Energy Management Systems

STEEEP – Training

Vienna, April 30th, 2014

Sonja Starnberger, MSc

Energieinstitut der Wirtschaft GmbH

Co-funded by the Intelligent Energy Europe Programme of the European Union

Content

- What is Energy Management
- Benefits of Energy Management Systems
- Overview Energy Management Standard ISO 50001
  - Development
  - Structure and Requirements
  - Synergies with other Management Systems
  - Experiences with Implementation
  - Future Perspectives

What is Energy Management? – Some definitions:

- „Energy management is the systematic use of management and technology to improve an organisation's energy performance.
  It needs to be integrated, proactive, and incorporate energy procurement, energy efficiency and renewable energy to be fully effective“
  (Carbon Trust Energy Management Guide – see links)

- *“Energy management is the sum of measures planned and carried out to achieve the objective of using the minimum possible energy while the comfort levels (in offices or dwellings) and the production rates (in factories) are maintained.“*
  (www.energyoffice.org)

Benefits of energy management

ENERGIEINSTITUT
DER WIRTSCHAFT GmbH

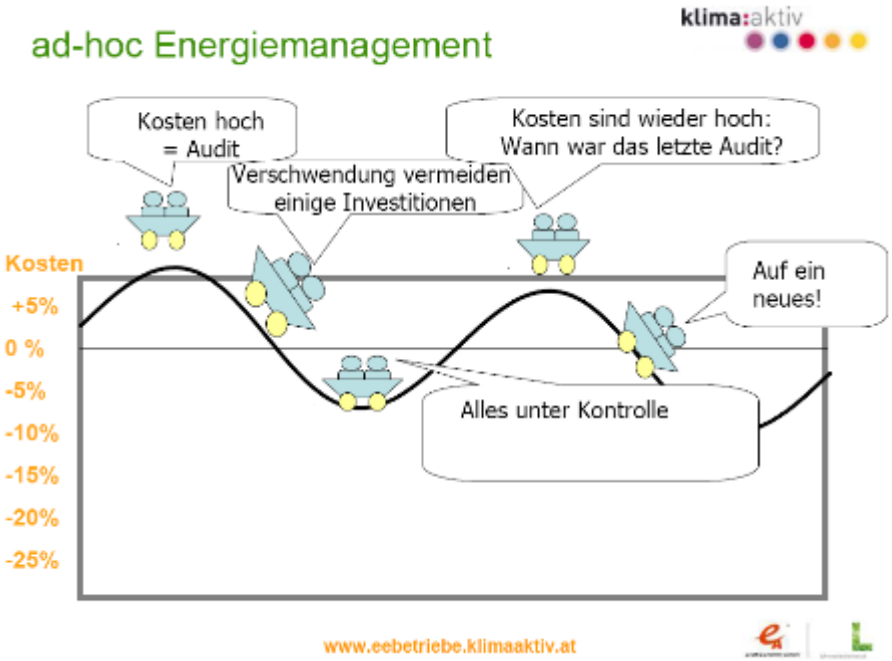
- Cost reduction
- Environment protection, doing business sustainably
- Positive image

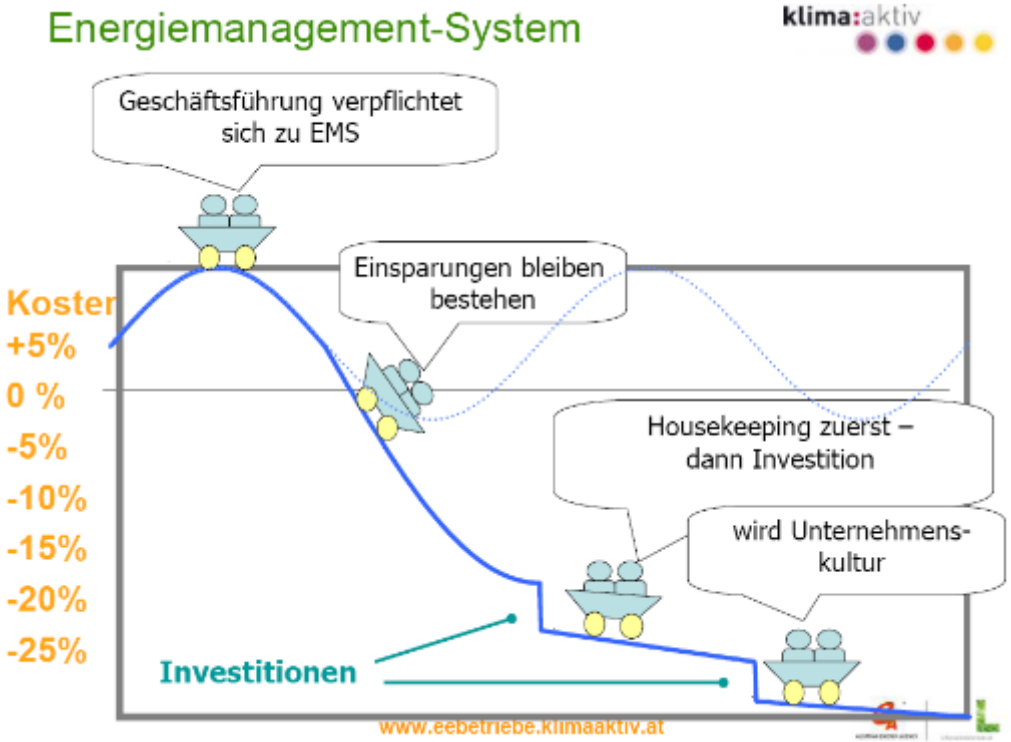
Achieved by

- Measuring and monitoring of energy cost
- Knowledge about energy flow and allocation to individual processes/machines
- Identification of savings potentials, continuous follow-up
- More transparency about energy relevant processes → optimisation, verification of correct execution
- Raise awareness of energy topics among staff
- **Energy conscious behaviour becomes daily routine!**

Benefit of Energy Management Systems

ENERGIEINSTITUT
DER WIRTSCHAFT GmbH





Source: AEA/ klima:aktiv /www.eebetriebe.klimaaktiv.at

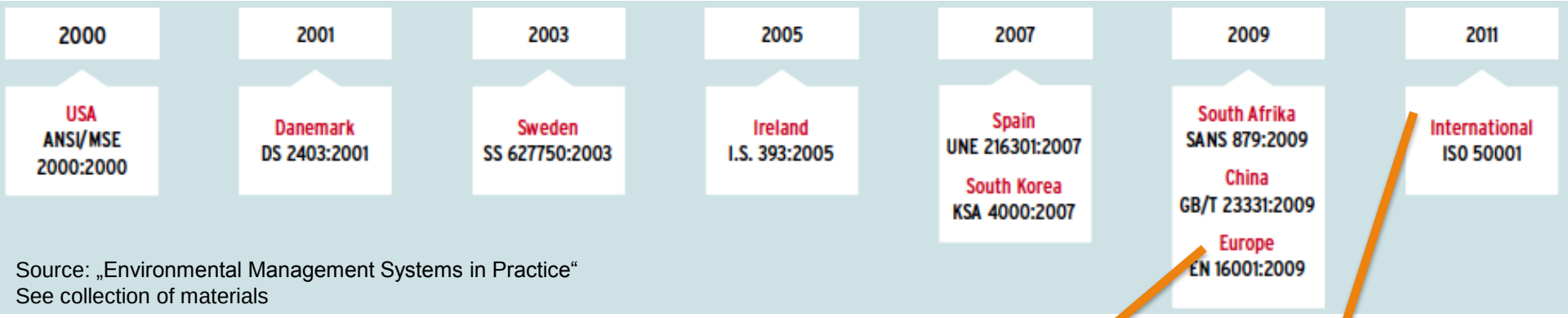
Energy Management Standard ISO 50001

- **Purpose:** Enable organisations to establish the systems and processes necessary to **improve energy performance** (includes energy efficiency, use and consumption)

- For all types and sizes of organisations

- DOES NOT prescribe absolute requirements/targets regarding energy performance
  (except adherence to legal obligations and other requirements that the company has subscribed to)

