In 18 steps over 3 steps to efficient energy management according to ISO 50001

mit DIN EN 17463

Guide Version 6

Version 6
Status 19.04.2024

This guide refers to ISO 50001:2018 "Energy management systems - Requirements de rungen mit Anleitung zur Anwendung". It is not intended to replace it and does not claim to be exhaustive. It is available on the Internet at

https://www.gut-cert.de/de/leistungen/energieeffizienz-energiemanagement/leitfaden-energiemanagement

You may find job titles in this text that are not formulated in a gender-appropriate manner for reasons of better readability. However, our guidelines explicitly address all genders.

Text and design GUTcert

Suggestions for improvements or information on errors are expressly welcome!
Please send them to info@gut-cert.de.

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Foreword

Dear Readers,

Rising energy prices, political pressure and new legal li regulations have made saving energy a self- ve r stand lichkeit. It has been widely recognised that climate protection and the energy transition can only be successful if energy consumption is permanently reduced. The Energy Effi ciency Act (EnEfG) published at the end of 2023 will motivate companies in Germany country for the first time to keep an eye on their energy consumption and introduce energy or environmental management systems, even independently of subsidies.

For many of these companies, the following questions therefore arise: How should a company tackle this task in a meaningful way without taking time-consuming and expensive detours? How can energy management ments be set up efficiently - alongside the many other tasks that need to be completed "en passant" today?

The aim of an energy management system is to produce more energy-efficiently in the long term, to benefit from this economically and at the same time to reduce the burden on the environment. ISO 50001 continues to offer excellent support here. However, standards do not always reflect the sequence of operational processes. This guide is therefore available to help you introduce an energy management system.

We are a little proud: for years, our guidelines have served as a working aid for numerous organisations, enabling them to become more aware of how they use energy step by step and to identify potential - and to pass all the requirements of external certification with confidence. Based on our many years of experience, we have developed a step-by-step, pragmatic approach that leads to energy savings and cost reductions in individual steps that are comprehensible to all employees.

Since the first edition in 2007, the guideline has been continuously updated and adapted to current developments and new empirical values. The second version, which integrated the requirements of EN 16001, was published in 2009. The third version of the guide already referred to ISO 50001:2011. The fourth edition was created after carrying out many projects with users of the guide and follows the structure and organisation of the practical experience gained during the introduction of the system. Version 5 was adapted to the revised ISO 50001:2018 with a view to supporting standards/guidelines from the ISO 50000 family (ISO 50003, ISO 50006, ISO 50015 and ISO 50047).

Version 6 incorporates new legal requirements, in particular DIN EN 17463 (VALERI).

An important aspect of introducing an EnMS is its integration into business processes and other existing management systems, such as ISO 9001 (quality management) or ISO 14001 (environmental management). With the revision of the ISO world and a binding or uniform standard structure, the so-called Harmonised Structure (HS), also known as the High Level Structure (HLS), this complex task is now easier to fulfil. Along our guide you will find references to the approaches of an integrated management system.

Start today and systematically take it step by step to your goal!

Stage I: Analyse your energy situation and identify potential savings right from the basic assessment.

Stage II: Integrate the procedure into your internal processes and save systematically.

Level III: Start your continuous improvement process to constantly increase energy efficiency and cost-effectiveness and easily achieve your ISO 50001 certification capability at the same time!

My tip: Read through this guide once to grasp the content as a whole and then take your own path to implementation step by step. Depending on the organisation's purpose, ni sation, size, level of concern or goal, you can stop and linger at each stage or take the relevant steps quickly one after the other and sometimes in parallel.

Once you have reached the third level, you have "incidentally" and safely implemented the requirements of ISO 50001 and can be certified at any time. This would then be the final step in continuously improving your energy efficiency and securing additional recognition and, if applicable, state aid. In addition, qualified external energy auditors will always help you to find new and exciting ways to make savings.

Good luck with your savings!

Prof. Dr.-Ing. Jan Uwe Lieback
Managing Director

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Introduction

Systematic energy management has developed into an effective method for reducing specific energy consumption and therefore energy costs: energy efficiency has become established as a key economic success factor. In line with increasing energy efficiency, the direct and indirect CO_2 emissions of an organisation, the so-called "Corporate Carbon Footprint" (CCF), decrease.

Since 2015, successful certification for all large companies in the European Union (EU) has meant ensuring legal compliance with the EU Energy effi ciency Directive, which was transposed into national law in Germany with the Energy Services Act (EDL-G). Germany now even has its own Energy Efficiency Act (EnEfG) - with this ground-breaking law ("bridge to the EDL-G"), Germany will also implement the requirements of the amended EU Energy Efficiency Directive. For the first time, the law obliges companies to systematically analyse their energy consumption independently of subsidies and to achieve a continuous improvement in their energy-related performance via an energy or environmental management mentsystem.

For companies in the manufacturing sector or particularly energy-intensive companies, a certified energy management system (EnMS) also offers the opportunity to benefit from subsidies. In return for the granting of state aid and subsidies, legislators are increasingly demanding a valid assessment of the energy efficiency measures (or action plans or implementation plans) identified in the EnMS in advance. Here, DIN EN 17463 has found its way into legislation and is gradually becoming the established methodology for economic efficiency assessment. The fact that DIN EN 17463 has become a matter of course in the context of energy management is also demonstrated by the Energy Efficiency Act in connection with the revised EDL-G. In implementation plans, DIN EN 17463 is the recognised method for assessing the effectiveness of energy end-use efficiency measures.

Energy management has been an integral part of the German economy for years, as it offers industry long-term competitive advantages. However, the development to today's status was particularly dynamic - and will perhaps remain so.

We have helped to shape this path through our many years of involvement in the NA 172-00-09 AA "Energy Efficiency and Energy Management" working committee in the German Institute for Standardisation's (DIN) Standards Committee on the Fundamentals of Environmental Protection (NAGUS). Looking back it is clear that although the journey was not without obstacles, the goal (to optimise the use of energy) was never lost sight of.

The first European standard for energy management, DIN EN 16001 from 2009, quickly gained international recognition and was similar in structure and organisation to environmental management in accordance with ISO 14001. At the time, critics complained that the terms "environment" had merely been replaced with "energy". The first international standard for a fully-fledged EnMS, ISO 50001, was published in June 2011 and was translated into DIN EN ISO 50001 in Germany in December 2011. DIN EN 16001 was withdrawn on 24 April 2012. Since then, there has been a globally harmonised standard for EnMS.

ISO 50003 was published in 2014, which, in conjunction with ISO/IEC 17021, defines the requirements for competence, consistency and impartiality in the auditing and certification of EnMS and thus standardises the requirements for certification procedures worldwide . ISO 50003 has now also been revised and is currently available in German as DIN ISO 50003:2022-05.

The requirements of ISO 50003 are directly addressed to the accredited EnMS certification bodies fi . The requirements of ISO 50001 are concretised in ISO 50003: Certi fication bodies must ensure that the auditors provide qualified audit samples to demonstrate the improvement of energy-related performance (ebL).

The prerequisite for issuing or reissuing certificates is therefore a corresponding confirmation by the certification body . According to the regulations of ISO 50003, certification bodies are required to check the improvement of the ebL and to prove it in audit reports in such a way that it can be verified at any time in the (re-)certification procedure and also in the accreditation procedure (by the German accreditation body DAkkS and the responsible authorities). Topics such as "energy indicators", "influencing factors", "normalisation", "adjustment", "measurement and verification plan" have thus become even more important for the individual stakeholders.

The ISO 50006 and ISO 50015 standards have been developed as guidelines to provide further assistance here (see Figure 1).

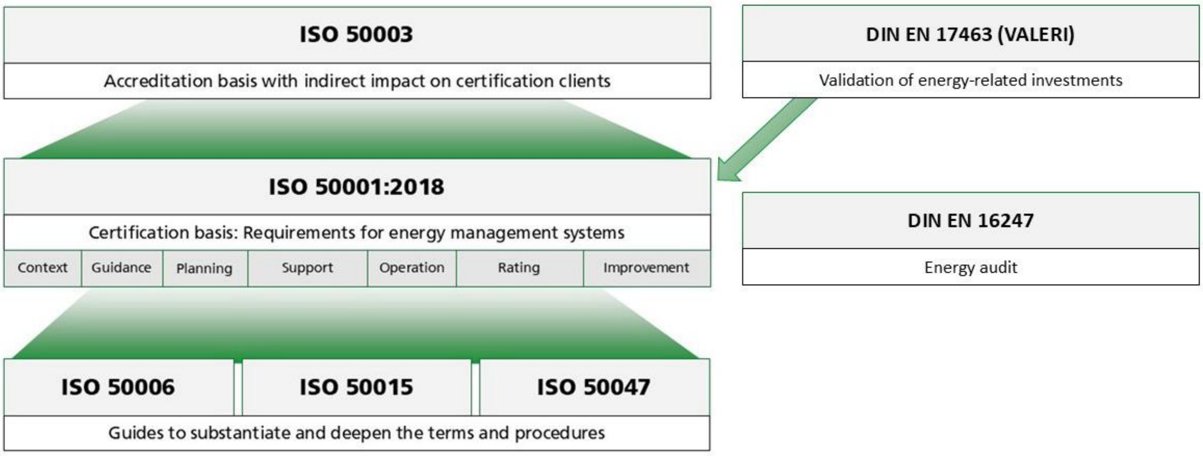


Figure 1: Relationship between the energy management standards according to GUTcert

Five years after its publication, the first revision process was initiated for ISO 50001:2011, and the revised standard was published in 2018. It follows the new paradigm of the ISO world: since 2012, all new and revised ISO management system standards have been based on a uniform content structure, the **Harmonised Structure (HS), previously also** known as the **High Level Structure (HLS).** It serves to improve the integration of an EnMS into other management systems to form an integrated management system (IMS). Above all, however, the revised ISO 50001 introduces new topics, such as the improved strategic orientation of the management system, the systematic consideration of risks and opportunities and the implementation of requirements in company processes. The improvement of the ebL becomes the "key element", the driving force behind all structures to be created in order to ensure success in terms of energy efficiency on the basis of valid measurements (see Appendix 1).

For the current second revision of ISO 50001, ISO TC 301 (Energy management and energy savings) has decided against a comprehensive revision and has only decided to make minimal adjustments in section 4 to take account of changes in the Harmonised Structure - in particular to take account of climate aspects. The new requirement requires organisations/companies to determine whether climate change is a relevant issue for the business and whether relevant interested parties have requirements relating to climate change. If the topic is classified as relevant, climate change must be taken into account in the design and implementation of the EnMS.

The fact that energy management can also grow into a proper climate management system is also shown by the current endeavours to further develop the family of standards with the possibility of expanding the EnMS via modules.

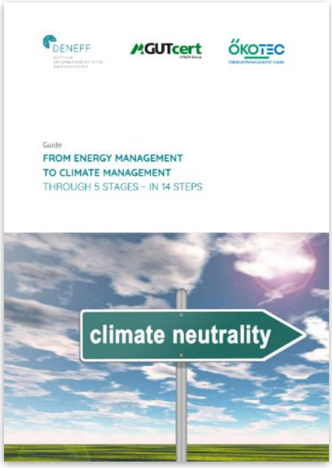
The fact that an EnMS is particularly suitable for this and forms a solid basis for emissions from Scope 1 and 2 is also demonstrated by the website www.ourworldindata.org. Here it is pointed out that around three quarters of greenhouse gas emissions are attributable to the energy sector: Climate aspects should therefore definitely be taken into account in energy management.

A comprehensive revision of ISO 50001 is not planned, but ISO 50001-2 on energy management and decarbonisation is currently being developed. It aims to confirm that the organisation is on the path to decarbonisation and is monitoring, setting targets and reducing energy related greenhouse gas emissions.

Climate management is addressed in various areas of standardisation. For example, the new ISO 14068-1 standard on carbon neutrality was published last year and has already been discussed here. It regulates the status of "carbon neutral" and who can call themselves carbon neutral and when, and builds on ISO standards 14064-1 and 14067.

It therefore appears that climate management is being docked onto established management standards, which can help companies that have already established a system to simply add the aspect of climate management and thus make a contribution to climate protection and transformation.

More on this topic in our very popular guide
From energy management to climate management.



What exactly is energy management and an energy management system?

**Energy management (EnM) is according to a
definition (VDI 4602:2018):**

"...the forward-looking, organised and system ma tised coordination of the procurement, conversion lution, storage, distribution and use of energy to meet usage requirements taking into account ecological gical and economic objectives."

It is designed to reduce energy costs, increase energy effi ciency, reduce energy-related environmental burdens, ensure security of supply and at the same time fulfil customer requirements.

An EnMS provides the necessary resources to firmly anchor the concept of energy efficiency in all processes and among all employees. According to ISO 50001 (terms esp. 3.2.2), it comprises an:

"Set of interrelated and interacting elements of an organisation to define an energy policy, objectives, energy targets, action plans and processes to achieve these objectives and energy targets."

Similar to environmental or quality management ment systems, an EnMS should also be developed systematically in the PDCA cycle (Plan-Do-Check-Act). This enables the company using the system to continuously improve its EAL and the system itself and provide sound evidence of this.

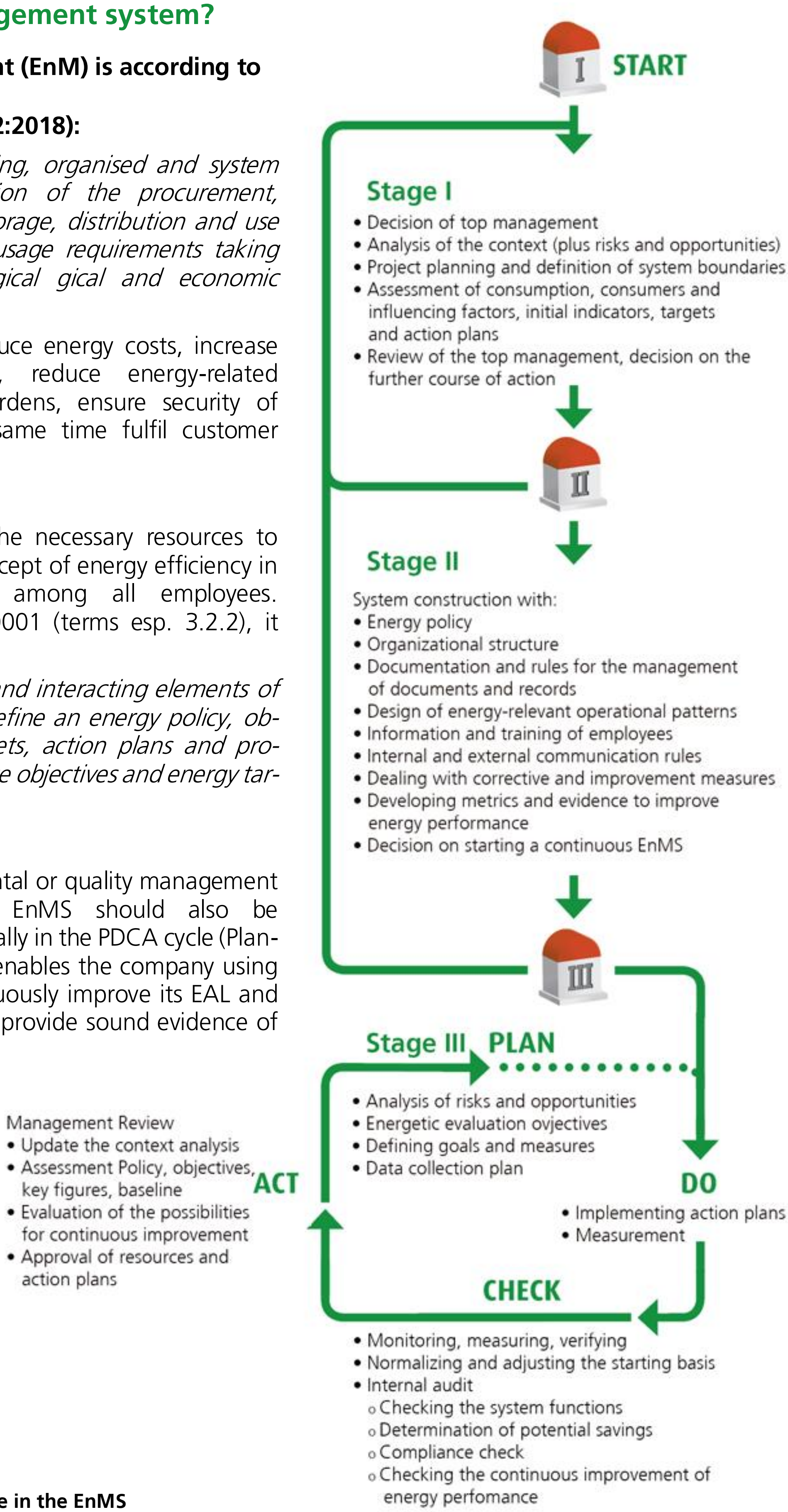


Figure 2: The PDCA cycle in the EnMS

The PDCA cycle in the EnMS means that an organisation records its energy flows, identifies the relevant factors influencing consumption, derives measures from this, systematically monitors their implementation and continuously receives information for new targets and measures and checks their applicability within the organisation.

Planning ("plan"): The first step is to understand the business environment, the so-called context of the organisation. Analysing the interests and requirements of interested parties and balancing these with the organisation's own requirements and obligations forms the solid foundation for assessing risks and opportunities, which must be taken into account when setting objectives in the EnMS. The following key elements are defined on this basis: the introduction of strategic and operational energy targets (policy), the establishment of savings targets taking into account the main energy influencing factors, the definition of measures as part of action plans with the determination of responsibilities, the provision of the necessary resources and the definition of energy performance indicators and associated energy baselines.

Execute ("Do"): Is the creation, maintenance and codification of management system struc tures for monitoring and maintaining a continuous process in order to implement improvements. This primarily involves implementing action plans, controlling energy-relevant operational processes and procedures, ensuring the competence and awareness of employees and integrating them into the EnMS across all functions and levels.

Review ("check"): This is the self-assessment of the functionality of the EnMS, the target progress and the collection of new ideas for improvements, if necessary with the help of external energy and system experts. At the same time: monitoring, measuring and verifying the success of the processes introduced in "Plan" and "Do" and the measures implemented to improve the ebL, collating men the current energy data, the audit results and new findings (new methods and systems), checking legal conformity and other relevant requirements .

Improve ("Act"): Is the review of developments in the corporate context (risks and opportunities), possible adjustment of the energy strategy (policy), assessment of the status quo or progress in the management review, derivation/definition of new targets and approval of further measures for the process of continuous improvement as well as the statement on fulfilment of legal conformity and other relevant requirements.

All management system standards are organised according to the key elements of the PDCA cycle. An established and ongoing management system follows this system. However, an initial analysis is necessary to get started, which is not described in the ISO standards. This guide therefore deliberately takes a different approach. After the structure in the first two stages, the process of the PDCA cycle is described in stage III.

Against the background of practical experience in recent years, the introduction and implementation of an efficient system that follows ISO 50001 is therefore described in 18 steps that follow operational practice. All standard requirements are taken into account, as can be seen from the references to the relevant standard chapters in the margin.

