of energy objectives and targets been established and implemented?			
· Designation of responsibility for achieving objectives and targets at each relevant function and level of the organisation			
· The means and time-frame by which the programmes are to be achieved			
· The statement of the method by which an improvement in energy performance ³ shall be verified;			
· The statement of the method of verifying the results of the action plans			
6. Have the action plans been documented and updated at defined intervals?			



Competence, Training and Awareness

Requirements	Conformity		
	Yes	No	N/A
1. Are all the personnel, related to significant energy uses, competent on the basis of appropriate education, training, skills or experience?			
2. Have training needs associated with the control of its significant energy uses and the operation of its EnMS been identified?			
3. Have procedures been established to assure that all the personnel working for or on behalf of the organisation are aware of			
• the importance of conformity with the energy policy, procedures and the requirements of the EnMS?			
• their roles, responsibilities and authorities in achieving the requirements of the EnMS?			
• the benefits of improved energy performance?			
• the impacts, actual or potential of their activities and how their activities and behaviour contribute to the achievement of energy objectives and targets and the potential consequences of departure from specified procedures?			
4. Are training records, certificates and licenses maintained to demonstrate the competence?			

Communication

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

Documentation

Requirements	Conformity		
	Yes	No	N/A
1. Have the core elements of the EnMS and their interaction been documented in paper and/or electronic form?			
2. Are the following EnMS elements documented?			
• Scope and boundaries of the EnMS			
• Energy policy			
• Energy objectives, targets and action plans; and			
• Documents required by ISO 50001, e.g. energy review			



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

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

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

Procurement of Energy Services, Products, Equipment and Energy			
Requirements	Conformity		
	Yes	No	N/A
1. Have the criteria for assessing energy use, consumption and efficiency over the lifetime of the product, equipment or service been established and implemented?			



2. Are specifications for items being purchased clearly defined and documented in the energy performance related requirements?			
3. Have energy performance related requirements been communicated to suppliers?			
4. Have suppliers been made aware that energy performance is part of the evaluation criteria?			

Monitoring and Measurement

Requirements	Conformity		
	Yes	No	N/A
1. Have procedures been documented and implemented to monitor the following key characteristics of operations that can have significant impacts?			
· Significant energy uses and other outputs of the energy review			
· Relevant variables related to significant energy uses;			
· Energy performance indicators (EnPIs);			
· Effectiveness of the action plans in achieving objectives and targets;			
· Evaluation of actual versus expected energy consumption.			
2. Are records available to track performance and conformity with the key characteristics?			
3. Has the energy measurement plan been defined and implemented?			
4. Are all monitoring equipment appropriately maintained and calibrated?			

Evaluation of Compliance

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

Internal Audit

Requirements	Conformity		
	Yes	No	N/A
1. Have internal audit procedures been developed and implemented?			
2. Has the internal audit schedule been developed?			
3. Are the internal audits conducted to ensure that the EnMS			
• conforms to planned arrangements for energy management according to ISO 50001 standard requirements?			
• conforms with the energy objectives and targets established?			



• is effectively implemented and maintained, and improves energy performance?			
4. Are audit reports and records documented?			
5. Are the auditors conducting the audits competent and in a position to conduct the audits objectively and impartially?			

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

Control of records			
Requirements	Conformity		
	Yes	No	N/A
1. Have procedures been established and implemented for the identification, retrieval and retention of records?			
2. Are records legible, identifiable and traceable to the relevant activities?			