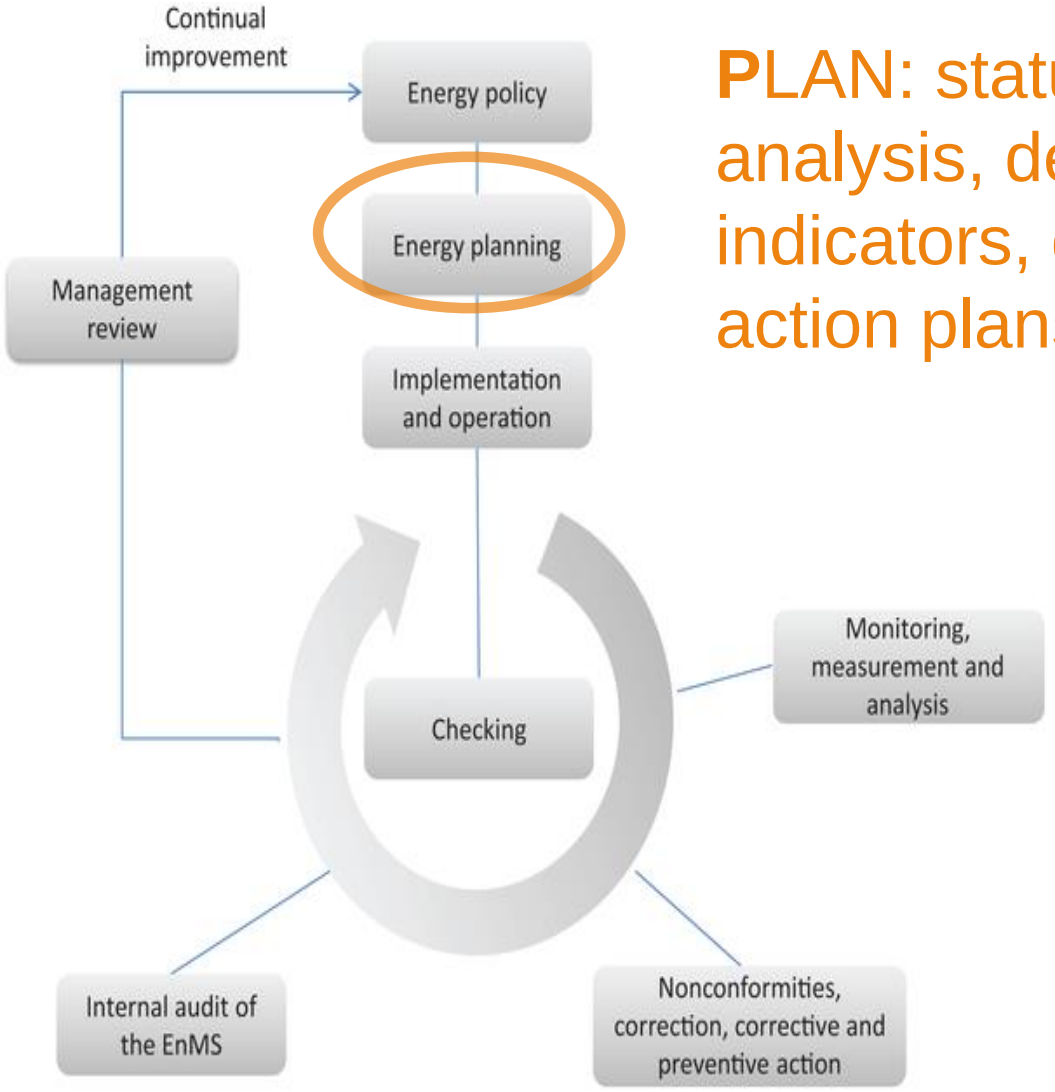
Energy Management Standard ISO 50001 - Development



Source: „Environmental Management Systems in Practice“
See collection of materials

- EnMS as prerequisite for tax reductions (e.g. Sweden, Denmark,...) ➔ Increasing number of national standards
- European Standard ISO 16001
- Replaced by international Standard ISO 50001„Energy management systems – Requirements with guidance for use“
- Text in national language can be purchased from the national standardisation bodies

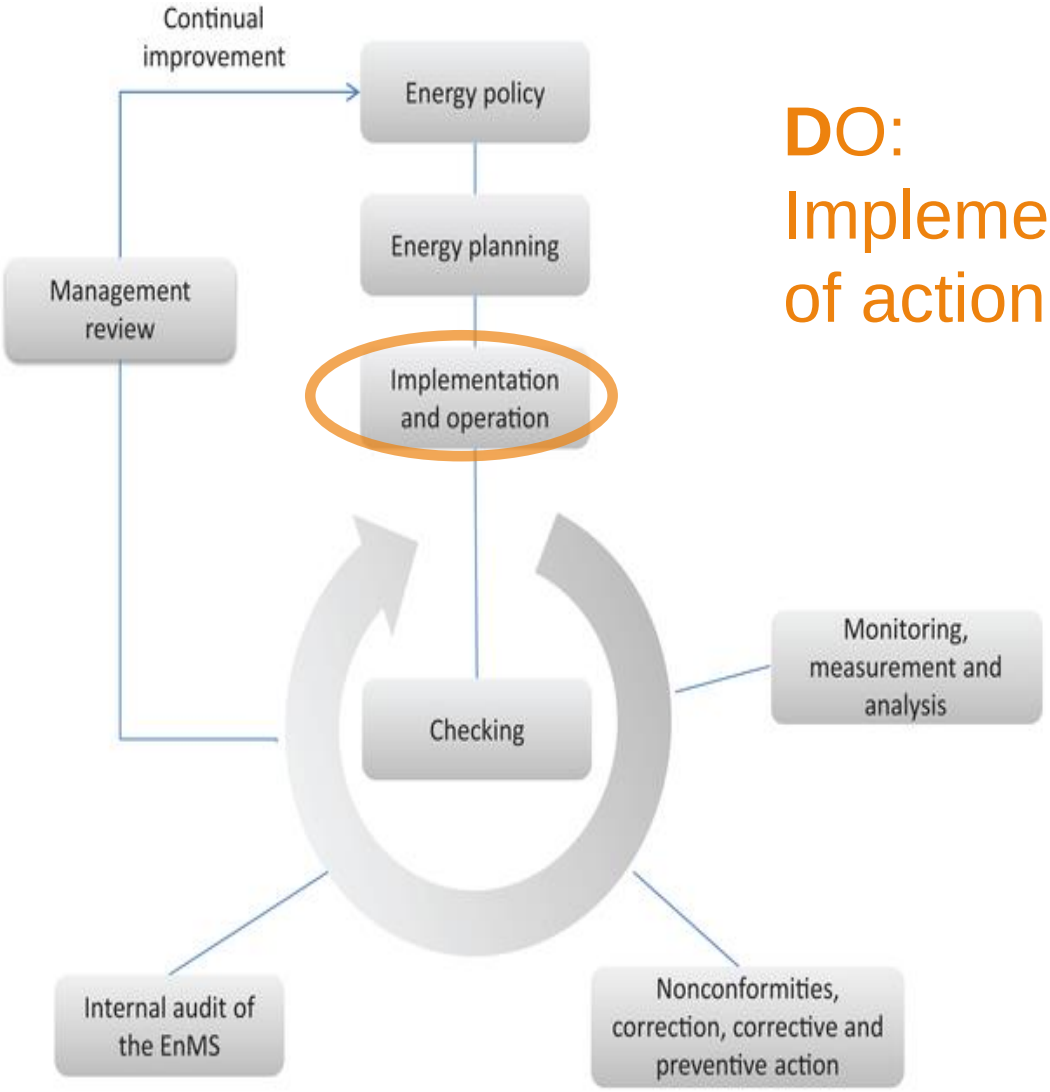
ISO 50001: Structure based on Plan-Do-Check-Act Cycle