For newcomers to an EnMS, this guide offers a clear and practical structure that enables energy saving success right from the start without having to create a bureaucratic superstructure. The documentation is created - efficiently and practically - automatically as you work through the implementation steps.

Order in the system right from the start

When starting an energy management system, various specification documents (system be descriptions, procedures, rules) and records (logs, data tables, statements wer tungen) are created. These should be systematically filed from the outset. They form the basis of an EnMS and will always support analyses and planning. In order to provide you with an organised filing system and structure right from the start, we provide a summarised overview below of the most important documents that will be created in the course of processing the steps (no. in brackets).

Level I

- Statement by top management (1)
- Context analysis (risks and opportunities) (1)
- Project plan (2)
- Defining the balance sheet limits and the scope of application (3)
- First energy, measurement and verification plan (4)
- Energy report (4)
- Legal register (4)
- Gauge list (4)
- Energy data acquisition plan (5)
- Initial list of possible energy savings (energy savings programme) and action plans with measures (5)

Level II

- Energy policy (7)
- Organisational structure (8)
- Defining the control of documents (documentation regulations) (9)
- Determining the organisation of energy-related activities (e.g. purchasing of goods and equipment), planning of infrastructure and processes (10)
- Training plan for employees (11)
- Definition of communication (12)
- Improvement action plan (13)
- annual energy planning (14)
- Evidence for the improvement of the ebL (14)
- Energy, measurement and verification plan (14)

Level III

PLAN	DO	CHECK	ACT
▶ Updated energy-saving programme (17)	▶ Records from the current energy con trolling (15)	▶ Internal audit programme (16) ▶ Internal energy audit, audit plan and report (16)	▶ Updated energy analysis (and energy report, if applicable) (16) ▶ Protocols of the Mgmt reviews (18)

Gradual introduction of an energy management system

Larger organisational projects are usually carried out in stages, after which there are always milestones with opportunities for top management to intervene and make decisions.

You should therefore plan the introduction of an EnMS in three main stages, which are self-contained:

I. **Determination of the current status with derivation of initial savings measures (steps 1-6),**
II. **Introduction of supplementary or new regulations for controlling an organisation (steps 7-14)**
III. **Comprehensive operation of a management system based on the PDCA cycle for continuous improvement (steps 15-18).**

If you are aiming for fast certification, you can complete the three stages quickly and sometimes in parallel.

Standard chapter

Relevant steps or sub-steps that implement the requirements of the standard points of ISO 50001 (chapters 4-10) are labelled so that when studying the standard and this guide in parallel, it is possible to see which requirement of the standard is currently being implemented or which **standard specification is** currently being worked on.

In addition, reference is made within the text to the guidelines ISO 50006 (Formation of key figures and energy baselines) and ISO 50015 (Measurement & verification).

At the end of each stage, top management must decide whether to move on to the next stage, stop for the time being or remain in place permanently. These points are marked separately by **milestones**, which indicate that the process can only continue once top management has been fully informed of the results to date and has taken a position on how to proceed.

In Germany, there has been a legal basis since 2013 that makes it attractive for companies to introduce an EnMS.

When the Energy Efficiency Act (EnEfG) came into force on 18 November 2023, the requirements of the Energy Services Act (EDL-G) for companies were extended. Among other things, the obligation to set up energy (EnMS) or environmental management systems (EMS) was introduced for companies with an average total energy consumption of more than 7.5 gigawatt hours (GWh) per year (a) in the last three calendar years, regardless of their SME status.

In addition, from a total energy consumption of 2.5 GWh per year, there is an obligation to draw up and publish implementation plans (action plans) for final energy saving measures that can be implemented economically through . The requirements of the EDL-G were specified and supplemented by the Energy Efficiency Act. With the above-mentioned thresholds, an increasing number of companies (many from the service sector) are switching from energy audits in accordance with EN 16247 to ISO 50001 systems or to validation under EMAS.

Standards have now been incorporated into various areas of legislation; an overview can be found in Figure 3. This prompted us to expand the guide in this regard as well.

Figure 3: based on Prof Dr Ulrich Nissen - Integration of standards (ISO 50001, DIN 16247-1, DIN 17463, EMAS) into legal requirements

Stage I - From the project idea to the status survey: Identifying initial potential savings

The top management's decision to introduce an EnMS in accordance with DIN EN ISO 50001 starts the process and informs the entire company. The first milestone therefore comes right at the beginning.

Once top management has positioned itself, it makes sense to draw up a project plan in which those responsible and involved, the timeline and the goal or interim goals are defined. At this stage, the first analysis of the business context is already necessary in order to determine risks and opportunities: These are essential for further planning. In order to delimit the project, it is necessary to define the balance sheet boundaries as precisely as possible before the first extensive task of data collection begins. The evaluation of the results with top management and the decision on how to proceed, which may initiate the second stage, mark the conclusion of the first stage.

Step 1: Commitment of top management, appointment of project management, analysis of the context

To begin with, the organisation's top management must make a clear commitment to recording the current situation and provide the resources to do so.

ISO 50001:2018 assigns a special role to top management, which is intended to express an increased commitment on the part of management. However, top management must ensure that the responsibilities and authorities for rele vant roles within an **energy management team** are assigned and communicated within the organisation. Therefore, the appointment of a **project lead** or, in other words, **energy management officers** (EMOs) in the role of 'doers' still makes sense. 5.3

The authorised person must have the necessary resources (time, support staff, IT, money for measuring equipment if necessary, etc.) and must be allowed to appoint persons with sufficient expertise as members of the energy management team to handle delegated energy management ment activities (see step 8).

Another important task is to research and analyse the context in which the company operates. This consists of the variety of internal and external issues that define the scope and content of the EnMS through so-called **interested parties** (also known as stakeholders). 4.1-4.4

a) Interested parties

Interested parties (3.1.5) of an organisation in the EnMS are all natural or legal persons who can influence or are affected by a decision or activity relating to the EnMS or the **energy-related performance (ebL)** (3.4.3). Specifically, the following actors can be defined as interested parties: 4.2

- Government and standardisation organisations, authorities, associations, energy suppliers, consultants, auditors, competitors, suppliers, landlords, insurers and financiers as **external stakeholders**
  - The following external topics may be relevant for the EnMS: government or industry specific targets and agreements; requirements, restrictions or limitations on energy supply and ensuring security of supply and reliability; geopolitical interests and thus the development of energy costs, impact of climate change (climate change is a relevant topic), etc.

- the management, employees, works council etc. as **internal parties**
  - The relevant internal topics therefore include, for example, company business objectives or corporate strategy, asset management plans, e.g. from asset management ment systems such as ISO 55001, maturity of the EnMS, technological maturity, operational risks, personnel policy.

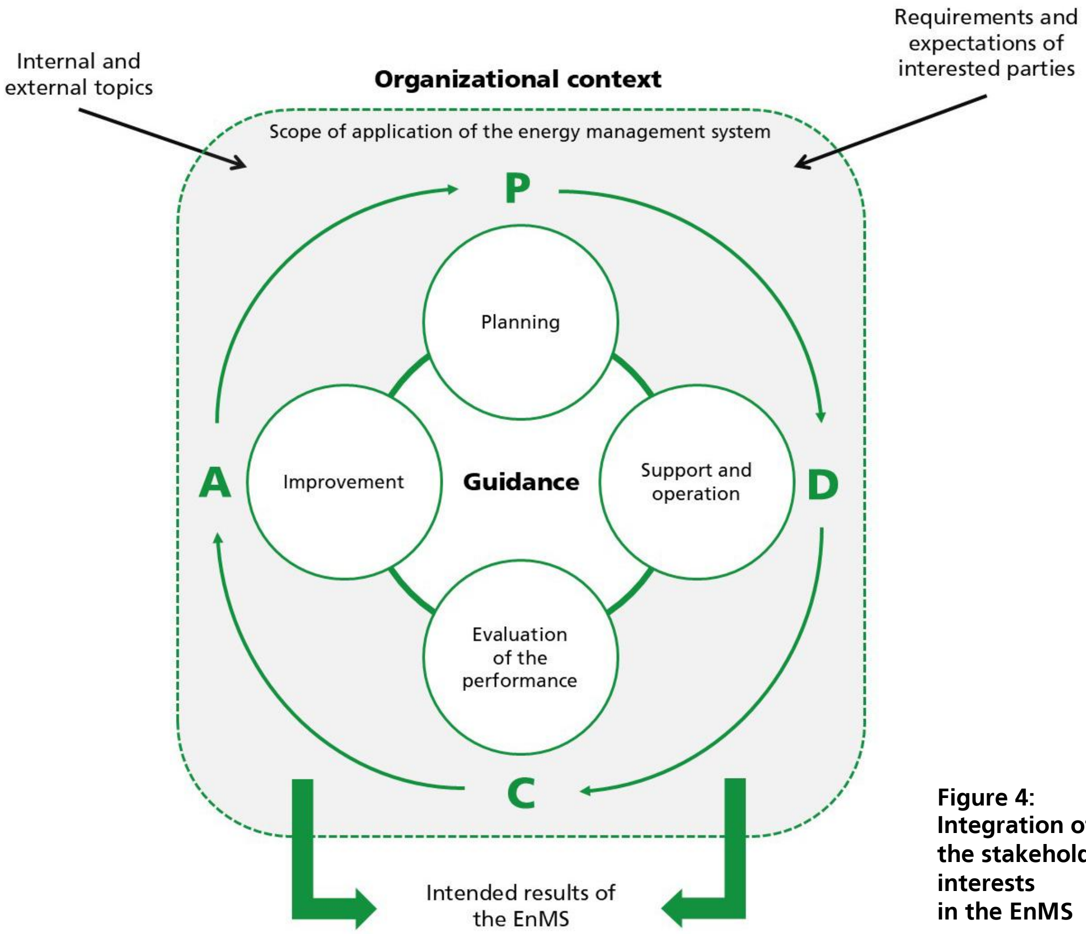


Figure 4: Integration of the stakeholder interests in the EnMS

b) Analysis of risks and opportunities (R&C)

The next step is to summarise, systematise and analyse the knowledge gained about the stakeholders' requirements and interests. A table matrix, for example, is suitable for this: It facilitates data maintenance and updating.

The result of the analysis is insights into which interested parties have the greatest influence on the EnMS and on the company's ebL and which topics emerge as the most important talli them . 6.1-6.2

These topics are assessed from the perspective of risks (3.4.11) and (absolutely!) opportunities. The methodology for assessing risks and opportunities (R&C) should be defined as part of the planning process and documented **in a comprehensible manner** to enable continuous updates.

Tip:

Associations as stakeholders can also support the introduction of systems and the subsequent exchange between like-minded people. Here it is worth taking a look at the services offered by the VNU Association for Sustainability and Environmental Management ment e.V., for example, or the Deutsche Unternehmens initiative Energieeffizienz e. V. (DENEFF).

A key criterion in the assessment is, for example, the legal and other relevant obligations relating to the EnMS (4.2): Licence requirements, lease agreements, industry agreements, energy-relevant technical rules, guidelines and standards, etc. (step 4).

Step 2: Project planning

Setting up a project plan makes it easier to track the next steps. It helps to plan and coordinate activities and resources. It can also be used to derive the time frame that is required or should be made available for the introduction of an EnMS.

Experience has shown that project planning leads to a stronger focus on the goals to be achieved and ensures better planning by setting deadlines. Use the project planning and project controlling tools available in your company. These will make it easier for you to achieve goals according to plan and keep track of completed and outstanding project steps.

The duration of the introduction of an EnMS will vary depending on the company's specifications, size and complexity. The basis is usually the provision of resources and the commitment of top management and the executive board to energy management.

In practice, EnMSs are actually introduced within a time frame of 3 to 18 months . Our experience shows that 6 months is challenging, but feasible. The implementation time can be shortened with the support of an external consultant.

Minimum time required to introduce an EnMS:

Small companies (up to 50 employees) at one location

- with an existing management system: implementation takes approx. **2 to 4 months**
- Without an existing management system: implementation takes approx. **3 to 6 months**

Medium-sized companies (from 50 to 500 employees) at one location

- with an existing management system: implementation takes approx. **3 to 6 months**
- Without an existing management system: Implementation takes approx. **6 to 12 months**

Large companies (from 500 employees) at one location

- with an existing management system: implementation takes approx. **4 to 8 months**
- Without an existing management system: Implementation takes approx. **6 to 18 months**

If several locations are included, an additional 2-4 months must be planned (based on experience).

Tip for SMEs:

The plan should be presented using tools that the company already uses or is familiar with.

For example: Microsoft Excel and Microsoft Project or simple control software for projects, also available as freeware.

Step 3: Determining the balance sheet limits

Accompanying the project planning, it is first necessary to precisely define the scope of the analysis and thus the scope of application. This scope is decisive for the scope and complexity of the EnMS (see also ISO 50006). The requirements and interests of relevant stakeholders must also be taken into account here: For example, a high-voltage switchgear upstream of the plant connection, supply or delivery traffic or the production of externally manufactured assemblies can be excluded or included depending on their influence on energy consumption or the possibility of influencing it. 4.3

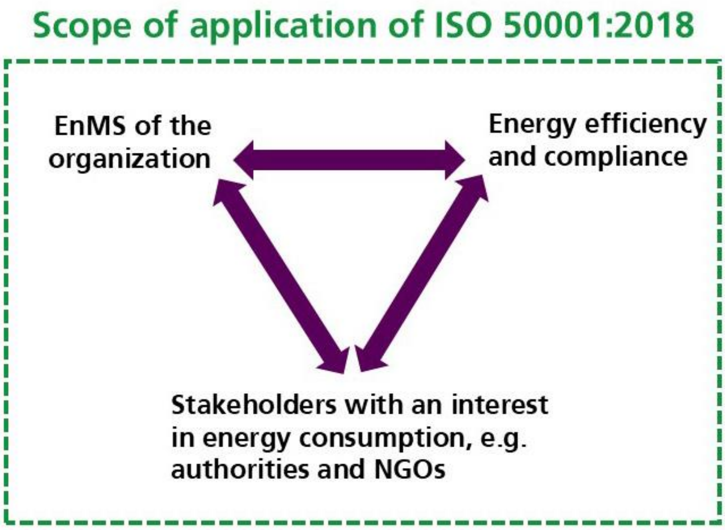


Figure 5: Triangle of interests and scope of application

According to ISO 50003, the exclusion of energy types (or energy sources) is not permitted. Determining the balance limits is the first task of the EnMB, parallel to creating the project plan. The balance limits should make it possible to allocate 100% of the energy input to the sum of the energy consumers. This applies to the energy components (electricity, gas, oil, heat, etc.) and the total energy used.

Tip:

The balance within the meaning of ISO 50001 may differ from the balance required to determine the total final energy consumption in accordance with the EDL-G and the EnEfG. The BAFA information sheet provides information on how to determine the total final energy consumption for companies subject to obligations under Section 8 EDL-G and Sections 8, 9 and 17 EnEfG. The current BAFA information sheet also contains examples of balance frameworks and lists the energy sources that should and should not be taken into account. The trick is often in the detail: for example, the Energy Efficiency Act does not take grid losses into account when calculating the balance. The reasons given are legal regulations that already have a regulating effect here. For example, according to the Energy Industry Act (Sections 11 ff) and the Electricity Grid access Ordinance (Section 10), the operators of energy supply grids are obliged to procure the energy to cover grid losses according to a market-oriented, transparent and non-discriminatory procedure and to record it in a separate balancing group.

It should be noted that energy

- can be converted in the system
- is "lost" due to efficiency losses or
- leaves the system as diffuse heat radiation (see 1st law of thermodynamics).

In order to measure the ebL, suitable measurement limits for energy performance indicators figures should be clearly defined at the outset so that they are appropriate for the respective significant energy consumption. The boundaries can be process-related, systemic (spatially or on the basis of logically related processes) or organisational. It is important in this context that the users of the key figures and their needs are also identified.

Note: What "energy" is energy management about?

To minimise the direct use of energy through:

- Combustion of coke/coal, gas, oil or substitute materials
- Use of e.g. diesel in the vehicle fleet or for internal transport
- Technical gases that have a chemical-calorific energy input (and possibly additional energy input through their pre-pressure)

Also to be included:

- energy sourced from outside the balance sheet framework that has already been refined, such as electricity, steam, district heating, cooling or compressed air
- Energy refined within the balance limit itself, such as electricity, steam, heat, cooling water or compressed air

The release of energy to the outside via the balance boundary must also be considered:

- e.g. as combustible CO gas
- as a product for a neighbour (e.g. steam, district heating or electricity)
- as a residual material to be utilised for energy (e.g. wood dust, wood chips, pellets, etc.)
- as waste heat in cooling water, as radiant heat or diffusely as warm air

The high physical energy content of the supplied pressurised gases, such as nitrogen, oxygen, argon, acetylene or hydrogen, is also important for the overall analysis - whether used for energy or not! In addition to their physical energy content, industrial gases may also have a chemical energy content. The diversity of the industry means that individual analyses are required in each case.

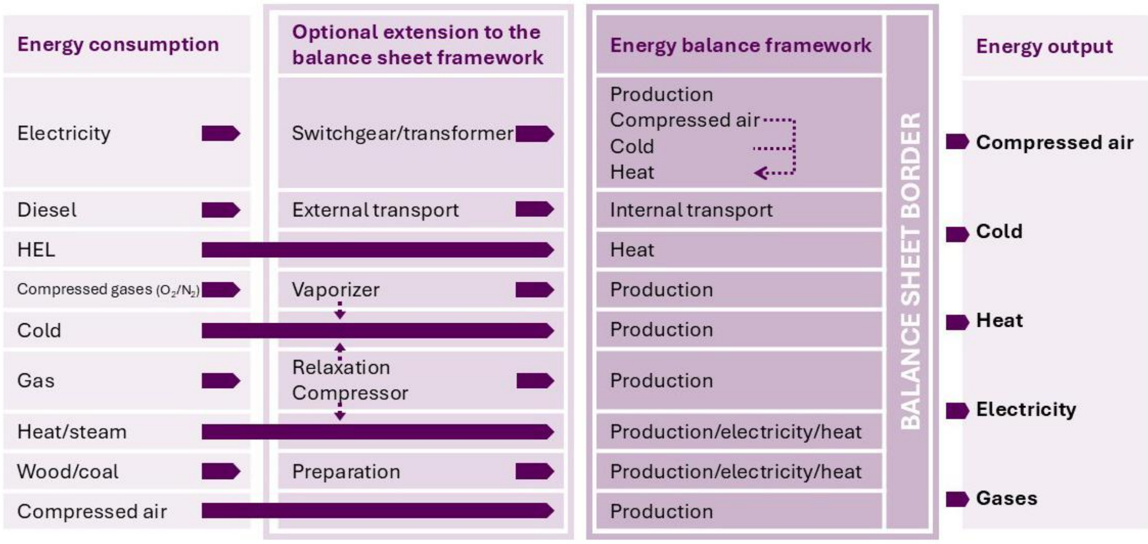


Figure 6: Determination of the balance sheet limit for the manufacturing industry

Note: In addition to the (balance) boundaries of the EnMS, ISO 50001 also refers to its scope of application. Balance boundaries are to be understood as location-related and relate to facilities and energy flows. The terms scope and area of application of an EnMS are used synonymously in the standard. They describe the scope of the activities, locations, processes, facilities and decisions to which the EnMS applies. The terms scope or area of application therefore represent the sum of several boundaries: e.g. a head office with several locations and possibly consumption points (not permanently staffed), each with its own balance sheet boundaries and an overall balance sheet for the company (e.g. including transport between locations).