<p>3. Does the organisation retain the following records?</p> <ul style="list-style-type: none"> • Training records; • Audit results; • Management review records; • Information on applicable energy laws and other requirements; • Inspection, maintenance and calibration records; • Information on significant energy use and energy performance indicators; • Procurement records; • Permits; • Monitoring data; • Details of non-conformities, incidents, complaints and follow-up actions; • Contractors and suppliers records; • Process and product information. 			
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Management Review			
Requirements	Conformity		
	Yes	No	N/A
1. Do periodic management reviews take place to ensure the continuing suitability, adequacy and effectiveness of the EnMS?			
2. Are management review records retained?			
<p>3. Are the management reviews carried out based on the following documents or information?</p> <ul style="list-style-type: none"> • EnMS audit reports; • Evaluation of compliance with legal requirements and other requirements to which the organisation subscribes; • Achievement of EnMS objectives and targets; • Communications and complaints on EnMS internally; • Energy policy; • Energy performance and related Energy performance indicators (EnPIs) of the organisation; • Status of corrective and preventive actions; • Follow-up actions from previous management reviews; • Projected energy performance of the following period; • Changing circumstances, including developments in legal and other requirements related to its energy use; and • Recommendations for improvement. 			
<p>4. Are the management reviews included in the decisions or actions related to:</p> <ul style="list-style-type: none"> • Energy performance of the organisation; • Energy policy; • Energy performance indicators (EnPIs); • Objectives and targets of the EnMS; and • Allocation of resources. 			

Source: TÜV UK



APPENDIX 11 MANAGEMENT REVIEW

Goal:

The management aims to continuous improvement in materializing the complete overhaul of the management system in reaching the objectives, but also in the relevance of the system itself.

It should allow to judge:

- The relevance of the EMS (e.g. relevance of the scope with activity, suitable size of the EMS, proportionate in relation to issues?)
- The adequacy of the EMS (e.g. financials, humans, technical resources in consistent with the expected and achieved results)
- The effectiveness of the EMS (e.g. to follow and made action plans, relevance of audits and effectiveness of corrective actions?)

Content:

Comparative board by baseline for the requirements of management review

	ISO 50 001	ISO 14 001	ISO 9 001
Review the EMS	At planned intervals make sure that it is relevant, adequate and effective	<ul style="list-style-type: none"> * At planned intervals make sure that it is relevant, sufficient and effective * Opportunities evaluation of improvement, the need of changes 	<ul style="list-style-type: none"> * At planned intervals make sure that it is relevant, adequate and effective * Opportunities evaluation of improvement including changes QMS, policy and objectives
Recording	Kept the management review <ul style="list-style-type: none"> * Monitoring of the previous management review actions * Review of the energy policy 	Kept the management review <ul style="list-style-type: none"> * Results of internal audits and conformity assessment 	Kept the management review <ul style="list-style-type: none"> * Audits results
Impute elements of the management review	<ul style="list-style-type: none"> * Review of the energy performance and the EPI * Results of conformity assessment * The degree of the objectives and targets <ul style="list-style-type: none"> * Results of the EMS audits * State of progress of the preventives and correctives measures * Energy performance in the coming period * Improvement recommendations 	<ul style="list-style-type: none"> * Information of interested parts and complaints * Environmental performance * Achievement level of the objectives and targets * Monitoring of the decided actions during the previous management reviews * Changes of circumstances and developments <ul style="list-style-type: none"> * Improvement recommendations 	<ul style="list-style-type: none"> * State of progress of the preventives and correctives measures * Actions stemming from previous reviews <ul style="list-style-type: none"> * Changes which can affect the QMS * Improvement recommendations
Output elements of the management review	Any decision or action connected to : <ul style="list-style-type: none"> * The modifications of the energy performance * The modifications of the energy policy <ul style="list-style-type: none"> * The EPI modifications * Modifications of the objectives and targets <ul style="list-style-type: none"> * Modifications of resources affectation 	Any decision or action connected to : <ul style="list-style-type: none"> * The modifications of the environmental policy, objectives and targets and other elements 	Decisions and actions relative to improvement of the efficiency of QMS, of the product in report with the customers requirements and the needs in resources



Tips & Advice:

Prepare properly the meeting (if necessary prepare a PowerPoint)

Validate collegially each agenda item

Submit a maturity grid to situate themselves in relation to the requirements of the standard

Example: System Maturity Grid

Level 1: The system meets the requirements and is effective (mainly objectives achieved)

Level 2: Management practices exceed the requirements (all objectives are achieved)

Level 3: Practices and results are similar to the best references of the profession and the resources to achieve them are optimized.