PLAN: status quo analysis, define indicators, goals and action plans

Source: iso.org – Online Browsing Platform

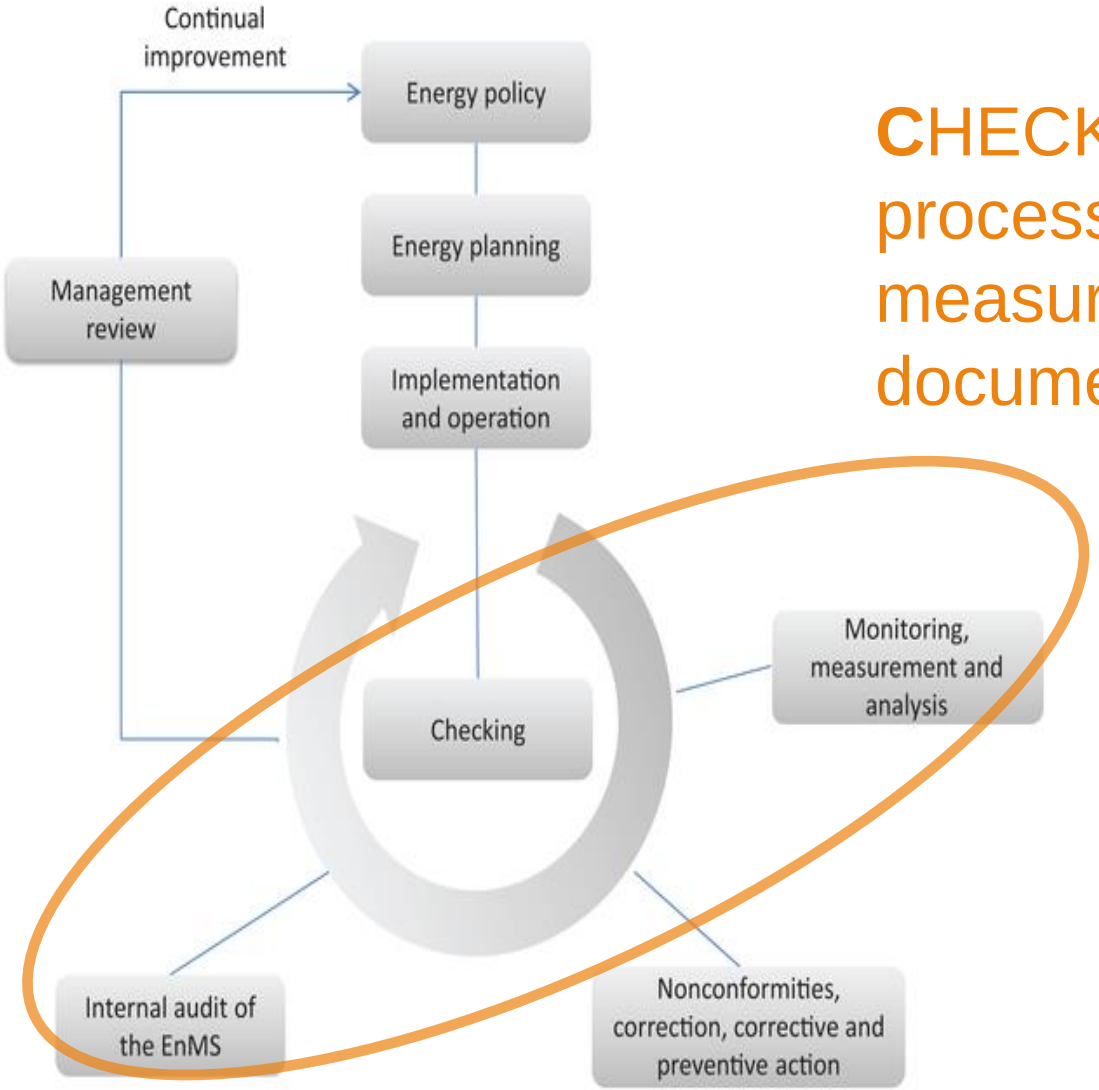
ISO 50001: Structured according to PDCA - Cycle



DO:
Implementation of action plans

Source: iso.org – Online Browsing Platform

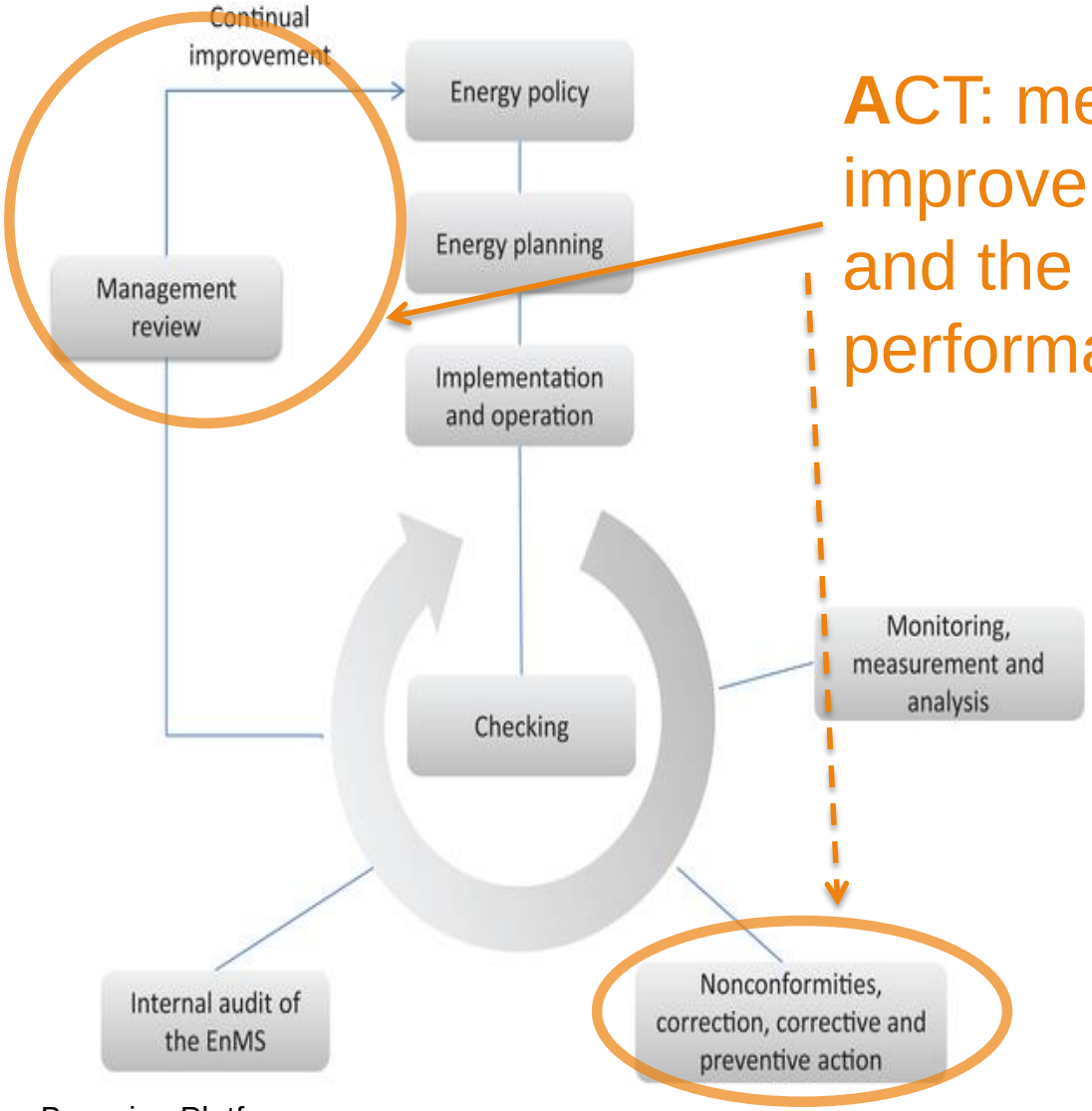
ISO 50001: Structured according to PDCA - Cycle