Limiting the scope of application to parts of the company or individual activities, as is possible with other management systems, is hardly an option with the EnMS, as the energy flows can rarely be meaningfully delimited.

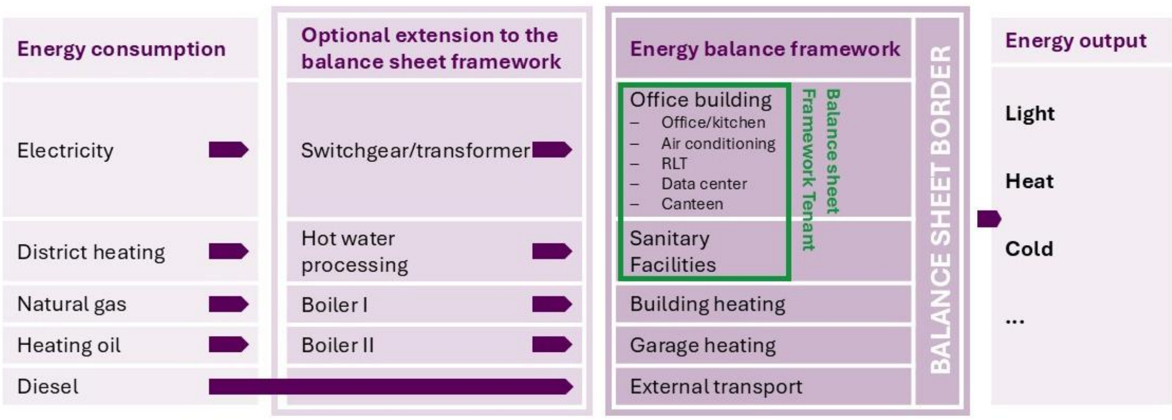


Figure 7: Determining the balance sheet limit for service providers

All locations of the company (including warehouse and administrative locations) must be included if tax relief is to be utilised.

Particularly in the case of service providers that often use rented buildings or premises, the energy consumption of the company that uses the building or premises for operational purposes and obtains and consumes final energy in this context must be taken into account. The determination of the total final energy consumption (balance limits) of a company obliged to comply with the Energy Efficiency Act , for example, therefore includes all buildings and locations owned and used by the company itself, as well as all rented buildings and locations where energy is consumed and all other energy consumers belonging to the company (systems, processes, vehicle fleet, etc.). Rented buildings/locations are to be recognised in the balance sheet of the company that uses or has rented these premises for operational purposes.

The balance sheet framework for the tenant must be formed accordingly. The building envelope as well as the heating, cooling, ventilation and lighting systems and equipment for which the company has no operator responsibility and therefore has no direct influence on energy consumption can be excluded from an assessment. However, it can be advantageous to also assess these systems in terms of energy efficiency and, if necessary, to convince the landlord of the need to invest in the energy efficiency of the building and the above-mentioned systems.

Tip for tenants:

In principle, you have the right to request the energy certificate for the office building from your landlord. This will allow you to check the energy consumption / energy efficiency and compare it with other properties when choosing a rental property.

Step 4: Collection of basic data

The next step is the initial data collection, the systematic recording of the current status. This energy baseline is an essential foundation of the EnMS, as all planning and targets are based on it. It is the reference point for future comparisons of the ebL. The energy baseline always refers to a fixed period (usually one year, possibly subdivided into months). External influencing variables should be included in the evaluation of the baseline for standardisation purposes. 6.3

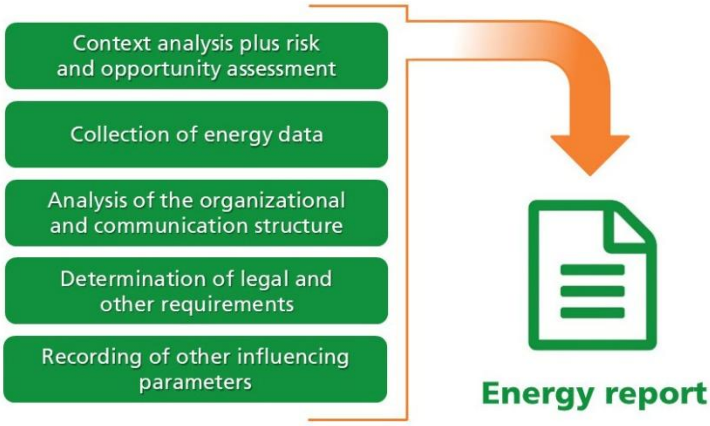
Note:

For later evaluation and categorisation of the results, it is recommended that some influencing parameters be recorded at the same time:

- Medium and long-term trends in energy prices
- Foreseeable legal regulations
- Development of new economical processes
- Known key figures used
- existing benchmarks etc.

The **energy assessment (3.5.5) is the** most important part of collecting the basic data. Energy input and energy consumption should be recorded in detail and, if possible, for several years in order to eliminate one-off effects. The energy gy analysis also includes comparing the recorded figures with selected benchmarks.

The initial data collection also includes the analysis of the existing energy organisation and the comparison of the organisation with any other management ments systems (e.g. for QM and UM). In addition, a comparison of the current activities and procedures with all **legal and their requirements with regard to energy use, energy consumption and energy efficiency** must be carried out (ISO 50001, 4.2). This forms an interface with the P&C analysis (steps 1 and 4).



These detailed entries can be made in parallel to save time. They hardly influence flus each other . As a result, however, they must be summarised , e.g. as an "energy report".

Figure 8: Components of an initial energy report

4.1 Energy assessment

Determining the energy status is of crucial importance at the start of an EnMS. This comprehensive initial survey forms the basis for all subsequent planning and decisions. It is systematically updated in the (usually annual) cycles for continuous improvement (see also step 16). 6.3

It is advisable to record all energy-relevant data for the period (annually) in two lists (tables) for the purposes of analysis and evaluation - firstly for energy use and secondly for energy utilisation. These tables together form the energy balance in the defined balance framework.

a) Energy use

The analysis begins with the recording and evaluation of the energy used at the site (or for the entire organisation including the points of consumption). The consumption to be included in accordance with the balance framework should be determined for at least the last three years if possible. In order to recognise seasonal effects, it is advisable to include monthly data, if available. Data on energy use is usually available from utility bills or purchase receipts and is easy to collect. They should be broken down as far as possible (monthly, process and system-related, building-related, etc.), as potentials can already be recognised here. Companies with high energy consumption can request a load profile with quarter-hourly consumption values from their grid operator. 6.3a)

month	Electri-city [kWh]	Gas [kWh]	Diesel [kWh]	Coal [kWh]	Other [kWh]	Total energy [kWh]	Production [tonnes]	Total energy/ tonne production
Jan.								
….								
Dec.								
∑ Year								

Table 1 Example of the recording of annual and energy consumption for industry

month	Electricity			Gas			Other			Total energy			Utilised area	EnPI
	kWh	€	tCO_2	kWh	€	tCO_2	kWh	€	tCO_2	kWh	€	tCO_2	m^2	kWh/m^2
Branch A														
Jan.														
....														
Dec.														
Branch B														
Jan.														
....														
Dec.														
∑ Year														

Table 2: Example of the recording of annual and energy consumption for service providers/store chains

A chain store should record energy consumption separately for each individual shop with the aim of creating transparency in the consumption behaviour of individual shops. Subsequent benchmarking, in which similar locations are regularly compared, is particularly important for chain stores. In this way, it is possible to identify branches with conspicuous consumption behaviour and specifically search for the causes of deviations and, if necessary, rectify them.

As the generation and consumption of energy cause different environmental impacts (key figure CO_2 emissions), it is proposed that the direct CO_2- emissions[1] from combustion processes and the indirect CO_2 emissions from electricity and heat generation, etc., should also be determined. CO_2 data collection makes it possible to design energy savings in a targeted manner that minimises environmental impact.

If you want to develop your EnMS into a climate management system, we recommend our guide "From energy management to climate management". It is also worth taking a look at our website klimaneutralitaet.de/ for more information.

[1] emissions are calculated: CO_2 emissions = energy input [kWh]/[GJ] * emission factor (for grid-bound energy, see utility bill/ or UNFCC default values, for other forms of energy, UNFCC default values, etc.).

Erfassung der Eingangsenergien für das Jahr: 2023

Ihre Anmerkungen...

HILFE

Energieträger hinzufügen | Diesel | Energieträger löschen

eingesetzte Energie/ Energieträger	Bezugsmenge [kWh/a]	Kosten pro kWh [€/ kWh]	Anteil am Gesamt-verbrauch	Kosten [€]	Kosten-anteil	CO_2 Emissionen [t]	CO_2-Anteil	Messsystem oder alternative Art der Erfassung und Analyse	Grad der Genauigkeit/ Kalibrierung
Diesel	280.156	0,18	3,08%	50.428 €	4,36%	74,73	2,49%	Zapfsäule	<2%
Heizöl EL	6.852.681	0,11	75,44%	753.795 €	65,24%	1.827,87	60,91%	Peilstab/Messung Tankwagen	<5%
Strom	1.950.627	0,18	21,47%	351.113 €	30,39%	1.098,20	36,60%	geeichter Zähler	<2%
Summe	**9.083.464**		**100,00%**	**1.155.336 €**	**100,00%**	**3.000,81**	**100,00%**		

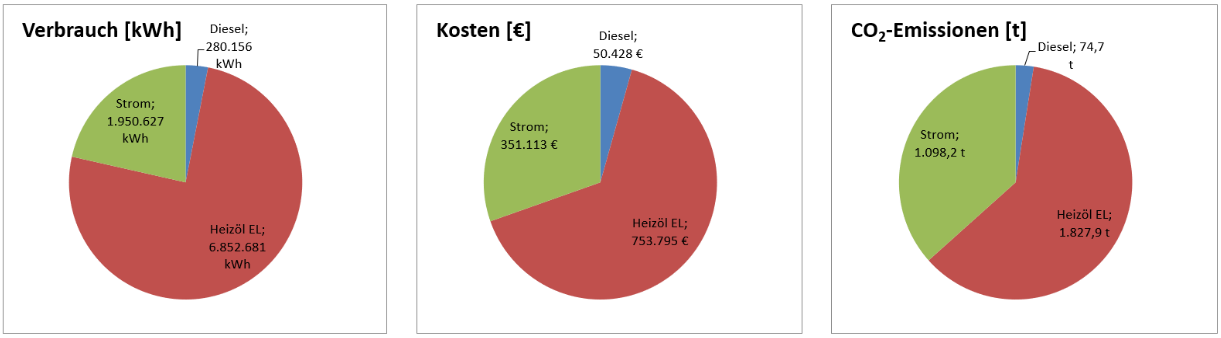


Figure 9: Extract from an exemplary Energy Tool, input balance

b) Energy utilisation and consumption

In addition to energy procurement, the energy balance also includes energy utilisation. The use of energy must be broken down by consumer.

6.3a)b)

A consumer can be a unit (motor/melting furnace), a plant component (robot/rolling mill), an entire plant (production line/cold rolling mill), a process (heat treatment/mechanical processing), a consumption group (hall lighting) or an entire consumption area including ancillary facilities (administration building), depending on the organisation, complexity and different zierability of the measurement. The recording of energy consumption should progress steadily and result in a 100% allocation of energy use to consumption. It is important that the subdivision is chosen so small that "energy guzzlers" are recognised.

In the consumption register, the data should be recorded on a system or area basis, separately for different energy sources used at a consumption point (electricity, compressed air, cold water, gas, etc.) and as a total. Care must be taken to ensure that energy generated internally through refinement/conversion (electricity for compressed air generation/compressed air, gas for heat generation/heating water, etc.) is not counted twice when balancing the individual energy sources (electricity use and consumption) and the total energy consumption. When making the entry, any onward transmission must be deducted and in-house production (e.g. solar panels) must be taken into consideration.

The data should be presented as quantities of "energy consumed" (in kWh or MWh), in costs, (direct and indirect) CO_2 emissions resulting from energy use, in absolute and proportional terms. This enables detailed analyses (see Table 3).

Energy consumer				Energy used E1, E2, [kWh/€/ CO_2 /%]				Waste heat [kWh] (temperature level)	Measuring system/ Measurement type	Accuracy
No.	Plant/ Part	Year of construction	Power consumption [kW] (capacity)	E1	E2	E3	Σ			

Table 2Example of the period-related (annual) recording of energy consumers

Energy balancing also generates information that describes the special features of consumers and key framework conditions. This information is later required for period comparisons (operating times, performance indicators, heat output, production figures, illuminated or heated areas, etc.). When operating an EnMS, further data and information will be added later. It is therefore advisable to use a data bank solution to record consumption data.

Companies can have the energy data analysed by AI-based analysis tools. As part of the analysis, special features are extracted from the load profile data and analysed using methods such as neural networks. The AI solutions are able to easily process large amounts of data and perform complex mathematical and statistical calculations . Load profiles from comparable locations are particularly suitable, e.g. for branch structures.

Figure 10 is an excerpt from the graphical representation of a bakery's load profile. The load is determined here for each day of the month at four tel hourly intervals. On 13 February at 4:45 a.m. there was apparently a lot of baking - Valentine's hearts in stock?

month	2													
Power [kW]	Day													
Quarter of an hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0:00	3,5	3,2	3,4	3,5	3,4	3,0	3,2	5,2	1,9	2,0	2,0	2,5	2,2	2,8
0:15	3,5	3,6	3,2	3,6	4,4	3,6	3,7	3,5	2,7	2,1	1,8	2,0	1,9	3,1
0:30	3,0	3,3	3,3	3,3	4,2	3,5	3,0	3,2	3,8	2,0	1,9	2,8	2,4	1,8
0:45	2,9	4,0	3,4	3,2	3,2	2,9	3,0	3,1	3,6	2,4	2,6	3	1,7	2,2
1:00	3,3	4,4	3,2	3,6	3,9	3,0	3,8	2,9	3,0	3,6	2,2	2,2	2,2	1,8
1:15	3,0	3,1	3,2	3,7	2,7	3,3	3,0	3,1	4,0	3,6	1,9	2,1	1,7	3,
1:30	2,9	3,0	4,2	4,0	3,2	4,2	3,5	3,0	2,3	3,1	3,4	2,0	2,4	1,7
1:45	3,3	3,4	3,2	3,3	3,6	4,3	3,9	3,0	2,0	2,9	4,1	1,7	2,1	2,1
2:00	3,0	2,9	4,6	3,4	3,8	3,2	3,1	3,4	2,1	1,9	3,5	3,1	3,9	1,9
2:15	3,2	3,1	4,4	3,5	3,8	3,5	3,0	2,9	1,7	2,6	2,6	3,6	1,9	2,5
2:30	3,0	2,8	3,2	3,2	4,0	3,4	3,4	3,1	2,1	4	2,4	4,0	2,3	2,0
2:45	2,9	2,9	2,9	3,6	2,9	3,2	3,8	2,7	2,0	1,9	1,9	2,7	3,1	2,0
3:00	2,9	3,2	2,8	3,2	3,2	4,3	4,7	3,1	1,9	2,0	2,6	2,2	3,7	2,2
3:15	3,6	3,0	3,4	4,3	3,4	3,4	3,8	2,7	2,1	2,4	2,2	2,3	2,8	5,2
3:30	3,2	2,7	3,3	4,6	3,4	3,1	3,6	3,2	2,1	2,1	2,7	2,5	2,9	4,5
3:45	5,6	3,5	3,7	3,5	3,4	3,5	3,4	3,6	2,4	2,7	3,9	2,4	3,1	4,0
4:00	4,6	3,5	3,2	3,6	3,3	3,7	3,7	4,6	2,2	2,3	2,2	2,3	2,4	2,9
4:15	7,5	7,8	7,3	3,4	7,7	7,9	7,8	8,7	6,9	6,5	2,2	6,2	6,1	6,3
4:30	25,1	25,2	25,8	2,8	26,0	25,0	25,2	25,3	21,6	24,3	1,9	21,7	24,4	24,6
4:45	27,6	24,8	24,8	3,4	26,1	24,4	24,4	24,5	20,5	23,4	1,9	27,3	42,6	32,8
5:00	21,8	21,1	33,5	3,7	33,4	17,0	16,5	40,2	13,2	17,0	2,9	23,9	29,0	21,2
5:15	13,9	20,2	34,0	3,4	30,0	10,0	10,0	29,9	8,2	29,0	2,4	18,6	24,9	13,0
5:30	17,8	11,9	24,0	3,6	28,6	20,9	14,5	28,9	26,0	28,9	2,6	28,4	26,9	11,6
5:45	28,4	11,5	32,0	4,1	33,1	32,7	16,9	31,6	34,1	25,7	3,2	22,9	25,0	9,1
6:00	28,9	14,5	30,4	4,1	28,1	33,5	32,2	27,3	30,0	32,6	3,5	28,7	14,6	12,5
6:15	30,8	30,6	27,7	3,8	33,8	31,2	29,0	25,6	25,8	30,1	2,8	29,7	17,3	30,9

Figure 10: Example of a graphical evaluation of the load profile of a bakery branch

Note: Consideration of "diffuse energies" (waste heat, environmental heat, radiation, etc.)

The term "diffuse energy" refers to forms of energy that cannot be utilised directly (waste heat using a heat pump, solar radiation using PV panels or solar thermal mie systems).

An improvement in energy-related performance is given if suitable EnPIs, taking into account the use of diffuse energy, improve efficiency or show a reduction in normalised energy consumption within the limits of the EnMS.

The energy utilised in this way reduces the energy input with the same output through substitution, or increases the output with the same energy input. Energy efficiency or energy-related performance is improved.

Depending on the complexity and quantity of the measuring points, tables with a folder structure (see example "GUTcert energy recording tool") may also be sufficient. Different levels of observation of the same consumers have proven their worth and facilitate the subsequent creation of energy flow diagrams, e.g. as **Sankey diagrams**.

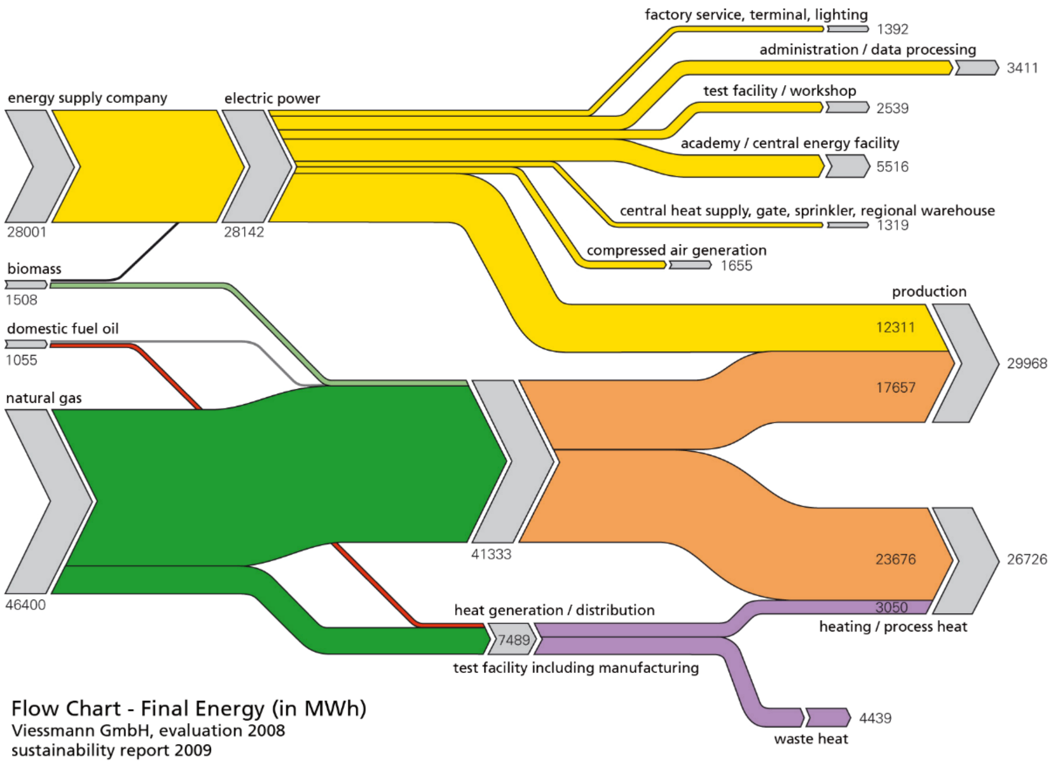


Figure 11: Example of a graphical energy flow diagram for industry

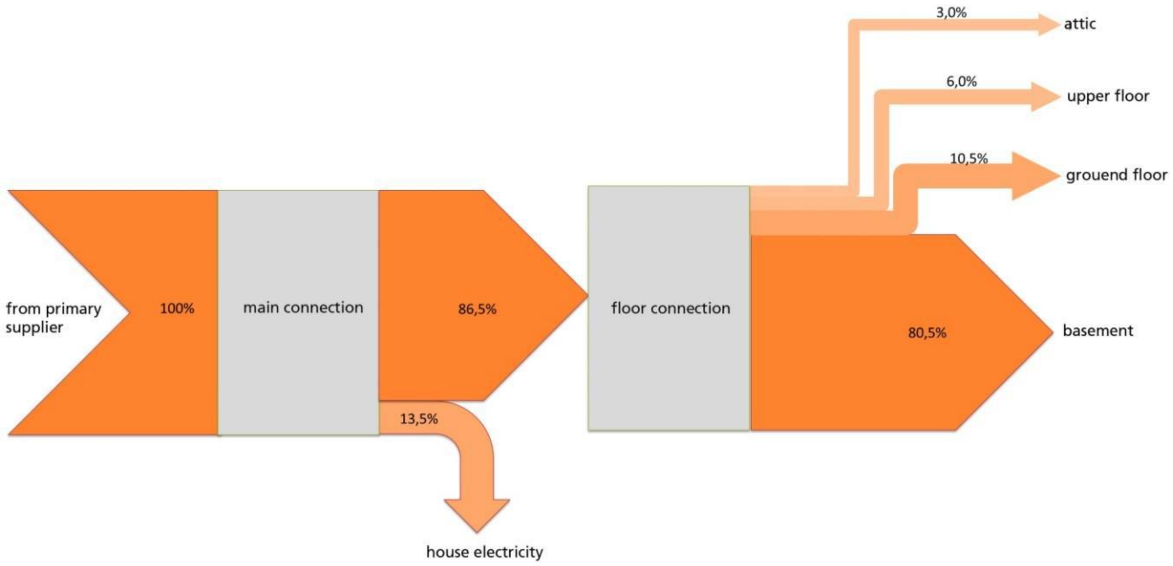


Figure 12: Example of a graphical energy flow diagram for service providers

c) Areas with significant energy consumption

An area with a significant influence on the energy balance can be a large individual consumer as well as interrelated plants, facilities, systems and processes that have a significant influence on energy use and energy consumption. To determine these, a methodology should be developed and documented . Relevant, significant energy consumers form the basis for planning the optimisation measures. 6.3a) - e)

During the inventory and the accompanying measurements, other framework conditions should also be taken into account and, if necessary, measured and (absolutely) documented. This refers to external circumstances that have a strong impact on consumption - positive or negative. They are called influencing factors (or relevant variables) in the EnMS. Examples include climate conditions, maintenance intervals, break and shift regulations, utilisation of units, energy prices, legal framework conditions, production methods, etc. A distinction should be made between influences that have a major or minor impact on the ebL. The systematic evaluation of influencing factors is an essential tool of the EnMS in order to filter out systems and circumstances that have the greatest influence on energy consumption and should be at the centre of processing.

d) Recognise or determine key influencing factors

Influencing factors can be of a different nature. Routine changes such as production output, outside temperature, availability of daylight, etc. are relevant variables (3.4.9). In contrast, non-routine changes to the framework conditions, such as a significant change in the product mix, renewal of technical equipment or building fabric, are referred to as static factors. These are decisive for a precise definition of the current status and the evaluation of EnMS progress and should be taken into account and adjusted when analysing the measured values of relevant systems. 6.3c)

Such an adjustment can take place in two stages. Firstly, these are determined qualitatively, for example in a brainstorming session of the competent employees. A list of consumers, which can be organised according to their size (ascending or descending), is helpful for this.

The significant energy consumers need to be analysed more closely. In addition to the largest ones, these include those with the most fluctuating consumption and those where changes can be made quickly and with little effort. Other factors that influence consumption must also be recorded. These are evaluated using criteria that are important for the organisation.

Note:
(3.5.6) "Significant Energy Uses" = SEUs are understood to mean the main energy uses (systems or production processes) with a significant share of energy consumption and/or significant potential for improving the ebL.

- Consumption level
- Deviation from planned consumption
- Cost-effectiveness
- Potential savings
- Possibilities of influencing: technical or organisational
- Legal Compliance
- Level of environmental impact
- Time to realisation
- Deviation from benchmarks
- Size of the consumption fluctuation
- ...

Example: A qualitative analysis using a matrix representation is often suitable. All energy influencing factors are plotted vertically and all criteria horizontally. Numbers, points or colours (strong, medium, low to none) can be used to assign a weighting. The energy influencing factors with the highest number of points or sum are the most important and can then be highlighted in colour, for example.

In order to determine the SEUs, a number of important criteria (consumption / influence on it, compliance, savings potential) should be compared with the consumers, then the most important consumers (SEUs) are intensively evaluated on the basis of their influencing factors (relevant variables).

The operational objectives and measures in particular can later be derived from this analysis. The analysis is therefore based on the simple economic principle of achieving the greatest possible benefit with limited resources.

For service providers for whom consumption results from the use of office buildings, influencing factors often concentrate on user behaviour (e.g. office occupancy and usage times, room temperature, air exchange, lighting, standby consumption). In addition to the factors mentioned above, human behaviour can have a considerable influence on the energy consumption of a process.) It is therefore necessary to analyse which people influence each major consumer and to what extent.

Tip for service providers:

In order to get an initial overview of your building's energy consumption, the billed energy consumption (electricity, heating energy) and the energy supply contracts must first be checked. In the case of a higher purchase of electricity or gas (special tariffs), power meters are also installed for the respective consumption points by the energy supply company (EVU), usually from 100,000 kWh (electricity) and from 1,500,000 KWh (gas). These companies can order their load profile from the energy supply company.

Consumption is billed to the energy supply company by means of a "labour price" (energy actually consumed at high and low tariff times) and a "power price". The capacity price is based on the maximum consumption within a quarter of an hour (peak consumption). It makes sense to analyse the load profile (load curve) for this: If the agreed maximum peak power is exceeded, this results in increased consumption costs; if the performance price was set too high for safety reasons, an excessively high performance tariff is paid each month.

For a plausibility check of the load profile, the data from the previous year can be requested from the energy supplier and compared with that of the current year. As part of the check and graphical processing, forwarding to subtenants or the house electricity can also be scrutinised.

In energy management, the physical optimum can be understood as the ultimate baseline that cannot be undercut. The optimum operating mode of a process is the one without human and external influences and is therefore only dependent on physical laws (this is described by "the best operating mode ever").

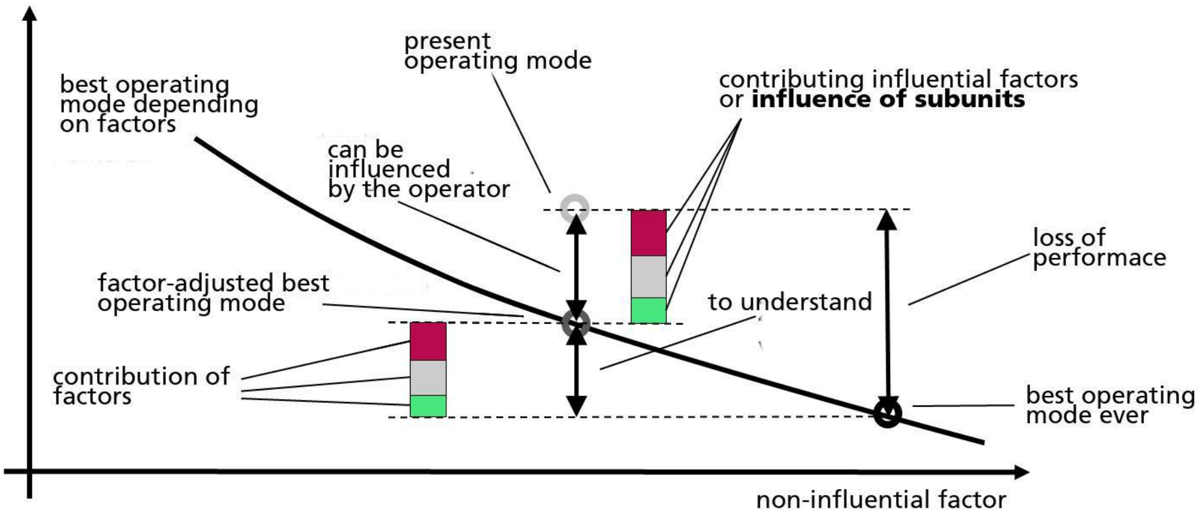


Figure 13: Best driving style ever [1]

Once the main influencing factors for the significant energy consumers have been recognised, a second stage begins - a mathematical adjustment. If there are too many possible influencing factors, the influence of each individual factor on energy consumption should be analysed mathematically. The same procedure as for **normalisation** (3.4.10) of the **energy baseline** (3.4.7) can be **used** for this.

e) Measurement and monitoring

6.6
9.1

In accordance with the standard, the organisation should primarily record its main consumers (or main characteristics) using measurement technology and determine and document the methods for monitoring, measurement, analysis and evaluation accordingly. It is therefore advisable to draw up an energy data collection plan (6.6) at this stage in which all key principles and methods for measurements (3.4.1) and future monitoring or verification are defined.

This also includes the handling of influencing factors or the frequency of measurements, responsibilities, restrictions and the measuring devices used or the type of sensor used to measure each individual variable (see also ISO 50015). Care should be taken to ensure that 100% of the energy consumption at the end of the measurement period can be allocated to a specific use.

Measuring devices and their accuracy must be recorded in relation to the consumer in order to be able to recognise any gaps or incorrect values. In principle, the measurement accuracy should increase with the size of the consumer. The deviation in the recording of the total energy flows, i.e. the consumption that cannot be clearly allocated to the consumers, should initially be a maximum of 5-10%. This is the only way to ensure that the analyses are meaningful enough to set comprehensible targets.

If it is not possible to collect data as planned, this must be assessed by the organisation and alternative methods used. (see also ISO 50006).

A list of all measuring devices ("list of measuring devices") helps to maintain an overview of whether measuring devices subject to mandatory testing have expired, whether measuring devices indicate incorrect measurements and whether the accuracy is sufficient for a meaningful objective.

Measuring location	Consumer group	Measuring device number	Measuring principle	Reading principle	Last calibration	Accuracy
E-station	Workshop	1234567	Counter/ electromagnet	Automated data acquisition IT	None, in use since 2023	1,5 %
Boiler house	Heating oil	Unitop 3000	Bearing/length m.	monthly	April 2024	0,5 %

Table 4: Example of a list of measuring devices

Collecting data on the use of energy in relation to systems or areas often requires a great deal of effort (measurement systems of sufficient quality are not installed everywhere and existing ones cannot be read out automatically). The first step is often to carry out partial measurements of systems, e.g. using current clamps or temporary dial gauges by and extrapolating consumption, output, operating times, etc.

Tip

For new or replacement ves titio ns in systems, attention should be paid to the adequate installation _COPY0 lation of measuring tech nical systems gies.

Tip for SMEs:

When analysing meters or installing new measuring equipment, the possibility of analysing so-called "virtual meters" should be taken into account. Additional consumers or consumption areas can often be delimited from higher-level measuring points in conjunction (deduction/addition) with underlying individual measurements, thus saving meters. The individual operation of units in total metered areas also allows precise consumption data or the recording of load profiles.

In addition, it is recommended, e.g. for motors, to collect the performance data or the waste heat leaving the systems in order to gain information on optimisation potential. If available, information on the load profiles of units should also be collected, provided that measurement options already exist. If these do not yet exist, it makes sense to consider purchasing them in the next step. In this case, measurement using mobile measuring devices that are able to record load profiles is also possible.

Note: Energy data acquisition plan

Soon after the start of the compilation or recording of measurement data, deficits become apparent, as the existing measuring points and their recording were not previously designed for the purposes of an EnMS:

- There is a lack of measuring equipment to record the consumption of cooling water, compressed air, gas or pressurised gases, for example, which was not required in the previous operating context.
- The measuring equipment is too old and inaccurate for the EnMS, such as old measuring orifices for steam or heat quantities or electrical meters that are up to >50 years old.
- The available values often do not adequately fulfil the measurement task. They do not allow time-dependent recording, which is essential for recording load profiles or consumption peaks, for example. With new electronic meters, not only continuous data, but also active and reactive power can be determined.
- Larger companies in particular generate so much data and accompanying information that it cannot be analysed without the support of suitable software - meaning that the information contained in the figures for improvements cannot be recognised at all.

As the amount of data increases, so does the understanding of the measurement obligations and evaluation requirements. Therefore, all measurements should be systematically planned, carried out and analysed.

f) Energy performance indicators and energy baseline

Companies must provide evidence of their energy improvements and the increase in energy efficiency: The ongoing optimisation of the ebL compared to the energy baseline (EnB) must be demonstrated by measurable results. Accordingly, the energy performance indicators (EnPIs) should be prepared or standardised in a comprehensible, meaningful and meaningful way. The aim is to use the indicator to show a verifiable positive change compared to the baseline.

6.4
6.5

Firstly, the system/installation/process (SEU) to be assessed should be sensibly balanced: the system boundaries should be defined as broadly as possible and as narrowly as necessary. Then, based on the material and energy flows, it should be ana ly sised (cost-benefit analysis tion) whether the system is also subject to external influences. It must then be assessed which quantifi able variables should be used to represent the benefits. As part of the number formation process, a decision is then made as to which type of valuation should be applied to the various expenses. One or more **energy performance indicators** (3.4.4) can be formed. Individual values, their ratios to each other or models and technical simulations can be used as indicators. These are used to control and evaluate the ebL: targets are set with the help of the indicators and progress is tracked and evaluated.

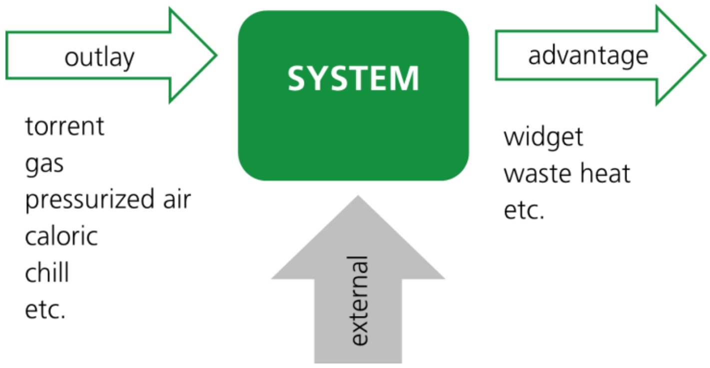


Figure 14: Simplification of the system (Ökotec GmbH)

It is essential that the key figures meet the needs of those who use them: Controlling and EnMB may have different perspectives and correspondingly different intentions when monitoring the same plant. Consequently, different key figures should also be established for controlling and EnMB.

Which key figures are useful? It is up to the companies themselves to decide how they define their key figures. A key figure will always be a simplification of reality, but an attempt should always be made to orientate it as closely as possible to the real situation.

A basic distinction is made between the overarching, organisational related so-called top-down key figures and the process-, measure- or system-related so-called bottom-up key figures (ISO 50047).

- The organisation-related key figures provide an overall overview of the change in an organisation's energy consumption within defined limits:
    - Total energy consumption of a location in absolute terms and in relation to the value added or the quantity of products manufactured / services provided.
    - These are particularly useful for commercial purposes.
- The subordinate key figures provide an overview of the development of the ebL of an individual system or process:
    - Each process can be viewed as a closed system with costs and benefits (see Figure 14). All influencing factors relevant to the system should be measured and recorded from the outset.
    - Such key figures make it possible and easier to benchmark the systems and verify the success of individual measures.

To compare energy consumption with a base year, an **energy baseline** (3.4.7) is necessary and required by standards. An energy baseline is also created for each key figure on the basis of an appropriate starting period (typically 12 months to compensate for seasonal fluctuations). It can be defined as a simple ratio of benefit to expenditure in a baseline period. However, if several factors have a significant influence on consumption, more complex models are required to take these influences into account (see also ISO 50006).

g) Correlation and normalisation of starting bases

The collected series of consumption data of a significant energy consumer and the analysed influencing factors are compared, e.g. in an Excel application, in order to determine a possible correlation. Corresponding reference values are displayed as points in a coordinate system. If it is possible to draw a straight line as an "average trend" of all reference values (points), a correlation exists. Such correlations can also be determined and checked by analysing the adjusted **coefficient of determination**[2] . The degree of correlation is calculated automatically by statistical analysis programmes. A clear correlation has a coefficient of determination of over 90%. If the "cloud" of reference values is too diffuse and no straight line is possible as a mean trend, there is no correlation and the influencing factor is not decisive for the ebL.

If there is a statistical correlation, **normalisation (3.4.10) or adjustment of the ebL for the influence of the relevant variables** can be carried out using a regression analysis . A linear regression line and equation is often used for this. The tests of the correlations should be recorded in a comprehensible manner (see also ISO 50006).