CHECK: monitor processes, measure results, documentation

Source: iso.org – Online Browsing Platform

ISO 50001: Structured according to PDCA - Cycle

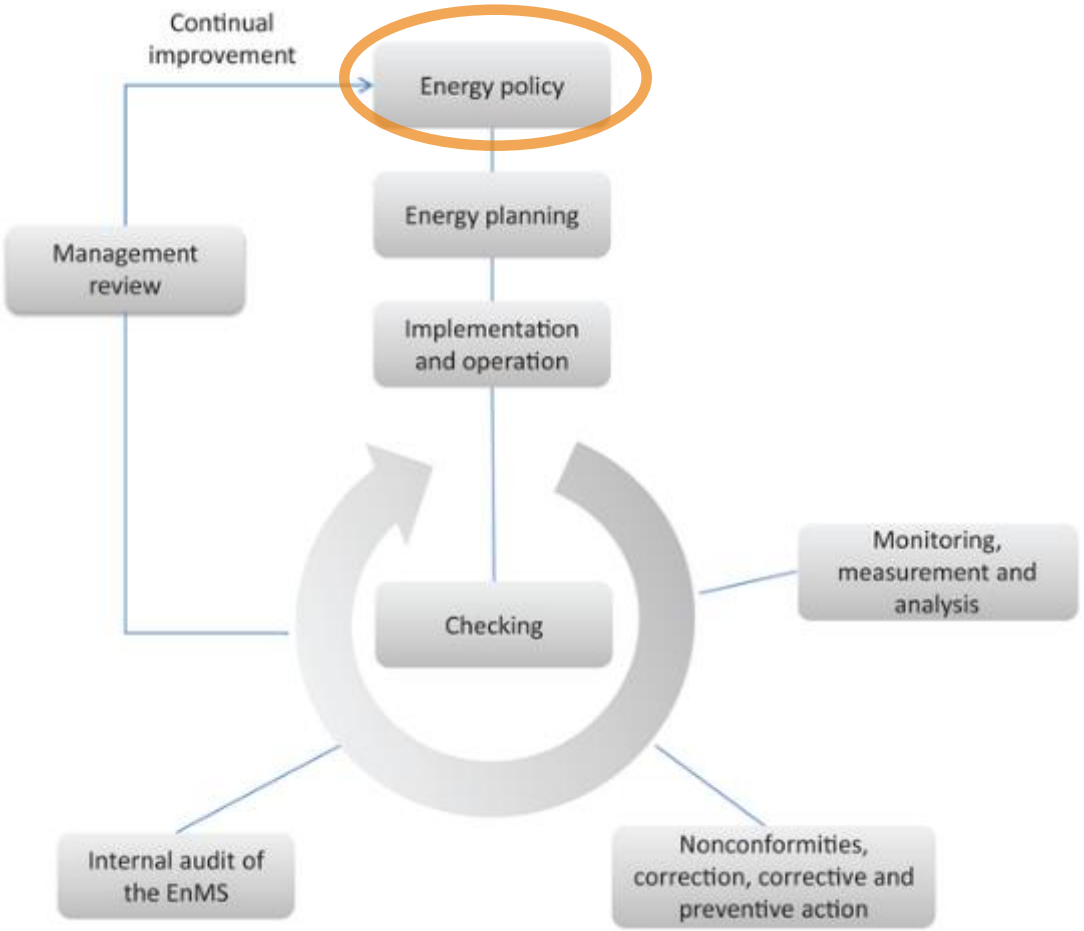


ACT: measures to improve the EnMS and the energy performance

Source: iso.org – Online Browsing Platform

ISO 50001 – Requirements (highlights)

Numbering of sections is not consecutive, as it corresponds to numbering of chapters in EN ISO 50001 standard



Source: iso.org – Online Browsing Platform

Starting point: 4.3 Energy policy

- „Declaration of intent“ / commitment of organisation to improve energy performance / „High level document“

- Top-Management is responsible to ensure the energy policy meets the criteria stipulated in the norm : The Energy policy
  - ....incudes a commitment to
    - Continuously improve energy performance
    - Conform to legal obligations related to energy use, consumption and efficiency, as well as to other requirements the organisation subscribes to („legal compliance“)
    - Make available resources and information necessary to reach targets
  - ...is the framework for defining and monitoring energy targets
  - ...supports consideration of energy aspects in purchasing
  - ...is documented and communicated within organisation
  - ...is regularly reviewed and updated if necessary

ENERGIEINSTITUT
DER WIRTSCHAFT GmbH

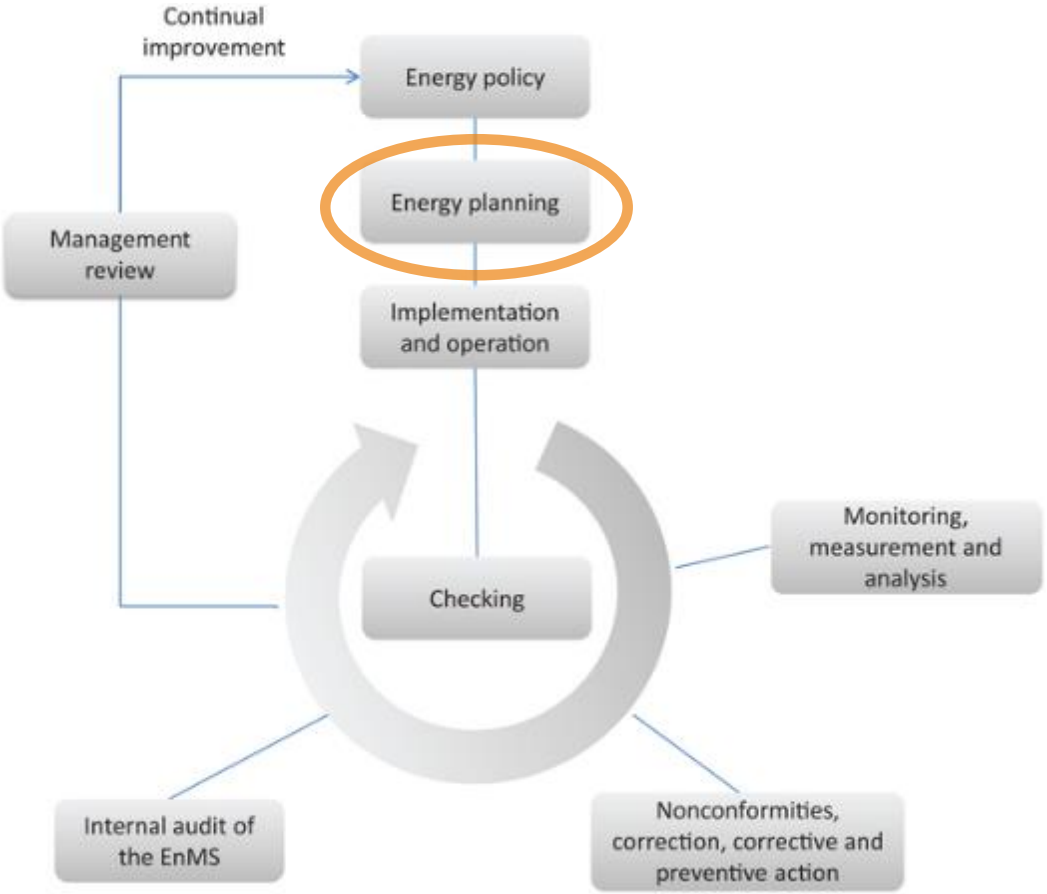
Example:

IBM ENVIRONMENTAL AFFAIRS POLICY

IBM is committed to environmental affairs leadership in all of its business activities. IBM has had long-standing corporate policies of providing a safe and healthful workplace, protecting the environment, and conserving energy and natural resources, which were formalized in 1967, 1971 and 1974, respectively. They have served the environment and our business well over the years and provide the foundation for the following corporate policy objectives:

- Provide a safe and healthful workplace and ensure that personnel are properly trained and have appropriate safety and emergency equipment.
- Be an environmentally responsible neighbor in the communities where we operate, and act promptly and responsibly to correct incidents or conditions that endanger health, safety or the environment. Report them to authorities promptly and inform affected parties as appropriate.
- Conserve natural resources by reusing and recycling materials, purchasing recycled materials, and using recyclable packaging and other materials.
- Develop, manufacture and market products that are safe for their intended use, efficient in their use of energy, protective of the environment, and that can be reused, recycled or disposed of safely.
- Use development and manufacturing processes that do not adversely affect the environment, including developing and improving operations and technologies to minimize waste; prevent air, water, and other pollution; minimize health and safety risks; and dispose of waste safely and responsibly.
- Ensure the responsible use of energy throughout our business, including conserving energy, improving energy efficiency, and giving preference to renewable over nonrenewable energy sources when feasible.
- Participate in efforts to improve environmental protection and understanding around the world and share appropriate pollution prevention technology, knowledge and methods.
- Utilize IBM products, services and expertise around the world to assist in the development of solutions to environmental problems.
- Meet or exceed all applicable government requirements and voluntary requirements to which IBM subscribes. Set and adhere to stringent requirements of our own no matter where in the world the company does business.
- Strive to continually improve IBM's environmental management system and performance, and periodically issue progress reports to the general public.
- Conduct rigorous audits and self-assessments of IBM's compliance with this policy, measure progress of IBM's environmental affairs performance, and report periodically to the Board of Directors.

Every employee and every contractor on IBM premises is expected to follow this policy and to report any environmental, health or safety concern to IBM management. Managers are expected to take prompt action.



Source: iso.org – Online Browsing Platform

4.4 Energy planning

- 4.4.2. **Legal and other requirements**
  related to energy performance of company
  - must be identified and accessible
  - their impact on organisation must be clear
  - must be complied with and taken into consideration for EnMS
  - Must be checked regularly
  - ➡ Not just laws and prescriptions by operation permits etc, but also „self-committed obligations“, e.g.resulting from voluntary agreements
  - ➡ Recommendation: make „legal register“ and update regularly (incl. responsible person, date of next required report, etc.)
  - ➡ Useful tools: Newsletters, specific databases, external providers with good sectoral and legal knowledge who offer regular screening of legislation as a service

4.4.3. **Energy Review** („Status quo analysis“)

This includes

- Analysis of energy consumption and use (energy sources used, quantities and costs, current and previous periods)
- Identify areas with significant energy use (Which machines, processes, persons? Which other factors are influential? What is current energy performance? Estimate of future energy use)
- Identify improvement opportunities, prioritise and record them. (e.g. measures to increase energy efficiency, to use renewable energy sources, to negotiate energy prices, to implement load management etc.)