The resulting linear equation can now be used to accurately predict consumption at a specific point in time using current influencing factors. It is therefore possible to calculate how the process in the system should run under the given framework din conditions ("target"). Using this model, a comparison of the key figure with its respective baseline can now be made in a comprehensible manner, excluding external influences, and thus the change in the ebL can be calculated.

Figure 15 shows an example of the **regression analysis** (left) and the progression of a **normalised energy baseline** for the heat demand of a building (right). Changes run in the heat demand depending on the temperature are shown as green dots - these are reference values. In this example, the outside temperature has a major influence on consumption: Consumption increases as the outside temperature falls - the reference values reflect the relationship and a straight line forms the mean value.

This allows an adjusted monthly comparison of heat consumption to be made for a 12-month reference cycle.
12-month reference cycle. A heat requirement that is below the target value represents a saving.

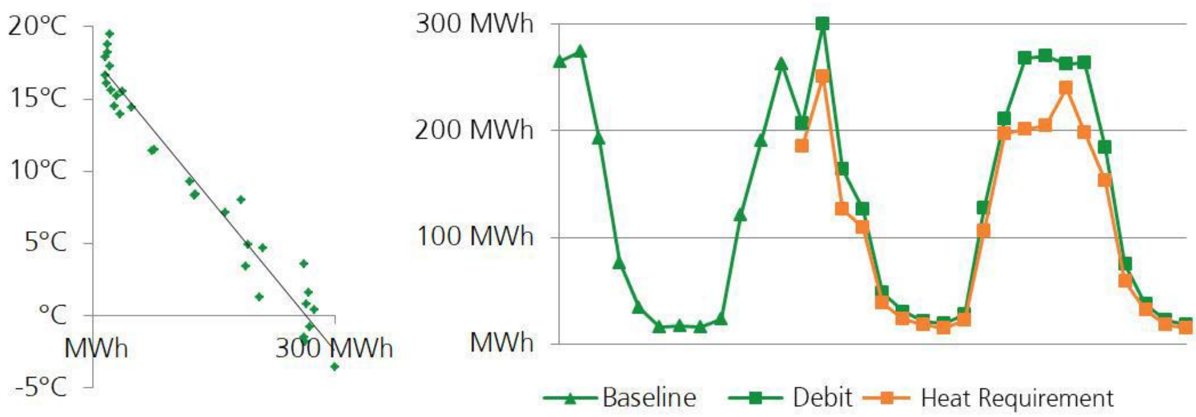


Figure 15: Determination of a normalised energy baseline (Schneider electric)

This can then be allocated to a specific measure (right).

Other examples of standardised key figures are

- Energy consumption of an organisation in relation to value added
- Energy consumption per manufactured part (light bulb, tin can, etc.) and year

[2] The coefficient of determination (from the Latin determinatio "delimitation, determination" and coefficere "to contribute") is a statistical measure of quality.

- Energy consumption per tonne of molten iron or saleable iron
  (Energy target can be an environmental and quality target!)
- Heating requirement per year per m² standardised with the help of heating degree days

If the static factors change (new systems are purchased, buildings are erected, tech nologies are substantially changed, etc.), the comparison between "old" and "new" is not meaningful without an adjustment. This means that a new starting point must be established.

Annual energy plans, similar to annual financial planning, should be drawn up using energy baselines and suitable key figures, including targets. By assuming me values for the influencing factors and using these in the equation of the energy baseline, a forecast can be made for future energy consumption. This helps to purchase energy in a demand- and cost-optimised manner, as better conditions are often available in advance than on spot markets.

Regular comparisons of current figures with planned data indicate malfunctions or unnecessary consumption in good time due to "outliers". Energy performance indicators are also used for internal ner and external benchmarking. At the same time, they enable an assessment of the organisation's or product's vulnerability to fluctuations in energy costs.

A documented list of selected energy performance indicators with a description of the methodology and sources for their creation is one of the main elements of an EnMS and should be regularly checked for suitability and up-to-dateness in future. The recording and methodology for normalisation and adjustment must also be recorded.

Tip

ISO 50006 and ISO 50047 provide comprehensive assistance for determining the starting bases and regression analyses with examples and explanations. The appendix to ISO 5006 includes the EnPI and EnB planning process, as well as an example of a step-by-step normalisation process and examples of normalisation.

h) Energy report

It is advisable to summarise the data, information and initial evaluations obtained in this way with the results from points 2 and 3 (energy report). This creates a comprehensive information basis (energy-related starting point for the EnMS) for an initial management review in accordance with ISO 50001.

The task of an energy report is to provide a format that enables a quick overview of the data and facts on energy consumption and comparisons with future energy analyses. The energy report is therefore the information medium for all those responsible in the EnMS. It can be passed on to interested parties and also serves as the basis for the internal audit (see step 16) and for analyses by external experts (e.g. energy audits in accordance with EN 16247/ISO 50002). This summary must be updated annually and updated ali sated.

An initial energy report should contain ideas for an initial energy savings programme with targets and measures based on the analysis of the data. If the "EnMS project" is further developed after implementation of stage I and management structures are introduced with stage II, the energy report must be supplemented with a planning section (see step 14).

4.2 Recording the organisational and communication structure

5.3
7.4

Almost all organisations have regulations and responsibilities for energy ma management, even if it is only the controlling department's obligation to regularly compare the energy gierech readings with their own meter readings. Responsible persons are often appointed to take care of energy consumption.

All existing organisational regulations and procedures must be recorded in order to make them usable for subsequent energy management. Existing processes are usually well managed and effective. They are practised and should therefore form the basis for new regulations.

The organisational analysis usually shows that existing energy-related activities are uncoordinated, without overall planning and outside the strategic objectives. Communication deficits also often become apparent. A systematic organisational and communication analysis therefore helps to derive goals and measures for an improved organisation. The results should form part of the energy report in order to provide top management with a comprehensive basis of information .

Tip for SMEs

Clarify:

- Who determines which energy consumption (by habit or by regulation)? Take particular account of notes in workshops, shift handover logs or accounting records, which often contain figures on energy data
- Who receives the figures, data and facts on energy consumption for checking and, if necessary, evaluation? If no one is clearly responsible, there is an urgent need for action - beyond an EnMS!

4.3 Determining legal obligations and other requirements (compliance)

9.1.2

An integral part of any good leadership and management system (QM, environmental management, occupational safety, energy, etc.) is ensuring compliance with laws and other relevant requirements that an organisation has entered into. Checking organisational practice for compliance with the laws applicable to energy use, consumption and efficiency and other relevant requirements of interested parties is therefore an essential task when collecting basic data.

This requires a collection **(legal register) of** all relevant laws, municipal regulations, voluntary commitments, energy-relevant authorisation requirements, technical regulations for the facilities, processes and other relevant requirements, regulations and restrictions . The register should be created as part of the baseline survey and then checked for relevance at regular intervals and updated if necessary. However, it should only contain the regulations that apply or could apply to the organisation, otherwise the overview will be lost.

Tip for SMEs:

- The energy agencies of the federal states, possibly also the trade association or specialised lawyers who deal with this rapidly growing area of law, can help with the creation of a legal register. Other energy management operators may also be able to offer support.
- Legal regulations, already organised by topic and always up to date, are available at low cost via subscriptions from corresponding Internet providers.
- (cf. in Germany: http://www.umwelt-online.de/).
-

No.	Range	Level	Law/ Regulation/ Ordinance	Abbreviation (Link)	Applicable Requirement	more affected Process/ plant	Responsibility for implementation	checked on, through:
1	Energy	Covenant	Ordinance on energy-saving thermal insulation and energy-saving systems engineering in buildings	EnEV	§ 4 Requirements for non-residential buildings	Production hall	Employee XY	Date; Employees

last update on DD.MM.YYYY by Mrs Muster

Table 5: Example of a legal register

The legal provisions recorded in this register must be compared with the organisation's procedures and compliance with them must be assessed and documented. If uncertainties arise, experts should be consulted if necessary (see tip). Compliance with all legal regulations should be one of the basic objectives of every organisation, regardless of whether an EnMS has been set up. If one or more of the regulations have not yet been implemented or have only been partially implemented, this means that the catalogue of measures from the baseline survey should be expanded to include the elimination of these deviations. These results of the baseline survey should also be included in the first energy report in order to complete the information base.

Note: Compliance = adherence to legal regulations

Even without developing this initial survey into a systematic management system with a continuous improvement cycle, one result of the initial survey should be to define the responsibility for the continuous maintenance of this register and the constant comparison within the organisation (compliance check). The legal requirements and obligations identified exist in principle, even without the establishment of a formal management system, and are often punishable by law.

Step 5: Energy targets, action plans and savings programme, Verification of success

Potential for improvement becomes apparent as soon as the basics of the current energy status (figures, organisation, legal environment) are collected. These should definitely be noted down and a **list of possible energy savings and improvements** drawn up. All potentials are recorded, regardless of whether they appear to be realisable at present or not. Each item on this list should be specified as specifically as possible: 6.2

- Savings target
- Possible measures
- Costs incurred
- Time required
- possible project management.

From the potentials on this list, initial energy saving targets can be defined and summarised in an **energy saving programme** .

To this end, the ideas that emerged during the initial data collection must be prioritised . The priority can be derived, for example, from whether legal issues are involved (highest priority), whether quick and inexpensive implementation is possible, whether the savings volume is particularly high, etc. To determine the priorities, an assessment of the main factors influencing energy consumption must be carried out. If the basic survey is later expanded into an EnMS, it must be updated annually.

Following a comprehensive assessment, an energy saving programme can be drawn up on a solid basis. It summarises all the targets for savings and sets out the action plans with which these will be implemented.

a) Energy target

Setting specific, measurable, ambitious, realis tic and time-bound targets (S.M.A.R.T.) is one of the key in instruments of any management system. They are in line with the energy policy and form the framework for the further ge hening. A distinction can be made between general, strategic and operational tive objectives of the organisation.

"Reducing energy consumption for heat generation" or "modernising lighting" are **strategic goals** and belong in the energy policy or an overarching energy strategy.

Operational targets (energy targets, 3.4.15) are the targets that are set for individual areas, levels and functions. These are derived from the strategic goals, broken down into the respective areas. The basis for this is the energy getic assessment of the SEUs and the associated opportunities (=measures) for improving energy-related performance (see 6.3), which must be available as documented information at . According to 6.2.3, this must also define how the results are evaluated, including the procedures used to verify the improvement of energy related performance.

Note: Define S.M.A.R.T. goals!

- Specific
- Measurable
- Accepted
- Realistic
- Terminable

Operational objectives must be measurable - otherwise they are not objectives! "Objectives" that are not measurable, i.e. whose pursuit cannot be monitored and whose realisation cannot be verified according to , are irrelevant for the system.

Note:

Experience has shown that the energy efficiency measures are often collected "bottom up" via the specialist departments (production, energy officers, development, etc.) or external knowledge carriers (consultants, working groups, initiatives, etc.) in the list of ideas and assigned to the overarching objectives for the SEUs. According to section 6.1.1, the planning of energy efficiency measures must always be in line with the energy policy and derived from it. Conversely, this also means that only those energy efficiency measures that are necessary to implement the energy policy (objectives and energy targets) and continuous improvement (10.2) must be implemented.

It is also important to understand which decision parameters are used to select or prioritise the energy efficiency measures to be implemented and whether all tifi cated energy efficiency measures have been included (or possibly already selected in advance). Every company should therefore prepare the process for identifying energy efficiency measures for itself as a scheme; this planning process is the core of ISO 50001.

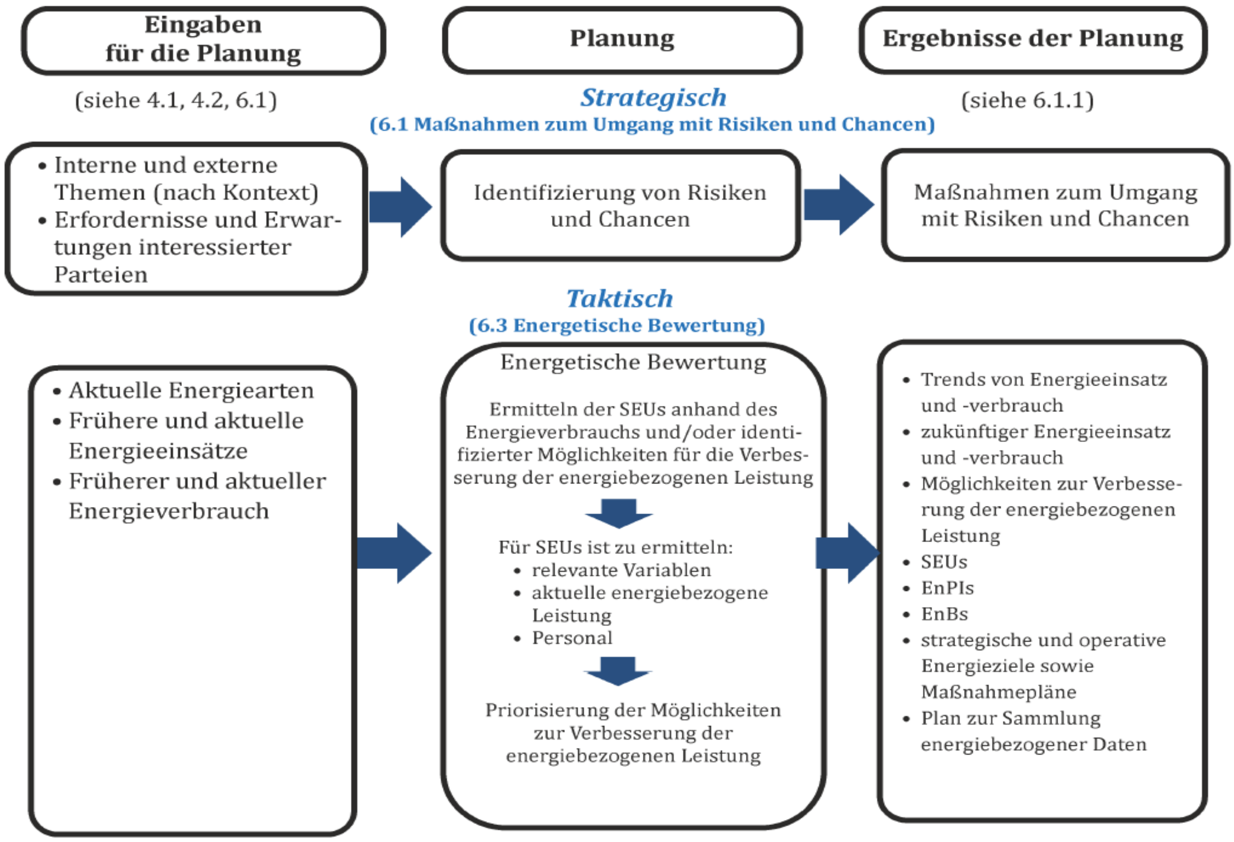


Figure 16: Source: https://www.m-q.ch/ ; Energy planning according to ISO 50001 © EN ISO 50001:2018 (D)

b) Creation of action plans and verification of success

The individual savings projects for improving the ebL are worked out from the results of the energy assessment and subordinated to the respective targets in action plans. 6.2.2 6.2.3

In addition to the overall overview (energy savings programme), the action plans should also include a performance review and, where applicable, a calculation of the cost-effectiveness of the savings project (e.g. from project cost controlling). Each action plan should therefore document how the results are evaluated, including the procedures for verifying the improvement in energy-related performance. An agenda for an action plan can be found in Appendix II.

The standardised method in accordance with DIN EN 17463 "Valuation of energy related investments" (VALERI) is increasingly being referred to for the economic efficiency assessment, with the intention of ensuring a uniform approach hens weise for subsidies and reporting obligations.

For an energy management system in accordance with ISO 50001 or EMAS, there are currently no fundamental obligations to apply DIN EN 17463. However, supplementary legal regulations lead to additional requirements.

The monitoring and verification of the savings projects with the respective measures to improve the EAL should also be planned and recorded in a verification plan (see step 14). 9.1.1 As a result, the existing documentation mentation on the measurement procedure should now be expanded: The general energy data collection plan is supplemented by the measurement specifications for individual projects, as can be seen in Figure 17. It is important that each individual M&V plan follows the same structure as the data collection

Tip for SMEs:

Potential for improvement can be recognised if the following questions are constantly asked when collecting data:

- How has energy consumption changed in recent years? Are there trends and how can they be explained?
- Which are the biggest energy consumers and did I expect this?
- Where is there potential that can be captured through further/more detailed measurement (load profiles)?
- Which variables could influence my energy consumption?
- What tariff structure do I have and is it appropriate for the production?
- Are there alternative energy sources (gas instead of oil or heat from electricity)?
- Are there any renewable or CO_2 -neutral energy alternatives?

plan.

At the beginning of systematic energy management, high energy savings can often be achieved with simple measures and little effort. In some cases, however, savings can only be achieved with considerable investment, which means a high capital commitment with a corresponding loss of liquidity. Before binding targets are agreed in the review, it is therefore important to record more than just the absolute investments. For larger projects, a profitability assessment should be carried out over the life cycle of the project or system. This makes it easier for management to make a decision based on the current situation of the organisation.

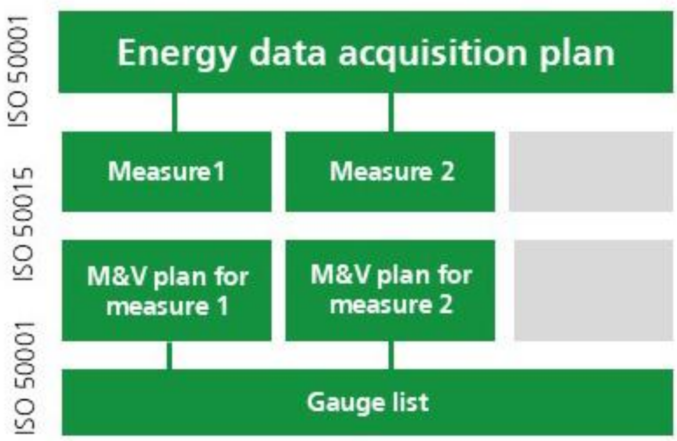


Figure 17: Plans and records in the EnMS

Tip:

Guidance on writing a measurement and verification (M&V) plan for each measure can be found in ISO 50015.

However, whether or not an energy-related investment or energy efficiency measure can be categorised as cost-effective when implemented depends on a number of technical and monetary factors.

Previous economic feasibility studies, such as the static or dynamic evaluation method or pure amortisation time considerations, do not take key aspects into consideration and require standardisation. DIN EN 17463:2021-12 "Valuation of energy-related investments (VALERI)" was developed to ensure a standardised system for energy related investments in measures. VALERI specifies how information is collected, calculated, analysed and documented in order to create solid business cases based on net present value calculations for measures and to determine their useful lives and net present values. An overview of environmental offsets, associated deadlines and explanations on the topic can be found in Appendix I.