➡ Is a major effort, but is worth the time spent, as it may be possible to immediately implement some of the identified savings opportunities.

➡ It can be useful to enlist an external consultant for this step, especially in smaller organisations with limited technical know-how.

4.4.4. **Energy baseline**

- Is a „starting point“ or a „description of the status quo“, which is defined based on the data from the energy review. The baseline will be used to compare energy performance of future periods and measure improvements. (Also with the help of energy performance indicators – EnPI, – see 4.4.5)
- To define the baseline, an appropriate time period should be chosen, e.g. data for a year, with normalisation factors.
- Baseline must be adjusted, if
  - processes or energy systems are considerably changed
  - EnPIs are no longer representative for the organisation
  - or according to some predefined schedule/method.

4.4.5. **Energy Performance Indicators (EnPI)**

- Appropriate EnPIs shall be identified, and methodology recoded.
- EnPIs shall be regularly reviewed and compared to energy baseline

➡ Comparability between periods is important: try to account for the influence of weather (heating degree days) and activity level (amount of product produced in period, number of hotel nights etc.…)

➡ Use specific indicators, e.g. energy use per production amount, per employee, per m^2 of conditioned surface,…

➡ Where useful, separate indicators for individual processes or areas of the company.

➡ Examples:

Specific energy consumption	$\frac{\text{total energy consumption}}{\text{production quantity}}$
Energy intensity	$\frac{\text{energy consumption of product in kWh}}{\text{total energy consumption in kWh}}$
Specific energy costs	$\frac{\text{total energy costs in } \textit{Euro}}{\text{total production costs in } \textit{Euro}}$

Source: EMAS Energy Efficiency Toolkit – see collection of links

4.4.6. **Energy objectives, targets, and EnM action plans**

- Organisation has to define and **record energy objectives and targets** that are in line with the energy policy for the relevant processes/facilities/functions, and set a timeframe for their achievement.

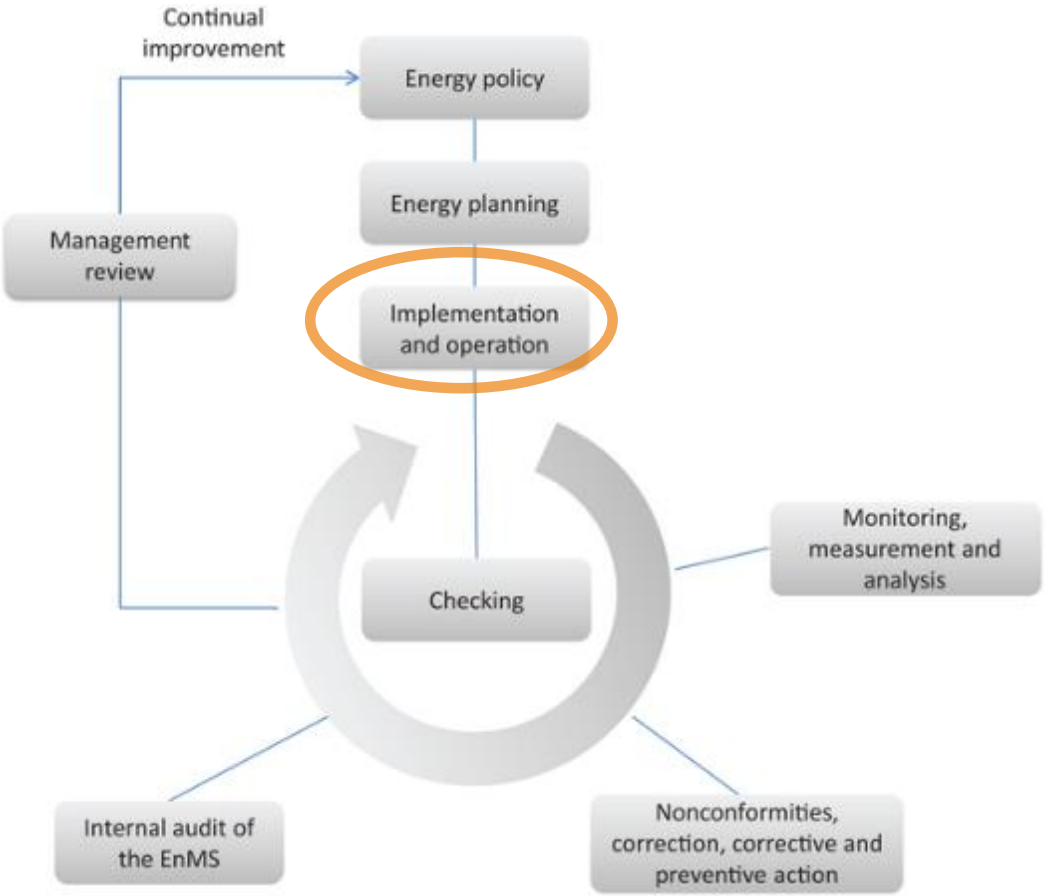
➡ Results from energy review (legal requirements, areas with main energy consumption, identified improvement options) must be considered, as well as business and financial framework conditions, technological options, stakeholder views.

- The **action plans** define what will be done to reach those targets. They must be regularly updated and must include
  - Who is responsible
  - Available resources (funds…) and time
  - How will results be measured
  - How will improvement in energy performance be verified

Example: Energy objectives, targets & programmes

Energy aspect	Objective	Target	Programme	Indicator(s)	Monitoring and measurement
General wash-up in dairy processing plant	Reduce warm water usage.	Reduce warm water usage in litre/m2 by 5% of current levels within 1 year.	Replace hose nozzles with more efficient models. Ensure solid waste residues on floor are swept up instead of flushed away. Ensure leaks are detected and fixed. Raise awareness.	Warm water usage in litre/m2 p.a. Mean temperature of water.	Bi-weekly monitoring of warm water usage for cleaning. Regular monitoring of water temperature. Spot checks on operators.
Heating and cooling in connection with processing of a product (food, chemicals, medical etc.).	Reduce energy used in heating (fuel based steam) and cooling (outside air ventilated though the material).	Reduce energy consumption to the minimum required to perform the aim of the processing (changing the structure and/or contents of the material processed).	Install more accurate temperature measuring equipment. Improve process management. Train those responsible for controlling the process. Install energy efficient ventilators & motors. Install frequency steering on ventilator motors. Reduce air leakage in vent. system	Use of fuel per ton processed. Use of electricity per ton processed.	Daily or weekly monitoring of steam or fuel usage (frequency depending on potentials). Daily or weekly monitoring of electricity used for ventilation.

Source: Technical Guideline I.S. 16001:2009 – Sustainable Energy Ireland



Source: iso.org – Online Browsing Platform

4.5.2. **Competence, training, and awareness**

- Staff and other persons working on behalf of the company and whose activities are related to signifigcant energy uses, must have sufficient competence (coming from their experience, education or training) with respect to control of the significant energy uses.
- Organisation must identify training needs and take actions to meet those needs
- All persons must be aware of
  - Benefits of improved energy performance
  - Importance of the energy policy, the procedures and requirements of EnMS
  - Their own impact on energy use, and the contribution they can make to the achievement of targets
  - Their role and responsibilities in the framework of the EnMS

➡ Example: Team training days & inclusion of info in „starter package“ for new employees.

4.5.3. **Communication**

- INTERNAL = MUST
  - Communication about energy performance and EnMS
  - Internal suggestion scheme for improvements must be implemented

- EXTERNAL = OPTIONAL
  - Organisation can choose, if they want to communicate externally about any aspects of their EnMS. The result of this decision must be recorded
  - If the organisation decides to communicate externally, a method for this shall be established and implemented.

- 4.5.4. **Documentation**
  - 4.5.4.1. **Documentation requirements**
    - Describes „*Core elements of the EnMS and their interaction**“
    - References what needs to be documented/recorded are distributed over text but no „definitive“ list. Compilation see next slide
    - ➡ Level of detail can be different, according to organisation size and complexity.

  - 4.5.4.2. **Control of documents**

Documents required by the standard and the EnMS must be controlled, i.e. there must be a procedure to regulate approval of documents, actualisation, how to ensure only up-to-date versions are in circulation, archiving etc.

*Quote from ISO 50001 standard text

EnMS Documents	Necessary records concerning...
EnMS documentation	Appointment of an energy manager/energy team
Scope and boundaries of the EnMS	Energy review
Energy policy	Energy baseline
Energy planning process	Methodology for defining and updating your EnPIs
Methodology and criteria for the energy review	Training needs and measures
Action plans	Design results
Strategic and operational objectives	Monitoring results and evaluation of "key characteristics"
Requirements for the purchasing of energy	Calibration of measurement equipment and analogous measures
Energy measurement plan	Results of investigation into significant deviations
Audit plan	Results of evaluation of noncompliance with regulations and commitments
	Results of audits
	Corrective and preventative measures
	Proof of conformity of the EnMS
	Energy performance results
	Management review

Documents: Plans, descriptions of procedures, „how something is done"
Record: Snapshot of how the situation was at a certain time – e.g. data from a certain day, proof that a training has taken place, etc.

Source: „Environmental Management Systems in Practice"
See collection of materials

This should not happen!

Cartoon from: EU-Commission, EMAS Toolkit for Small Organisations

4.5.5. **Operational control**

- Those activities (operation, maintenance) with relevance for energy performance shall be planned, so that they are carried out unter specified conditions.
  - Elaborate criteria for effective operation and maintenance of those activities, if lack of such criteria would lead to deviation from energy performance
  - Operate those facilities/processes according to plan.
  - Communication about operational controls to staff and relevant 3rd parties

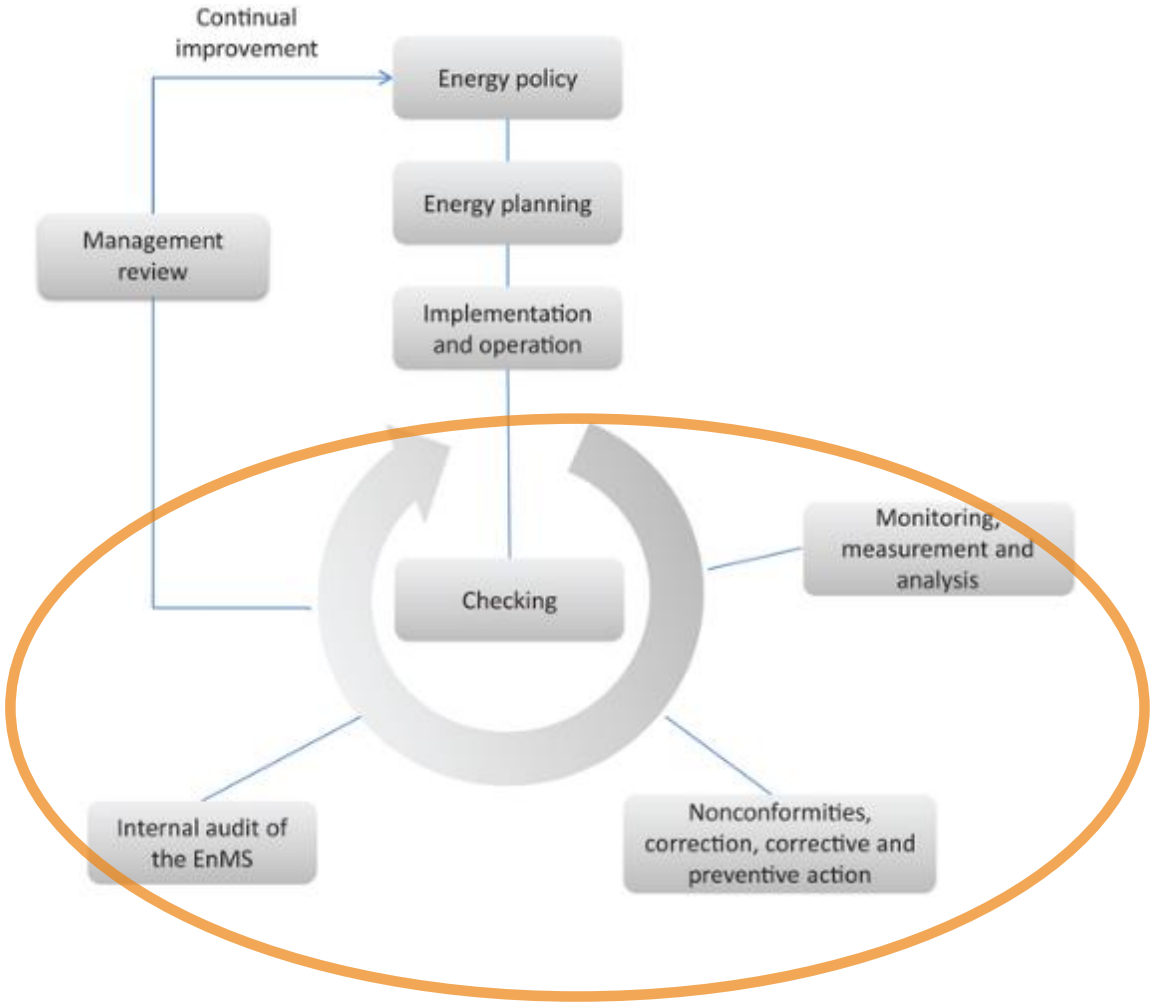
Example: Operational controls & monitoring

Energy aspect	Programme	Indicator(s)	Operational control	Monitoring and measurement
General wash-up in dairy processing plant	Replace hose nozzles with more efficient models. Ensure solid waste residues on floor are swept up instead of flushed away. Ensure leaks are detected and fixed. Raise awareness.	Warm water usage in litre/m2 p.a. Mean temperature of water.	Specification for fitting new nozzles. Work instruction for floor cleaning. Procedure for detecting, reporting and fixing leaks. Basic instruction in basic correct floor cleaning.	Bi-weekly monitoring of warm water usage for cleaning. Regular monitoring of water temperature. Spot checks on operators.
Heating and cooling in connection with processing of a product (food, chemicals, medical etc.).	Install more accurate temperature measuring equipment. Improve process management. Train those responsible for controlling the process. Install energy efficient ventilators & motors. Install frequency steering on ventilator motors. Reduce air leakage in vent. system	Use of fuel per ton processed. Use of electricity per ton processed.	Specify max. and min. temperatures in connection with heating of the processed material. Specify max. and min. temperatures in connection with cooling of the processed material.	Daily or weekly monitoring of steam or fuel usage (frequency depending on potentials). Daily or weekly monitoring of electricity used for ventilation.

Source: Technical Guideline I.S. 16001:2009 – Sustainable Energy Ireland

- 4.5.6. **Design**
  - In the design of new facilities, equipment, systems and processes, or in case of renovation, the organisation must take opportunities for the improvement of energy performance into account.

- 4.5.7. **Procurement**
  - **…of energy servies, products, equipment with influence on energy performance**
    - Organisation must define criteria regarding energy consumption/use, etc.
    - Suppliers must be informed, that energy efficiency influences the purchasing decision.
  - **…of energy**
    - Organisation must define specifications „suitable for“ „effective energy use“.