Energy efficiency measures are generally referred to as energy-related investments (ERI) in DIN EN 17463:2021-12. In order to evaluate them financially, benefits and burdens including all relevant energy flows are compared. Benefits and burdens should be financially quantifiable in terms of payments and receipts within the assessment period (cash flow). They should also take into account possible influencing factors, such as expected price fluctuations or degradation.

The following burdens and benefits may be present, among others:

Effect	Range	Example
Benefit	Energy (operation)	• Improved ease of maintenance • Extended maintenance frequency, reduced maintenance time
	Material	• Cost savings on consumables (sealing material, filters, etc.) • Less material used in production (e.g. by reducing waste, optimising construction and product design such as lightweight construction, increased material recycling, etc.). • Reduced susceptibility to repairs (MTTF, MTBF)
	Equipment	• Higher system availability • Higher system productivity, lower production costs
	Waste	• Lower waste costs, fewer rejects
	Product quality	• Better tolerances in production, therefore higher quality products possible
	Grants	• Grants from funding programmes
	Terms and conditions of purchase	• Indirect influences on electricity procurement costs (e.g. changed contractual conditions due to lower or higher electricity procurement)
Effect	**Range**	**Example**
Loads	Planning costs	• Feasibility studies and preliminary investigations (not to be taken into account according to DEHSt guidelines on ecological compensation)

		• Specialist planning, implementation planning and construction supervision
	Acquisition costs (BAFA: component/installation costs)	• Purchase price, rental/leasing costs, transport costs, installation costs • Liquidity analysis and effects of borrowing on the overall result
	Operating and maintenance costs	• Energy costs - electricity, diesel, petrol...) • Drinking water and waste water costs • Consumables (paper, toner, lubricants...), taxes (motor vehicle...) • Insurance (liability, comprehensive cover...) • Training costs (cleaning staff...) • Maintenance costs (facility...) • Repair costs (spare parts, labour) • Costs for necessary accessories
	Disposal costs (BAFA: demolition and disposal costs)	• Transport to the disposal company, waste treatment in accordance with the law Pollutant treatment
	Residual value	Income from sale, value of the item if used beyond the period of use
		...

Non-quantifiable benefits and burdens, such as noise reduction, image gain, etc., can be taken into account, but in our opinion are not absolutely necessary for the economic viability analysis within the legal obligations. Personnel costs a spa rungen are not taken into account in the

Table 6: Benefits and burdens

analysis.

In order to calculate the net present value, the following calculation variables (which are discussed in more detail in the following points) are required in addition to the benefits and burdens (quantifiable expenses and income zah lungen) and the periods to be taken into account (useful life):

(1) Calculation interest rate

(2) Annual energy price fluctuations

(3) Annual price fluctuation, no energy

(4) Actual specific energy price

The calculation variables can then be used to correct the cash outflows and inflows (cash flows) for the periods taken into account by the future price increases in order to calculate the "net cash flow" and then discount this to today's net present value (NPV).

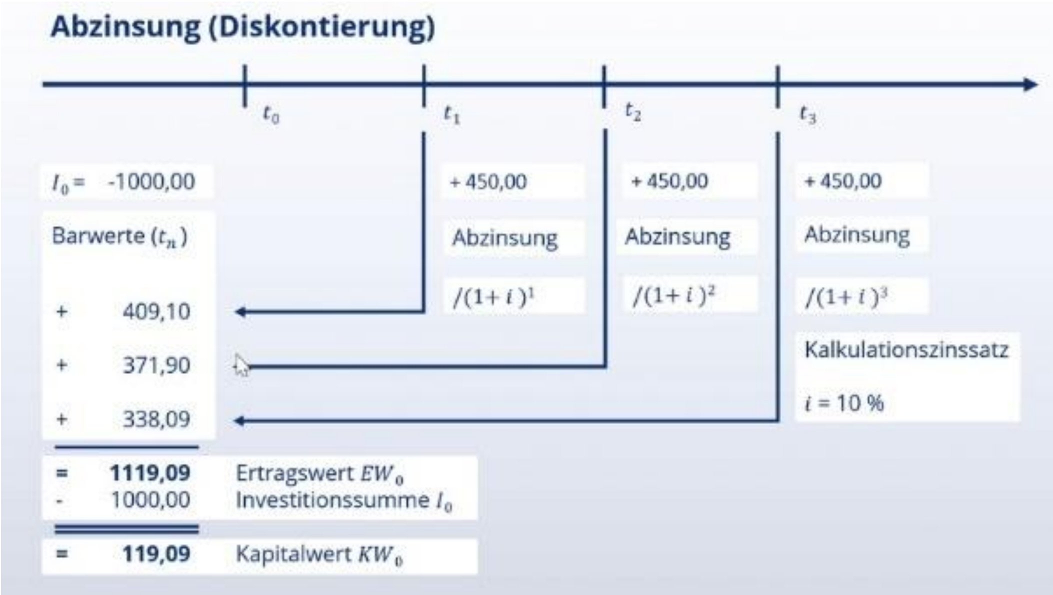


Figure 18: https://www.bwl-lexikon.de/wiki/kapitalwertmethode/

The target value for the profitability analysis is therefore the net present value as an indicator for the investment decision. The equation for the net present value at the time of calculation is as follows:

$$NPV = P_0 + \frac{P_1}{q} + \frac{P_2}{q^2} + \cdots + \frac{P_T}{q^T} = \sum_{t=0}^{T} \frac{P_t}{q^t}$$

Dabei sind

$q = (1+r)$	der Abzinsungsfaktor;
P_t	die Zahlung am Ende der Periode t;
r	der Kalkulationszinssatz (als Dezimalwert).

Various Excel tools offer help here, such as the Excel tool from Prof Dr Nissen, which you can download from the following link:

http://www.cms.ulrichnissen.de/clickandbuilds/CMS0/index.php/forschung-praxis/din-en-17464-valeri

Note:
Overall, the identified benefits and burdens as well as basic assumptions regarding the calculation variables (interest rate, price increase) **must** be documented together with a comprehensible project description and the scenario analysis in a so-called assessment report. A template for this can be found as a checklist in Appendix E of DIN EN 17463.2021-12 or as a separate tab in Prof. Dr Nissen's Excel tool.

As the calculation parameters are subject to major fluctuations according to experience , DIN DIN EN 17463:2021-12 provides for a mandatory scenario analysis for the most important input pa ra metres. The analysis is carried out by simultaneously varying all setting parameters and decides between three scenarios: Best Case, Worst Case and Most Likely Scenario. This "extreme value analysis" is used to derive an approximate value from the various influencing factors for the most probable or most realistic case. The sensitivity analysis, in which the individual influencing factors are weighted, is voluntary, but should be roughly estimated.

c) Energy saving programme

The energy savings programme (as a condensed overview of the projects) and the associated action plans (detailed verification including verification methodology and M&V design) are approved by top management in an (initial) review after the final evaluation.

The pursuit of objectives must already be regularly monitored at stage I and the at tungs status documented. Monitoring according to a defined process (internal audit) is only required after entering a continuous improvement cycle (see description of step 14 in stage II and 17 in stage III).

Bewertungsbericht Nr_1 "Austausch von Kühlpumpen im Gebäude1"

Name des Vorschlagenden: Karl Schmidt	**Datum: 06.07.2022**

Kurze Beschreibung der energiebezogenen Investition:
Um die Energieeffizienz zu erhöhen, sollten die 5 Kühlpumpen in Gebäude 1 durch neue energieeffizientere Pumpen ersetzt werden. Dies insbesondere auch deshalb, da die alten Pumpen aus dem Jahr 1976 stammen und in naher Zukunft wahrscheinlich ausfallen könnten.

Vorschlag für die Entscheidung

Alle Ergebnisse und Berechnungen finden sich in dem vorliegenden Bericht.

Zusammenfassung der Ergebnisse

Kapitalwert:

Szenario Analyse:

Qualitative Beschreibung nicht monetarisierbarer Effekte:

Neben dem positiven Kapitalwert bewirkt die Investition weiter positive qualitative Effekte. Die neuen Pumpen werden die Zuverlässigkeit der Produktion erhöhen, da die Chance für einen Ausfall der Pumpen durch die Investition verringert wird.
Die neuen Pumpen werden den Geräuschpegel in Gebäude 1 von 85dB auf 65dB senken.
Zusätzlich führen die Energieeinsparungen zu einer Verringerung der CO2-Emissionen von x Tonnen.

Anhang
- Tabelle 1: Berechnung des Kapitalwerts (Wahrscheinlicher Fall)
- Tabelle 2: Berechnung des Kapitalwerts (Best-Case Szenario)
- Tabelle 3: Berechnung des Kapitalwerts (Worst-Case Szenario)

Figure 19: Extract from DIN EN 17463 - 2021-12

Society	Savings target	Planned efficiency measure(s)	Planned investment	CO_2 savings	Economic efficiency assessment	Responsible	Project status	Link verification (Details)
Efficiency GmbH	Electricity savings of 37,400 MWh	Control optimisation and replacement of old transformers	3.150 €	16,800 t/a	< 2	Technical planning	◕	Action plan 1
Efficiency Logistics GmbH	Reduction in electricity consumption by 74 MWh	Only allow pumps to run automatically	0 €	48 t/a	Immediately 6.500 €/a	Technical planning	●	Action plan 2
Energieeffizienz GmbH	Reduction in electricity consumption by 1,350 kWh/light	Replacing efficient light bulbs	100 €/ luminaire	878 kg/ luminaire t/a	< 3	Building services	◑	Action plan 3
Efficiency Logistics GmbH	Reduction in electricity consumption by 50 MWh	Lowering the compressed air by 1 bar	0 €	31 t/a	Immediately 6.150 €/a	Technical planning	●	Action plan 4
Efficiency Logistics GmbH	Reduction in electricity consumption by 1,000 MWh	Reduce compressed air network losses through non-closing condensate drains	10.000 €	570 t/a	< 0,2 55.000 €/a	Production production manager	●	Action plan 5
Efficiency Foundry GmbH	Reduction in electricity consumption by 250 MWh	Installation of an energy control system for efficient operation of ovens	15.000 €	169 t/a	< 1 23.550 €/a	Production production manager	◕	Action plan 6

○ Planning recorded/recorded ◔ Processing started ◑ Processing in full swing
◕ Processing completed ● Effectiveness tested

Table 7: Example of energy-saving measures from energy programmes for industry

Tip for tenants:

Where possible under the tenancy agreement, tenants should enter into a dialogue with the operator of the building leit technik to identify possible potential: Who set the specifications for the existing settings and on what basis? Are they comprehensible and in line with requirements or is there a need for manual lungs adjustment? For example, were the temperature values for the air conditioning of the server rooms set too high? Is the level of air circulation rates in the buildings appropriate, etc.?

In the case of owner-operated buildings, the optimum setting of the heating, ventilation and air conditioning system and heat loss through the building envelope (building physics properties) also play a role. The "human factor" must not be neglected. The influence of manual control can sometimes have a significant impact on energy consumption.

Society	Savings target	Planned efficiency measure(s)	Planned investment	CO savings^2	Economic efficiency assessment	Responsible	Project status	Link verification (Details)
Efficiency GmbH	Electricity savings of 37,400 MWh	Control optimisation and replacement of old transformers	3.150 €	16,800 t/a	< 2	Technical planning	◕	Action plan 1
Energieeffizienz GmbH	Reduction in electricity consumption by 74 MWh	Only allow pumps to run automatically	0 €	48 t/a	Immediately 6.500 €/a	Technical planning	◔	Action plan 2
Spar Ltd.	Reduction in electricity consumption by 1,350 kWh/light	Replacing efficient light bulbs	100 €/ luminaire	878 kg/ luminaire t/a	< 3	Building services	◑	Action plan 3
Transparency Ltd.	Reduction in electricity consumption by 50 MWh	Lowering the compressed air by 1 bar	0 €	31 t/a	Immediately 6.150 €/a	Technical planning	●	Action plan 4
Efficiency Logistics GmbH	Reduce the energy consumption of lorries by 5%	Installation of CMS devices	18.500	33 t/a	1,5	Technical planning	●	Action plan 5

○ Planning recorded/recorded ◔ Processing started ◑ Processing in full swing
◕ Processing completed ● Effectiveness tested

Table 8: Example of energy-saving measures from energy programmes for service providers

Step 6: First management review

Using the data from the first steps, top management and, if possible, all departments and individuals with a significant influence on energy consumption conduct a (first) **management ment review (management review).** The results of the basic data collection are presented, explained and discussed at this meeting.

After that it's time,

- prepare a list of possible energy savings
- to draw up an initial assessment of the main factors influencing energy consumption and the main energy consumers
- to create an energy saving programme
- Draft energy action plans to track the measures

A number of decisions then have to be made by top management:

- Determining the context and prioritising internal and external topics that are relevant to energy planning
- Determining risks and opportunities in relation to the EnMS
- Formulate an initial energy strategy (energy guidelines or similar) for the organisation
- Confirmation of compliance, adherence to all energy-relevant legal regulations or formulation of measures to ensure compliance in the future
- Determining/confirming the energy use, the main energy consumers, influencing factors and energy costs as the basis for the energy targets

- Confirm or derive energy targets and energy action plans for the next period
- Decision on how to proceed (place the system on a more stable formal footing and continue to Level II or simply update the basic principles annually and remain at Level I for the time being)
- Define a suitable organisational structure for processing the objectives, recording the data, regular communication and, if necessary, further development of the EnMS in the next stage (energy officer, energy team, etc.)

At the latest, the results of this first review should be communicated to everyone in a suitable form for information, increased be zie ing and motivation. Comprehensive information harbours the potential to involve all employees in the savings efforts.

Stage II - Integration of the EnMS into company processes

The first steps have laid the foundations on which an EnMS is built. The self-analysis carried out already makes it possible to identify and implement significant savings. For some companies, this is already enough. They can simply continue the annual recording and management assessment with updated targets .

However, many will go on to the next stage based on their savings successes, in which a standard-compliant and ultimately certifiable management system in accordance with ISO 50001 is set up in order to save even more energy and money in a further 12 steps.

In steps 7 to 14, key management system structures are established and the necessary resources and tools are provided.

The title of this stage makes it clear that no artificial organisation should be built for the EnMS at . It is better to supplement the existing organisation and only introduce new processes where necessary. The following steps therefore describe the most important elements that ensure the effectiveness of the EnMS in all areas of an organisation.

Step 7: Energy policy

5.2

An energy strategy was already formulated at the start of the project and in the first review. At the beginning of the establishment of fixed EnMS structures, an **energy policy** (3.2.4) should now be drawn up as the top management's primary objective on the basis of the initial survey. As in other management systems, this policy defines the working framework and the strategic objectives of the EnMS. The EnMS (3.2.2) is defined as a set of inter related and inter acting elements that serve to achieve the energy policy and objectives (3.4.13) in the existing corporate context.

Top management thus determines the importance of energy management. It is therefore important that top management not only "approves" the energy policy and signs it off at , but that it is also directly involved in drawing it up and formulating it. This ensures that the strategic direction is set while balancing internal expectations and wishes for an EnMS with the requirements of external interested parties. In addition, the policy provides the impetus for all areas of the organisation to provide and receive the necessary support: It is important to consider policy as one of the most important communication tools - externally and especially internally. The policy should not only fulfil the standard requirements, but should also be written in such a way that employees can recognise their own company. This makes it credible.

If there is already a company policy and possibly other management systems that require such a policy, the existing policy should be expanded with the formulated expectations of top management to include the energy-relevant focal points. The obligation to comply with the law and the principle of continuous improvement are also the basis for other management systems.

The following minimum components of an EnMS policy are specified in the standard:

- The policy must be appropriate to the purpose and context of the organisation.
- Top management must provide the necessary resources and emphasise them in the energy policy.
- The applicable laws and other requirements with regard to energy use, consumption and efficiency must be observed, -consumption and efficiency must be observed.
- There must be a commitment to continuous, measurable improvement of the ebL and the EnMS.
- As shown in the previous steps, determining the energy baseline on which the strategy, objectives and energy targets are to be based is also a basic prerequisite for an EnMS.

- The same applies to the principle of continuous improvement (PDCA cycle), which forms the basis of all management systems and describes the process by which an organisation "learns".
- The procurement of energy-efficient systems, products, raw materials and services is a key factor in the functioning of the EnMS, as these influence the ebL.
- Energy efficiency should be a focus when designing systems, processes and buildings.
- If an organisation has specific energy consumption issues that it wants to focus on, it makes sense to highlight these as key strategic objectives in the policy.

The energy policy must be reviewed, confirmed or updated annually (e.g. in a review) (ISO 50001, 9.3.4). Anyone using an EnMS should ensure that it is passed on to all those involved . This also applies, for example, to subcontractors (or service providers) so that their employees also adhere to general rules on efficiency. The energy policy can (but does not have to) be publicised to the public (e.g. via the website).

Step 8: Organisational structure

If the organisational analysis in the fourth step has revealed deficits, it is now time to create a systematic and organisational framework for the EnMS. A responsible energy manager (EnM) should be appointed from top management who bears overall responsibility for the introduction, maintenance and improvement of the EnMS. 5.3

Tip:

A meeting based on the metaplan principle is suitable for drawing up an energy policy:

The opinions, ideas and wishes of those involved are collected on various aspects (continuous improvement, compliance, savings through environmental protection, etc.), summarised and sorted according to importance. A formulation can be drafted later in a small group or by the authorised representative. It is then approved by the management.

The EnMS is anchored in the organisation by appointing an energy team. To manage the administrative tasks in day-to-day business, the EnM can appoint an EnMB who takes on the day-to-day work, even if there is no longer a direct requirement to do so (see step 2).

The management of the energy team (EnMB, if applicable) must have all the powers required to introduce, maintain and monitor a functioning EnMS. In particular, the management must have the authority to approach top executives who can provide support. The management should have or acquire experience and qualifications in energy-related areas. Even if there are no explicit requirements for documenting and communicating the organisational structure in the revised standard, it is recommended that the roles, tasks and area of responsibility for each member of the energy team be documented, included in the organisational structure/organisation chart and communicated to employees.

It is important to **organise internal communication from the** outset, i.e. the fast and efficient exchange of information on the energy status and on new findings and ideas. In larger organisations in particular, it is helpful to establish regular (e.g. quarterly) exchanges of this kind between the person responsible in top management and the energy team. The energy team should monitor the current situation and implementation of the targets and define further or supplementary measures. It supports top management and the EnMB in all tasks relating to the introduction and maintenance of an EnMS and ensures implementation and communication in all areas of the organisation. The members of the energy team should therefore come from all areas and departments that are relevant to energy. In addition to the energy team, it is important to understand the roles and influence of personnel before excluding them as EnMS-effective personnel. Here, it is a good idea to break down the number and designation based on the functions.