Source: iso.org – Online Browsing Platform

4.6.1. **Monitoring, measuring, and analysis**

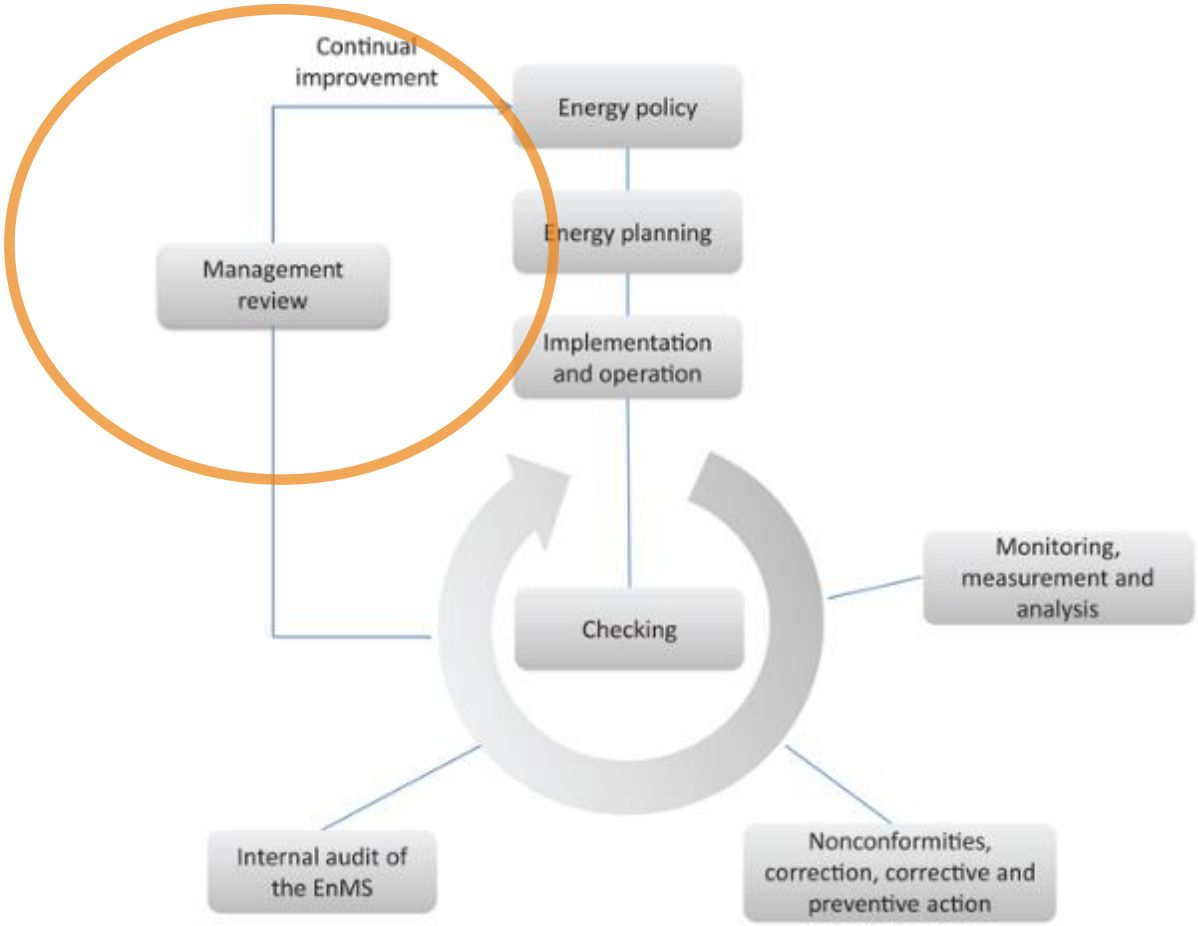
- Main factors influencing energy performance must be regularly monitored, measured and analyzed. At least:
  - Main energy users and relevant influencing factors
  - EnPIs
  - Degree of achievement of targets
  - Current energy consumption compared to plans
- A plan for energy measurements has to be established
  Level of detail and degree of sophistication can vary according to company size and activities!

- 4.6.2. **Evaluation of compliance with legal and other requirements**
  - Must take place regularly

- 4.6.3. **<u>Internal</u> Audits of EnMS**
  - Aim: ensure EnMS conforms to requirements of standard, is effective and is being improved.
  - Must take place in planned intervals (e.g. annually), consider relevance of the areas and results of previous audits
  - Results must be recorded and reported to Top Management
  - Important: objectivity – can be person from within company (e.g from different department, or similar department in different location) or external consultant

- 4.6.4. **Nonconformities, correction, corrective action and preventive action**
  - Check for potential or actual nonconformities and find out reasons
  - Evaluate what needs to be done to avoid (re)occurrence
  - Implement necessary measures

- 4.6.5**Control of records**
  - Keep records that prove the adherence to norm requirements, and improvement of energy performance
  - Ensure records are kept readable and traceable



Source: iso.org – Online Browsing Platform

- 4.7.1. **General**
  - Top-Management must check regularly whether EnMS is still appropriate and working.
- 4.7.2. **Input to mangement review:**
  - Activities resulting from previous MRs
  - Result of evaluation of energy policy, energy performance and EnPI,
  - Result of evaluation of legal compliance
  - Degree of achievement of targets
  - Results of internal audit
  - Status of corrective and preventive actions
  - Prognosis of energy performance
  - Suggestions for improvement

4.7.3. **Outputs from Management Reviews**

Decisions and measures regarding

- Energy performance
- Energy policy
- EnPI
- Targets/objectives or other areas related to continuous improvement
- Availability of resources

(Roles and responsibilities of Top Mangement and of Managment Representative (=„Energy manager“) are also listed separately in norm)

If desired: External Audit

qualityaustria
Erfolg mit Qualität

ZERTIFIKAT

Die Quality Austria Trainings-, Zertifizierungs- und Begutachtungs GmbH stellt folgender Organisation ein Quality Austria-Zertifikat aus:

ebswien hauptkläranlage Ges.m.b.H.
A-1110 Wien, 11. Haidequerstraße 7

Dieses Quality Austria Zertifikat bestätigt die Anwendung und Weiterentwicklung eines wirksamen

ENERGIEMANAGEMENT-SYSTEMS
entsprechend den Forderungen der
ISO 50001:2011

Registrier-Nummer: 00005/0
Erstausstellung: 9. Mai 2012
Gültig bis: 14. Juni 2013

qualityaustria

Die Gültigkeit dieses Quality Austria Zertifikates wird durch jährliche Überwachungsaudits und dreijährige Verlängerungsaudits aufrechterhalten.

Wien, am 9. Mai 2012

Quality Austria Trainings-,
Zertifizierungs- und Begutachtungs GmbH

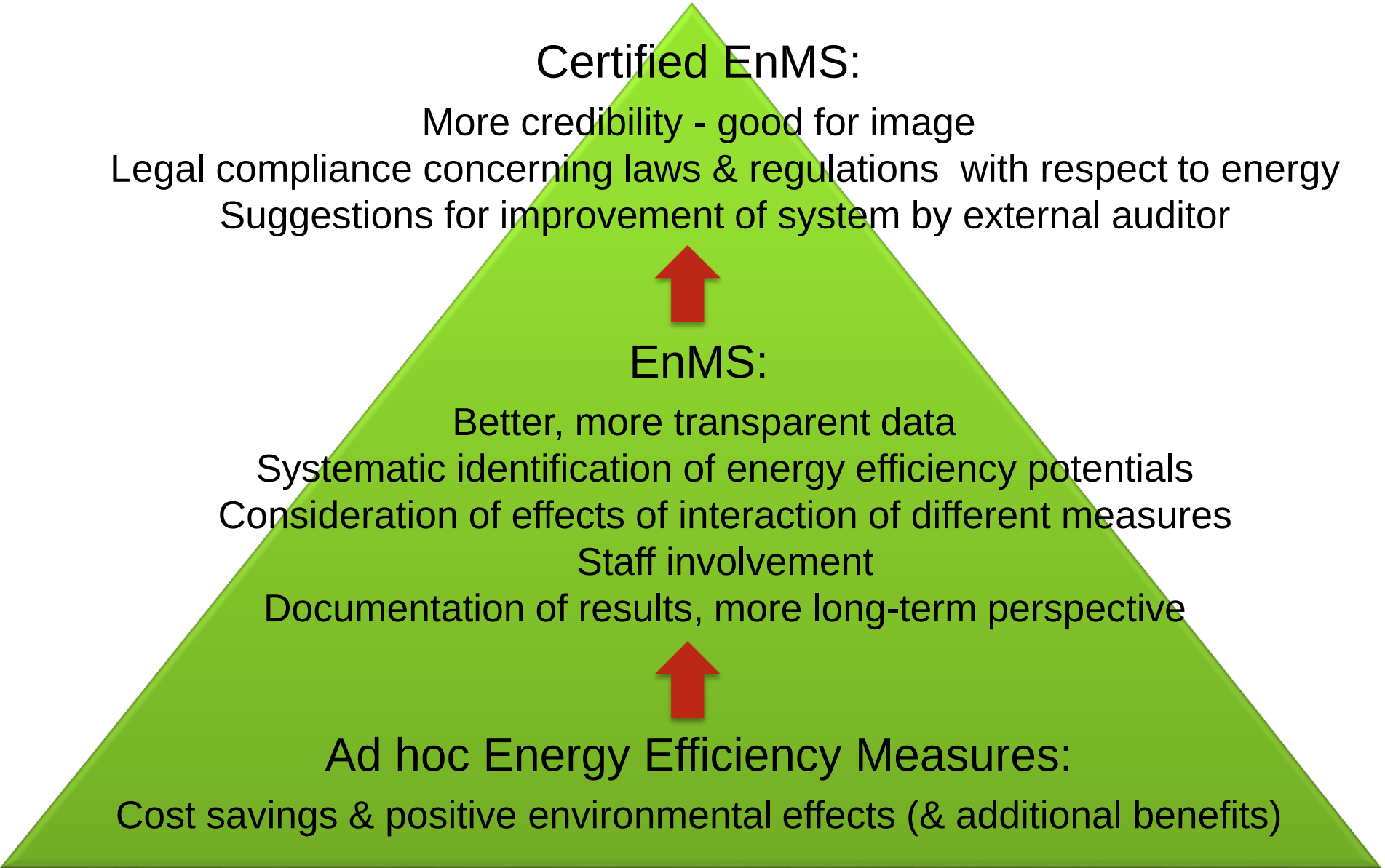
Unterschriften aus Sicherheitsgründen entfernt

Konrad Scheiber
Geschäftsführer

Ing. Wolfgang Hackenauer
Fachbeauftragter

Die aktuelle Gültigkeit des Zertifikates ist ausschließlich im Internet unter http://www.qualityaustria.com/de/cert dokumentiert EAC: 39.1

Benefits of of Energy Management Systems



Synergies with other Management Systems

Similar structure with other standards (ISO 9001, ISO 14001, EMAS) → facilitates integration

- **Quality Management System** exists: you can build on structures and practices such as descriptions and documentation of processes, document control, management handbook, internal audit procedure, management review

- 25-30% of preparatory work already done

- **Environmental Management System** exists: many relevant structures and practices already in place, only need to be extended to incorporate energy aspect (e.g environmental policy, legal register, input-output analysis,...)

- 60-70% of preparatory work already done

List of similarities and differences ISO 50001 – ISO 14001 (extract)

ISO 50001:2011		Requirements ISO 14001:2009		What should additionally be done with an existing ISO 14001?
Chapter		Chapter		
4.4.2.	**Legal and other requirements**	4.3.2.	**Legal and other requirements**	Generally included. Ensure conformity with all energy-related laws.
	Identification and implementation of applicable legal and other requirements		Establishment and implementation of a procedure for identifying applicable legal and other requirements	Generally included
	Consideration in the establishment and implementation of the EnMS		Consideration in the establishment and implementation of the EMS	Generally included
	Regular review of legal and other requirements		-	In substance largely included in the regulations on review.
4.4.3.	**Energy review**		**Partial correspondence to 4.3.1: Environmental aspects**	
	Conducting and maintenance of an energy review		Not explicitly asked	Ensure that an energy review is conducted regularly and document yo
	Identification of energy sources and evaluation of energy use and consumption		Not explicitly asked	Generally this should already have been done, but make sure.
	Identification of areas of significant energy use based on certain preparations		Identification of environmental aspects with significant impact on the environment	The requirements of ISO 50001 are considerably more detailed here. T cation of relevant factors, the determination of energy performance o
	Identification and prioritisation of opportunities for improving energy performance		Not explicitly asked	Identify and prioritise opportunities for improving your energy perfor
4.4.4.	**Energy baseline**		**Not included**	Ensure that you establish an energy baseline and adjust it as needed,
4.4.5.	**Energy performance indicators**		**Not included**	Ensure that you identify energy performance indicators, document yo compare it to the energy baseline.
4.4.6.	**Energy objectives, energy targets and energy management action plans**	4.3.3.	**Objectives, targets and programme(s)**	Generally included. Ensure that your objectives are aimed at improvin
	Establishment and implementation of documented strategic and operational objectives		Establishment and implementation of documented environmental objectives and targets	Generally included

Source: „Environmental Management Systems in Practice“ - See collection of materials

Synergies with other management systems

ENERGIEINSTITUT
DER WIRTSCHAFT GmbH

Example OMV – Extended integrated management system to cover also energy

Source: OMV & quality Austria Presseinformation, Nov. 2010

First experiences with implementation

Project EM2010 (Austrian Energy Agency, OEKV, KEC)

- Implementation EnMS (EN 16001) in 5 organisations (43 – 2,800 Employees)
- **Estimated time spent** internally for implementation
  - EMAS or ISO 14001 already implemented : 5-15 days, depending on company size; somewhat more if > 1.000 employees
  - QMS implemented: 10-20 days
  - No experience with management sytems: up to several100 employees ~15-20 days (This is an estimate, there were no such companies in the project!)

- **Estimated costs** for EnMS implementation:
  ca. 30,000-40,000 EUR, incl. external consultant, internal staff time, cost of certification
- Pays back relatively quickly if company is quite energy consuming

Perspective: Incentive for EnMS

Energy Efficiency Directive (2012/27/EU)

- Article 8 prescribes:
  - Non-SME: obligatory energy audits every 4 years (first one until 5.12.2015). *Audits carried out in the framework of a certified EnMS or EMS which fulfil minimum criteria (Annex VI) are considered equivalent*.
  - SME: Member States introduce programmes to incentivise energy audits
- Entry into force: 5.12.2012,
  Implementation in Member States: until June 2014

Digression: „Audits“ – what is what???

<u>Energy Audits – different types</u>

EnMS

- Internal audit
- External audit

Independent of EnMS:

- Energy audit = „thorough energy consultancy“ (Standard EN 16247 -1, special parts 2-5 under development)

Possible Levels of Energy Management

ENERGIEINSTITUT
DER WIRTSCHAFT GmbH

Company Size	Energy Intensity	Organisational Structure	Business Processes
Small	Low	Measure by measure – project based	A few organisational provisions (e.g. purchasing process)
	High	Task of Top Management, maybe Energy Manager/Team	Provisions for very energy relevant processes
Big	Low	Maybe Energy Manager/Team or integration in EMS	Especially extension of existing processes
	High	Energy Manager/Team and maybe Energy Department	„Full“ EnMS according to standard

Based on a presentation by Dr. Martin Streibel, DENA

Summary & EnMS „light“
10 important building blocks of an EnMS

ENERGIEINSTITUT
DER WIRTSCHAFT GmbH

1. Overview of energy situation of organisation (technical, organisational, efficiency potentials & opportunities)
2. Energy policy = Commitment of Top Mangement to improvement of energy performance
3. Designate Energy Manager
4. Set up energy information system / energy accounting
5. Set strategic and operative energy targets
6. Define energy management programme = concrete measures, responsibilities and resources for implementation

10 important building blocks of an EnMS

ENERGIEINSTITUT
DER WIRTSCHAFT GmbH

7. Check energy relevant processes, plan them as efficiently as possible, and document parameters for optimum operation
8. Raise awareness among staff for energy topics (internal communication), inform about efficient behaviour (trainings, operating instructions), involve in improvement process (suggestion scheme)
9. Regularly check and record fulfilment of goals and correct operation of energy relelvant processes
10. Correct deviations, update goals and energy management programmes, and develop them further.

Weiterführende Informationen (Useful material in German)

- Leitfaden „Energiemanagementsysteme nach ISO 50001“ (Hrsg. WIFI) http://portal.wko.at/wk/format_detail.wk?stid=630205&dstid=6963&angid=1

- „Systematisch Energiekosten senken – Kompass zum Einstieg ins betriebliche Energiemanagement“ (Hrsg.: Energieinstitut der Wirtschaft im Auftrag von BMWFJ, WKO, IV)http://www.energieinstitut.net/portal/page/portal/EIW_HOME/PROJEKTE/EN%2016001

- Dokumentation zum Projekt EM 2010 inkl. nützlicher Musterdokumente für die Einführung von Energiemanagement http://www.energyagency.at/projekte-forschung/industrie-gewerbe/detail/artikel/energiemanagement-fuer-oesterreich.html

- Leitfaden „Energiemanagementsysteme in der Praxis – ISO 50001 Leitfaden für Unternehmen und Organisationen“ (Hrsg. Deutsches Bundesumweltministerium und Umweltbundesamt) http://www.umweltbundesamt.de/publikationen/energiemanagementsysteme-in-praxis

- Gegenüberstellung EMAS – ISO 50001 (Deutscher Umweltgutachterausschuss) http://www.uga.de/fileadmin/user_upload/06_service/PDF-Dateien/EMAS-und-DIN-EN-ISO-50001.pdf

Further Information in English:

- „Energy Management Systems in Practice– ISO 50001: A Guide for Companies and Organisations“ (Published by: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety & Umwelt Bundes Amt, Germany, 2012)
  http://www.umweltbundesamt.de/publikationen/energiemanagementsysteme-in-praxis

- Energy Management – A comprehensive guide to controlling energy use (Published by: Carbon Trust, 2013)
  http://www.carbontrust.com/media/13187/ctg054_energy_management.pdf - Includes links to additional info and tools, e.g. checklist for Walkaround Energy Survey

- EMAS Energy Efficiency Toolkit (Published by: European Commission, 2004)
  http://ec.europa.eu/environment/emas/pdf/general/energyeff_en.pdf

- Collection of sector-specific energy efficiency information:
  http://eurem.net/display/eurem/Sector+Corners
  Soon available in English, German and partly other languages

ENERGIEINSTITUT
DER WIRTSCHAFT GmbH

Any questions?

Energieinstitut der Wirtschaft GmbH
Energy Institute for Business

Webgasse 29 • 1060 Wien

Tel +43 1 343 3430 • Fax +43 1 343 3430-99

office@energieinstitut.net • www.energieinstitut.net

Sonja Starnberger

s.starnberger@energieinstitut.net