Example table of characteristics for effective personnel in accordance with ISO 50003:

Function:	**Number and designation:** **(Attention: no double counting!)**
1) the **top management**	2 (Management, Executive Board, etc.)
2) the **energy management team**	1 energy management officer, 3 members of the energy team
3) the person(s) responsible for **procurement** in connection with the energy-related service	1 Purchasing management
4) the person(s) responsible for **implementing significant changes that** affect **energy-related performance**	2 persons of the technical management
5) the person(s) responsible for **developing, realising or maintaining improvements in energy performance**, including targets, energy objectives and action plans	1 divisional management
6) the person(s) responsible for **compiling and maintaining energy-related data** and **analysing it**	2 Head of Controlling; MSR foreman
7) the person(s) responsible for **planning, implementing and maintaining the processes associated with the SEUs**, including seasonal measures (e.g. harvesting activities, hotel operations), as applicable	5 plant managers: Production manager, shift supervisor, electrician, machine foreman, head of maintenance/servicing
8) the person(s) responsible for the **development that affects energy-related performance**	2 Head of Research and Development
9) If applicable, persons carrying out similar or repetitive processes (reduction in number permitted). Please document the rationale and criteria for determining the EnMS-effective personnel performing similar or repetitive processes here	
10) ...	
Total number of EnMS-effective personnel (Attention: no double counting!)	

Table 9: Characteristics for effective personnel according to ISO 50003

This means that all knowledge relating to energy-relevant processes is represented in it. An effective energy team is a very helpful organisation for successfully and quickly introducing an EnMS and continuously saving energy. All employees should be motivated to make suggestions for improvement and comments regarding the EnMS. (ISO 50001, 7.4)

The following example illustrates the possible structure of an energy management organisation:

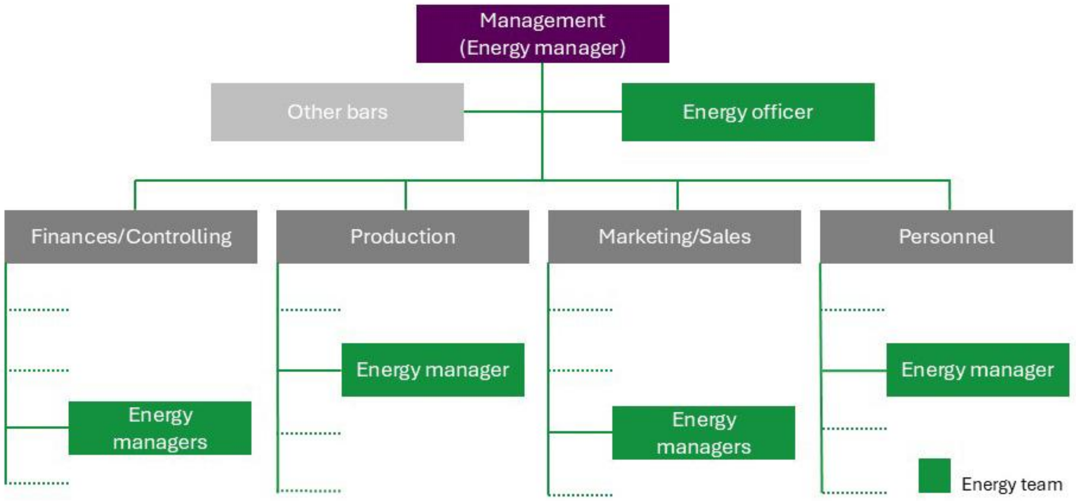


Figure 20: Example of an energy management organisational structure

Different types of presentation have proven to be effective for the tasks and authorisations of function holders and those responsible in management management systems. If systematic management is already being pursued, the responsibilities should be integrated into an EnMS or the same type of presentation should be used.

Available roles: Responsible (**V**) Cooperation (**M**) Information (**I**)	Energy commissioner	Energy team	Top management	Purchasing management	Production management
Data collection and monitoring	V	M I		M	M
Energy report	V	M I	I		
Energy management program	M	M	V		
Evaluation	M	V	V		
Training and awareness	V M	M I	I	V	V
Purchase of energy-efficient components	M	M	I	V	
Technical improvement measures	M	M I	I	V	V
Energy performance in production	M	M I	I		V

Figure 21: Example of responsibility matrix

The necessary resources must be made available to implement the energy policy and the energy saving programme . This is the only way to achieve them within the desired time frame and with the required quality. The resources should therefore already be specified in the energy programme. In addition to the necessary working time, the energy manager or officer also needs work equipment, expertise, access to support functions in the organisation and possibly the possibility of securing external support within the framework of a budget.

Step 9: Documented information

A management system is inextricably linked to a document system. There is a good reason for this: only what is written down (documented) can be improved . If there are only verbal agreements, experience shows that different people often act very differently in the belief that they are doing everything the same way. 7.5

Only a document provides a "target" against which an "actual" can be compared. For this reason,

Tip for SMEs: necessary resources

- **Time**: If an energy team is appointed, the members must have a time fund at their disposal (which is emphasised, for example, by the participation of top management).
- **Money**: The funds made available to the target managers should be budgeted. In addition, EnMB should receive a fixed budget for free disposal. The possibility of topping this up with funds from immediate savings has a motivating effect!
- **Support functions**: The support provided by important functional areas (IT, maintenance management, R&D, controlling) should be set out in the task and function description. If an energy team is set up, these functions should be specifically involved.
- **Personnel**: Informing and training employees is a key factor for their active participation. It can lead to considerable savings. The HR department as a support function needs resources for this.
- **Equipment/technology**: Not only measuring devices and equipment for data acquisition are required, but also the expertise to operate, install or maintain them.
- **External advice**: The representative or the responsible specialist should receive a budget for advice or services from division.

documentation in the context of management systems is not a "nonsensical compulsory task", but a prerequisite for continuous improvement. However, the document system should be appropriate for the purpose of the system and the size of the organisation. The **Documented Information** (3.3.5) describes the main elements of an EnMS: processes, procedures, energy-related principles and criteria for procurement and the evidence that the EnMS is effective. At least the following elements should be documented and stored in the EnMS:

- Scope (methodology including the determination of risks and opportunities from the business context and the result of the R&C assessment)
- Politics
- Energy planning (sequence and role of individual players)
- Energy assessment (methodology, criteria, result)
- Energy performance indicators (methodology and result)
- Starting point (methodology and result)
- Goals
- Action plans/data collection plan and measurement and verification plans
- Ensuring competence (methodology and result)

- Documentation regulations (methodology and results) and documented information of external origin that is relevant for the planning and operation of the EnMS
- Technical processes and procedures, incl. design activities
- Evaluation of performance (methodology and result)
- Conformity (methodology and result)
- Internal audit programme and evidence of its implementation
- Management review (methodology and result)
- Dealing with non-conformities (methodology and result)

The description of energy data collection and processing is exemplary (cf. note: "Energy data collection plan"). In order to ensure the quality, reproducibility and comparability of data, it must be defined how, how often, when, in what time resolution and quality etc. this data is collected. This information can also be part of the introduction to the energy report, for example.

"Documented information" in the sense of a standard is a sensible collection of necessary specifications and evidence - not a hundred pages that nobody reads later. The company's own document system should be structured and practised in such a way that all persons concerned know what, how and when to do in the EnMS and how they personally contribute to the success of the EnMS.

Furthermore, all information carriers and methods are meant: the documented information can also consist of a graphic or text-graphic representation of the processes. Modern data processing workflow programmes offer a good alternative to purely textual descriptions. However, partial graphics and descriptions with links to verification documents, forms etc. can also be generated in the "office world". Programmes such as Microsoft Visio or PowerPoint, which also allow links to other documents, are suitable for visual representation. An IT solution enables all employees to access the regulations.

Step 9 should be implemented in parallel with the other steps. At the beginning, however, it is necessary to define the type of documentation (text, workflow, combination, computerised basis, paper basis, etc.) and agreements on the so-called **control of documents**.

Note: Documented information

- Documents reflect specifications in the EnMS (such as procedures or methods)
- Protocols and other records of the results serve as evidence of activities carried out

7.5.2
7.5.3

This refers to various aspects of clear labelling (e.g. numbers, revision sions statuses, responsibilities for content) and their verification, as well as specifications for archiving older versions and records. When **managing records** it is important that they are legible, identifiable and traceable to the respective activity .

The scope of the documentation depends on the type and size of the organisation and the complexity of the processes. If a documentation system already exists due to an environmental or quality management system, the EnMS-relevant documents should be integrated here as the employees are familiar with the existing system. The number of records in particular increases over time. A clear hierarchical structure should therefore be defined right from the start. In this way, new regulations can be integrated at any time and made easy to find for those affected by means of links.

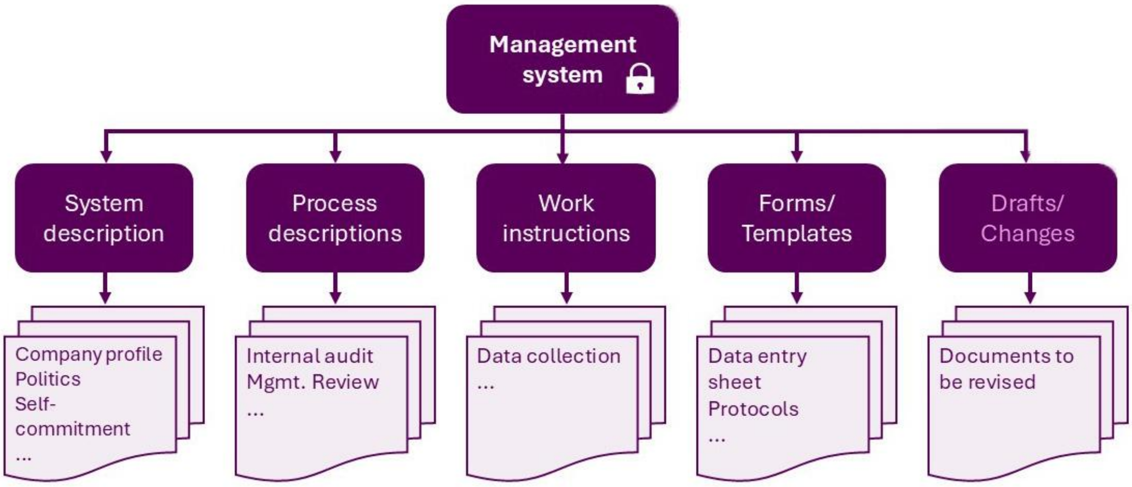


Figure 22: Example of a system structure

Tip for SMEs:
For an overview of all relevant EnMS documents, it is recommended to create an overview (list) of all applicable EnMS documents (document name, person responsible, revision da tum and number). Changes can be entered in this list - always an up-to-date overview without complicated structures.

Step 10: Operational planning and control

In addition to determining organisational workflows and system-relevant processes, the activities that have a significant impact on energy gy consumption (heating cycles, system operation, maintenance and upkeep work, purchasing of energy-relevant raw materials and systems, building management ment, vehicle fleet operation, etc.) must be described and planned in more detail. 8.1

In particular, activities that (can) have a major impact on consumption should be defined and documented in order to establish best practice. In this way, the pro ces ses can be systematically improved in the future as new experiences are gained. Operational planning and control means planning and executing the activities associated with the main energy consumers in such a way that this results in the lowest possible energy consumption with the highest t possible efficiency.

From the initial analysis of the energy factors, processes with a major influence on energy consumption are already known. A close examination of all workflows and all energy-relevant processes in the organisation (possibly already recorded in other management systems such as QM) shows which processes should be described in more detail, at least in the initial approach, and should therefore be included in the next assessment of the energy influencing factors. Experience has shown that this chapter grows during the ongoing operation of the EnMS.

The following processes, among others, have a permanent influence on energy consumption and should be regulated and described:

- Description of the procedure for energy-efficient processes and systems
- Maintenance and repair of buildings and systems
- Commissioning, continuous operation and/or shutdown of large energy consumers (melting ovens, air conditioning systems, compressed air)
- Selection and purchase of energy-efficient raw materials, economical equipment and services _COPY services
- Description of the procedure for the design (planning) of energy-efficient processes and systems
- Operational requirements/specifications for the planning and construction of structural facilities
- Development of energy-efficient products (services) and processes
- Firstly, the existing planning processes should be scrutinised: Do they provide impetus for finding the most energy-efficient solutions possible? If not, the processes need to be supplemented. In the EnMS, managers have the task of systematically searching the market for such possibilities (technologies, procedures, processes) together with the energy be at experts.

Design of energy-relevant processes

New systems, facilities and buildings in particular have a significant and long-term impact on an organisation's energy consumption. These should therefore only be planned and documented with an accompanying energy efficiency analysis and optimisation . 8.2

The same can apply to the energy consumption of services and products over their entire life cycle, which can be much higher than the consumption during their production. Research and development activities are therefore among the particularly energy-relevant processes that should be defined (even if ISO 50001 does not provide any further information on this).

Existing systems or their use or operation can often be optimised, especially if the experience of employees is drawn on. To this end, systematic matic inspection programmes should be introduced or existing programmes supplemented (e.g. as part of TPM activities). It is important to communicate the energy-efficient processes relevant to their work to all persons working for the organisation or on its premises, to encourage them to follow these processes and to monitor them where necessary.

Tip for SMEs:

The processes described will only be effective if they are not defined "theoretically", but are geared towards the life of the organisation. To this end, known processes should be looked at again together with all those affected through the "lens" of energy efficiency and adapted if necessary. Processes may already be "good" and only need to be documented for the first time in order to provide a basis for future improvements and to ensure that they are always carried out in the same way.

Furthermore, at least the employees concerned must be informed or trained on how they should proceed in future. In order to achieve even greater acceptance, it should be pointed out in the training that ideas for improving procedures that arise during application are always welcome at the EnMB.

Procurement of energy-related equipment, materials and services

Building or facility specifications should summarise information on energy consumption in a special chapter. For example, when procuring machinery, binding information on consumption, e.g. of electricity, heat, gas, cooling or compressed air at defined operating points, should be explicitly requested. This should be included as a penalised part of the contract. 8.3

With the help of precise consumption data in offers, life cycle cost comparisons can be made that take operating costs into account in addition to depreciation (concept of TCO = total cost of ownership). More expensive machines and systems with more efficient motors or buildings with better equipment are often much cheaper than "cheapest procurement" after just a few years due to the lower operating or maintenance costs. As early as the enquiry and procurement process, the purchasing department must inform potential suppliers that the energy consumption of the requested systems or services will play a significant role in the award decision. Criteria for this assessment should be defined and communicated to suppliers prior to the enquiry. Using the net present value method set out in DIN EN 17463, an economic viability assessment can then be carried out over the life cycle, especially for larger projects.

Step 11: Awareness raising, training and skills

It is not possible without the involvement of the entire workforce. No management system works without the commitment of the employees, who consistently "live" the defined procedures . This is particularly true for an EnMS. Every employee decides several times a day whether they want to participate in saving energy - whether they switch off the lights or the PC, shut down systems during rest periods, switch off the compressed air when it is not needed and much more. 7.1-7.3

Employees know their working environment inside out: they are the main source of information on how energy can be saved, used more sensibly or, for example, utilised at a lower temperature level. It is therefore important to influence the **awareness of** employees working and change their **behaviour in** the medium term. No one can be "forced" to save energy. Internal rejection cannot be controlled or sank tio nised, but it can torpedo any management system. However, if employees are motivated, they themselves will endeavour to keep energy consumption low and contribute to improvements.

EnMS-related training topics can originate from general surveys of training needs, from comparisons with a training matrix or from the experience of the officers, who keep up to date with developments in the organisation, the industry and the market. The information and training of all employees on an EnMS is summarised in a training plan. The training required depends on the age and maturity of the system and the position of the individuals:

- **Initial information on the EnMS** initially explains to all employees the will of top management based on the energy policy and the initial objectives, describes the system function, refers to information and communication opportunities and encourages participation. The focus here is on the opportunities for energy-efficient behaviour by each and every individual.
- **Topics on saving energy** (including in the private sphere, which increases awareness and acceptance) and on new, efficient technologies should be offered to all employees on a regular basis in order to keep motivation high, demonstrate the personal advantages that can result and thus promote further ideas on a broad basis.
- Depending on the prior qualifications of the employees, special training is required if their work can have an **impact on energy consumption** (of a system).

EnMB, the energy officer and, if applicable, the members of the energy team or all specialists must keep themselves continuously and independently up to date on the topic of energy saving. Topics can be coordinated in the meetings of the energy team. Basic training in energy-saving techniques and processes and in management systems is advisable. If they carry out the internal EnMS audits, they should also receive basic from training in auditing techniques. External training on EnMS-relevant topics should also be provided, for example training on the measurement and verification process.

- Management should be continuously trained and informed about the current energy situation in order to involve them in setting strategic and operational goals and to promote their implementation in all areas.
- Important topics (e.g. new processes, new technologies, energy-efficient design, etc.) should always be stimulated by the EnB from its knowledge of the market if the specialist departments themselves develop little activity in this regard.
- Employees of service providers or persons acting on their behalf should also be trained in the systems and processes that affect them from an energy perspective in order to promote their participation in the EnMS and their understanding of energy-relevant processes and to encourage them to think and act.

Tip for SMEs:

It is particularly worthwhile at the beginning to organise training sessions in the form of "workshops" in which employees are invited to participate and have the opportunity to replan defined processes and adapt the design using their knowledge.

Suitable ways of raising awareness on a broad basis include

- Energy-saving suggestion campaigns (results become part of the energy saving programme)
- Information on the amount, costs and savings potential of energy consumption, possibly in relation to other parameters such as labour or raw material costs
- Energy consumption barometers, energy cockpits and target achievement information at , which provide immediate feedback on the success of ongoing activities

Feedback should be obtained on the quality of training courses in order to improve them on an ongoing basis. In particular, the main factors influencing greater energy efficiency must be taken into account in the training plan. For energy topics, existing system training courses can also be used, for example on quality management, safety and, in particular, environmental protection. The path from the idea for training to its implementation and feedback is planned as part of step 8 and documented in accordance with the specifications in step 9.

Step 12: Type and structure of communication

In quality management, the focus is on customers, in environmental management it is on neighbours and the interested public and in occupational safety management it is on employees. nage ment. For an EnMS, there is no specific stakeholder group for communication. There are also many links to different partners in the EnMS, albeit not as pronounced as in other MS. A list of the possible relevant parties interested in an EnMS can be found in step 1. 7.4

ISO 50001:2018 builds the entire planning process on the results of the assessment of risks and opportunities, which in turn should be developed by analysing the interests and requirements of the inte rested parties. Communication with the inte rested parties therefore plays an important role in the revised EnMS: it is the key to informative input for planning.

The communication of EnMS results per se is still not mandatory. The standard con form is the **definition and documentation of a procedure** that regulates both internal and external communication. The procedure must be introduced and implemented in such a way that all persons working in the organisation or on its behalf (e.g. also extended workbench, external companies) are able to submit comments or suggestions for improvement regarding the EnMS and the ESD (see also step 13).

The publication of the energy policy beyond the operational framework is not an obligation in ISO 50001 today, but an option. It is important to note that at least the energy policy should be made available to interested parties (if required).

Once all communication channels that an organisation wants or needs to use have been identified, these should be precisely defined (e.g. in a process description in accordance with step 10, documented after step 9). Contact persons and internal responsibilities must be defined for each communication channel. In addition, it should be described which information should be exchanged or passed on at least tens of times and how often this should take place.

a) Internal communication

As explained above, the information and systematic involvement of all employees is the decisive factor for the success of any savings endeavour and the EnMS. It contributes significantly to participation in the EnMS. Procedures for this are divided into the system ma tical training described above (step 11) and general ongoing information.

Communicating the energy policy obliges everyone involved to adhere to the energy strategy and to incorporate it into their work. In addition, well-informed and involved employees are much more motivated to realise the goals. All known means of contact with the workforce are suitable: e.g. employee magazines, intranet and internet, e-mail and notice boards, but above all meetings and training sessions. Information on the status of savings efforts, the achievement of targets and target proposals from employees keeps attention levels high. They increase the willingness to make a personal contribution, e.g. with their own ideas. The EnMS is therefore not realised without the employees, but with their support.

b) External communication

Authorities often also need to be contacted, e.g. if tax credits are to be claimed or statutory equalisation schemes and subsidies are to be used. Such contacts are also often helpful or necessary when using renewable energy generation plants, for example. In many cases, the introduction of an EnMS can be partially subsidised.

Energy suppliers are certainly important points of contact for communication in the EnMS; they now often have or must have their own consulting capacities. Due to their position, they often have extensive knowledge of potential savings.

Energy consultants are generally interesting communication partners due to their comprehensive knowledge. In addition to independent consultants and specialised engineering firms, these include the **energy agencies** that have emerged in recent years.

Customers are also an important target group for communication, especially when products are manufactured ge whose production is very energy-intensive (aluminium) or which consume energy during use (electrical appliances, cars). In this case, marketing often becomes a "significant energy factor" and therefore a process that should be defined and described in more detail after step 10, because the relevant customer requirements and consumption behaviour must be included in the planning (even if ISO 50001 does not explicitly require this).

The necessary communication with **suppliers** of equipment and materials has already been described in step 10 and communication with **service providers** operating on the premises or under the name of the organisation in step 11.

An organisation's **investors** and **banks are** also certainly interested in energy saving activities and, in particular, the associated cost reductions or pre cautious investments. Today, analysts assess the CO_2 emissions of an organisation in relation to its value creation, which is largely determined by energy consumption, as a key performance indicator .

The energy policy can be publicised (e.g. on the website) in order to demonstrate the company's own commitment.

Step 13: Dealing with corrective and improvement measures

10.1

Dealing with non-conformities and corrective actions, as they are referred to in all standards , is the essential tool for making an organisation more efficient, better and safer. Suggestions for improvement and the discovery of inadequacies and risks lead to new ideas for savings, corrections and measures to prevent waste. They are the basis for continuous improvement in an MS.

Corrective and improvement measures are fed by everything that happens in an organisation. Tours of all kinds, internal and external audits, suggestions from employees, ideas or measures from meetings, etc. always lead to new insights. What can be done better, what is going wrong and needs to be corrected, how can risks be recognised? It is important to immediately record the suggestions and opportunities for improvement that are constantly coming in so that no good idea is "lost". If the goals are realistically realisable, they should be incorporated into the improvement plan in the next step.

In addition to general numbering, the columns are recommended in such a plan:

Cause/problem/improvement (and goal, if applicable): This is often not considered important. However, it is essential and represents the reason for a deviation, a risk or an improvement idea. If measures are implemented, they can be successful without solving the actual problem. In the so-called "effectiveness assessment" (mandatory under ISO 50001), it is then not recognised that the problem may still exist even though measures have been successfully implemented.

- The **Measure** column may contain several measures for dealing with problems or implementing an idea. Measures are defined by the person responsible for implementation or a team.
- ALL measures (like the targets in the energy programme) are to be provided in corresponding columns with **responsible persons** and **deadlines so that** they can be planned and tracked (cf. on S.M.A.R.T.).
- Good monitoring of the **status** of the measures is important. The graphical representation in the game has proven its worth and can also be supplemented by a traffic light labelling of the background in green/yellow/red to indicate that measures are in the plan, just out of half or clearly exceeded.
- Without the **comment** column, nothing works, as everyone knows.
- A column for **verifying** the success of measures is also necessary. This should be used to plan how and when the success of each individual measure is checked.
- Columns for departmental labelling, type of measure, etc. can also be useful. This plan is then also suitable for other systems. Ideally, the organisation can draw on a plan for its entire management that can be sorted and easily managed using internal identifiers.

No./ Source	Cause/findings/improvement	Measure(s)	Responsible	Date	Status	Remarks	Link Verification (Details)
1st Int. audit	Switching off the machines during breaks	Check where possible while maintaining quality	Technical engineering	09/20xx		Testing only possible step by step	Action plan 5

2. ext. audit	Are 2 out of 3 drives enough?	Check and, if necessary, keep a motor in reserve	Technical engineering	05/20xx	◕	System is currently only operated with 2 motors	Action plan 8
3rd Int. audit	Light switch-off in the outdoor area at night 5h	Decoupling exterior and interior lighting	Electrical building services	01/20xx+1	◑	Control cabinets in installation	Action plan 11
4th round walk	Compressed air losses at the joining system	Sealing and follow-up inspection at the weekend	Maintenanc e tung	04/20xx	●	Switch-off completed, tightness confirmed	Action plan 14

○ Planning recorded/recorded ◔ Processing started ◑ Processing in full swing

◕ Processing completed ● Effectiveness tested

Table 10: Example improvement action plan (own illustration) for the industry

No./ Source	Cause/ Findings/ Improvement	Measure(s)	Respon-sible	Date	Status	Remarks	Link Verifi-cation (De-tails)
1st Int. audit	Switch off comput-ers, printers, scan-ners etc. during breaks	Check where possible	Energy team	09/20xx	◔	Testing only possible step by step	Action plan 12
2. ext. audit	Are 2 out of 3 light sources in the lamps sufficient?	Check and if nec-essary out	Facility	05/20xx	●	Lamps are cur-rently only oper-ated with 2 lights	Action plan 9
3rd Int. audit	Light switch-off in the outdoor area at night 5 h	Decoupling exte-rior and interior lighting	Electrical building ser-vices	01/20xx+x	◑	Control cabinets in installation	Action plan 10
4th round trip.	Light sensor for poster lighting is de-fective	Changing the Control via build-ing technology	Maintenance	04/20xx	◕	Sensor unin-stalled, control has not yet been changed	Action plan 13

○ Planning recorded/recorded ◔ Processing started ◑ Processing in full swing
◕ Processing completed ● Effectiveness tested

Table 11: Example improvement action plan (own illustration) for service providers

Step 14: Benchmarking and evidence for the improvement of the ebL

9.1

Successful energy savings and the achievement of targets are often difficult to prove due to production tion fluctuations, model changes or organisational changes. For this reason, the energy baseline must first be determined. This has already been done in step 4 with the accompanying recording of the main factors influencing energy consumption.

With the help of meaningful and appropriate key figures (energy consumption per unit of time, etc.), this data can now be compared over different periods. This reveals changes run or, ideally, improvements in ebL.

Tip for SMEs:

To manage targets and improvement measures effectively, they are simply entered into a sortable Excel spreadsheet. (Access databases have also proven their worth for the efficient management of many measures, especially as further characteristics such as the department concerned, the first date of inclusion, the history of postponements, etc. can be easily noted).

This table is divided into "optional measures" (goals and new ideas) and "mandatory measures" (problems, measures to prevent problems). In addition to the name of the table, this makes it clear to all employees that this is not a list of "errors", but a tool for improvement. The ideas section often gives rise to new goals. The better a management system runs, the greater the proportion of "optional measures".

a) Benchmarking

In the energy data collection for step 5, initial comparative figures are often developed "intuitively" in order to compare energy data over different time periods (horizontally) or different plants, locations and sectors (vertically). Regardless of whether plants of the same type, plants with the same product, similar locations or similar organisations are compared, there are almost always differences. The value of the benchmarking process lies in these differences when their causes are analysed.

Often, only horizontal comparison across different years is possible or desirable, in addition to vertical comparison across different plants. For these comparisons to be successful, annual data or plant data (in the vertical comparison) must be subjected to further **normalisation.** (see step 4)

This analysis of energy consumption is the source of knowledge, especially in energy management ment:

- Why do we consume more in spring than in autumn?
- Why is energy consumption increasing despite production remaining the same?
- Why does an identical system consume more with the same production?

The astonishment at the differences immediately leads to the question of why what works on one system or at one time is not also possible on other systems or at other times. The answers lead to insights that enable further optimisation and better energy planning.

b) Evidence for the improvement of the ebL

The continuous improvement of eBI is the central objective of an EnMS. With the introduction of the new accreditation regulations for certification bodies in the form of DIN ISO 50003, the now explicitly required examination of the improvement of the eBI in a certification audit in accordance with ISO 50001 is becoming more prominent. By carrying out audits in accordance with the regulations of ISO 50003, certification bodies are required to review the requirements for the continuous improvement of eBI in accordance with ISO 50001 and to provide evidence in the audit reports that they can be implemented at any time in the (re-)certification procedure and also in the accreditation procedure in accordance with . A good certifier thus also protects its customers, especially when it comes to tax relief.

Successful verification is based on the following key points:

- Selection of suitable key figures
- Planned, implemented and transparently documented measurements before and after implementation of the measure
- Comprehensible normalisation and, if necessary, adjustment of the starting bases
- Availability of all documented information mentioned above

As mentioned in step 4, the EnMS uses organisation-related and process- or plant-related process or plant gen related indicators are used in the EnMS. The changes in energy performance could be mapped using both types of indicators or a mix of them. The choice of method depends on the local circumstances: If there have been hardly any changes in production facilities, order situation and building fabric compared to the previous year, the top-down approach is practicable and suitable - however, this is rarely the case. As soon as there are significant changes to the plant n equipment, shift system, pricing or order situation, the top-down approach is more suitable due to the increasing complexity.

Irrespective of the method, the same energy consumption value or the same savings must be determined at the end of the process, provided the data is correct. Companies are therefore free to switch between the methods or combine them depending on the location and time.

Tip:

Improving energy-related performance is the central objective of energy management ment systems in accordance with ISO 50001. The standard requires proof of the continuous improvement of energy-related performance. According to the standard, this can be provided by energy gy performance indicators (EnPIs) by determining their baseline value (EnB, en = energy baseline) and the current EnPI value for all EnPIs at regular intervals, normalising them if necessary, comparing them and summarising them. The NAGUS website contains questions from companies that have been submitted to and answered by the German standardisation committee with regard to the verification and presentation of the improvement.

- The heat **recovered** in organisation A, **forwarded** to organisation B and **used** there represents a **useful output** for the forwarding organisation A in the amount of the **energy substituted** in organisation B (improvement in energy efficiency!). (Improvement in energy efficiency!)
- Measures for waste heat utilisation should **not only** be limited **to the respective plant,** but should also include waste heat utilisation options on the **premises** and with **external third parties**. (Para. 2 § 16)

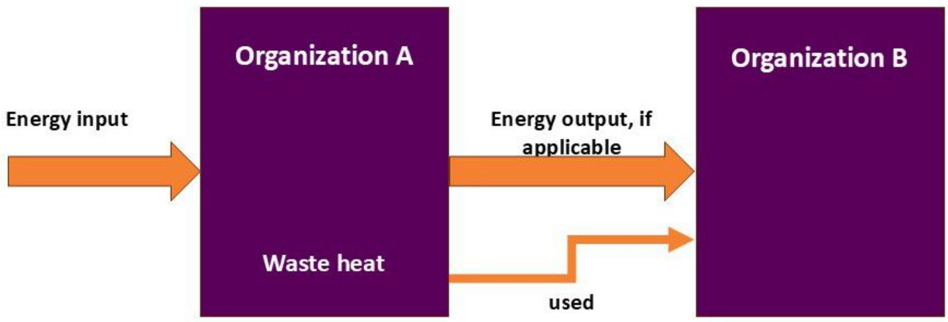


Figure 23: FAQ example - forwarded heat as an improvement

Tip:

ISO 50047 addresses the topic of determining energy savings. Here, both me tho den for calculating key figures are explained in detail using examples (also for regression analyses).

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Stage III - Entry into continuous improvement based on the real PDCA cycle

The systematic data collection of the first stage was intended to help find out whether there was "something to be gained" from the energy supply and the main consumers. It thus increased interest in the second stage, in which additional savings opportunities were developed with the help of a more systematic energy organisation. Particularly energy-relevant activities were subject to fixed processes, employees were involved, a systematic improvement management ment was set up and initial energy indicators were defined. This means that all energy-relevant processes and elements of an EnMS are in place. Top management can now decide how to proceed.

If you want

- **return to Level I** because the effort, benefits and possibilities of the more systematic approach are not in good proportion, or
- issue the order to **simplify** the **regulations established in stage II** and to resubmit the documentation or
- Continue to drive savings from previous work and **implement a full EnMS**, which means developing new targets and system adjustments in the future in a continuous improvement process?

If the top management decides to implement the documentation of the procedures and their processes, it has reached the third stage of energy management. This marks the start of a genuine **PDCA cycle** and the introduction of a complete EnMS in accordance with DIN EN ISO 50001.

The cycle for continuous improvement that now begins can be based on the calendar of the year or the financial year, but should not last longer than 12 months. The regulations on process organisation are implemented periodically with regular monitoring of targets, exchanges with all areas and top management, meetings of the energy team, employee training, etc.

Once a year, all recorded data and facts are updated (the energy report) and an internal energy audit is carried out (step 16). Finally, based on the results of the previous year, a review is held with top management to decide on the future strategy and the targets to be achieved before the routine processes for implementing the targets and improvements are finally restarted.

Once this introduction to the EnMS has been completed and an initial internal audit cycle has begun, nothing stands in the way of external **auditing and certification in accordance with ISO 50001**!

Step 15: Application of organisation and communication (Do)

Now that the steps in the last stage have resulted in comprehensive regulations for operating an EnMS and have been documented, it is important to apply them to day-to-day work .

Regular monitoring of targets and corrective and improvement measures is of the utmost importance. This can be done, for example, through regular meetings of an energy team (at least quarterly is considered "regular"), at which information from all areas is exchanged (see step 12).

Following the initial information in step 11, employees may now require further training in order to familiarise themselves with the particularly energy-relevant processes and apply them to maximise savings. Energy management representatives and authorised representatives will attend specialist seminars and lectures to gain ideas for their work and pass these on internally, etc.

10.1
10.2

This is the latest point at which regular **energy controlling** begins during the year. Based on the historical data from the energy report (the first energy consumption analysis), in conjunction with the current data and key figures, this enables those responsible to monitor and control the effectiveness of the EnMS via consumption. 9.1

If "deviations" from the target planning or new consumption details become known, these form a basis for the further continuous improvement of energy utilisation planning, for key figures or new energy targets. Actions to involve all employees lead to further energy rele vant suggestions that supplement the catalogue of improvement measures.

In this respect, step 15 is not a "work package to be ticked off", but the start of an ongoing process that is constantly monitored, improved and supplemented by all those involved.

Step 16: Updating the energy analysis, internal energy audits (check)

The first part of the at least annual self-assessment (check) in the PDCA cycle is the **energy analysis.** Ongoing energy controlling does not replace the detailed collection of all relevant data and facts at least once a year and the updating of (external) information (development of energy prices, upcoming legal regulations, new energy-saving same processes, current characteristic values from benchmarking, etc.).

If the energy analysis has been summarised as an energy report, this is updated with the current values after the end of an observation year (see step 4). At least the following should be considered:

- Assessment of current and planned energy consumption
- Analysis and selection of the main energy input ranges, relevant variables, static factors, key figures, output bases (including adjustment and normalisation if necessary)
- Implementation of an energy data collection plan and individual action plans
- Effectiveness review of action plans
- Determine further measures for energy optimisation

The updated energy analysis is again the basis for the revision of the energy use planning for the next period and the basis for the internal audit. It is used by top management in the review to monitor success.

The second part is the **internal audit** (3.3.8) of all relevant areas. It is one of the core elements of every management system. The current energy technology and energy management situation is recorded with the participation of as many areas and employees as possible. The process and the audit programme must therefore be planned and documented (see also step 8). 9.2

The internal audit plan should take into account the significance of the areas to be audited for energy consumption. Within a three-year cycle, every area that has an influence on or participates in energy consumption must be audited internally at least once. It makes sense to include energy-intensive systems, particularly for conversion into other forms of energy (electricity, heat, compressed air generation), in the internal audit every year. Low-consumption areas may only be included once every three years.

Internal audits can be carried out throughout the year (especially in large organisations nisations). They often take place within a certain time frame in order to determine the current status of the energy situation and energy management in addition to the energy analysis prior to the review. These are evaluated in the review. The results of this assessment form the basis for further planning.

In preparation for internal energy audits, the person conducting the audit or the audit team should receive up-to-date information (figures, data, facts = ZDF) before visiting an area in order to use this as a basis, e.g. to clarify the cause of changes. After the internal audit, the energy analysis (the energy report) is corrected or supplemented with the current results . The suitability of the selected key figures, the plausibility of the influencing factors (see also energy data collection plan) and the changes to the baselines for the main consumers should already be checked in this phase.

Furthermore, before visiting the facilities or areas, the auditors should be aware of any improvement measures and objectives to be implemented there in order to check their current status. The internal audit usually pursues four objectives in management systems:

- **System audit:** Checking the integration of standards to be observed in the MS (strongly decreasing importance with increasing age of the MS)
- **Functional audit:** Checking the implementation of internally defined processes and target fol gation, quality control of data collection processes, determining the causes of deviations and defining the need for corrections by users or in the system (if there is room for improvement)
- **Compliance audit:** Checking compliance with the applicable legal regulations and voluntary commitments. (This audit can be carried out in parallel with the system and function audit, but the procedure and the result must be described separately in the audit report - ISO 50001, 9.2)
- **Continuous improvement:** discovering further savings potential from discussions and suggestions from employees, from site visits and from jointly analysing current data and facts

An internal energy audit carried out by energy experts offers the opportunity to gain further insights based on the preliminary for information. For example, observations and discussions with employees often result in new or additional suggestions for potential savings. In addition to fulfilling the standard requirements, an audit should also have added value for the company and uncover new opportunities to improve energy efficiency. As the internal audits must take place at regular intervals, this means that an improvement in ebL must also be regularly documented in the form of internal audit reports and thus be comprehensible to third parties.

If another management system is already in place (QM, UM, OHSAS, ISMS), the energy audit can be part of a more comprehensive internal audit that includes environmental or quality management, for example. As in other management systems, the energy auditors should have knowledge of the basis of the standard and of energy distribution and utilisation techniques. They must also be independent of the area to be audited in order to enable an "outside view" in the internal audit. If necessary, external energy experts can also be involved.

Tip for SMEs:

Form an audit team consisting of one person from the company who knows the management regulations and concentrates on these in the audit and an external expert, e.g. an energy consultant, for whose use there are often subsidies. In this way, further savings potential can be recognised in the internal energy audit and the required objectivity is maintained.

An organisation rarely has the opportunity to examine a topic as comprehensively as an audit team does. The results of the energy audit are therefore an essential information basis for the review. The audit management should therefore prepare a summary of the results. The audit report should also include a list of potential improvements, which is then incorporated into the improvement action plan.

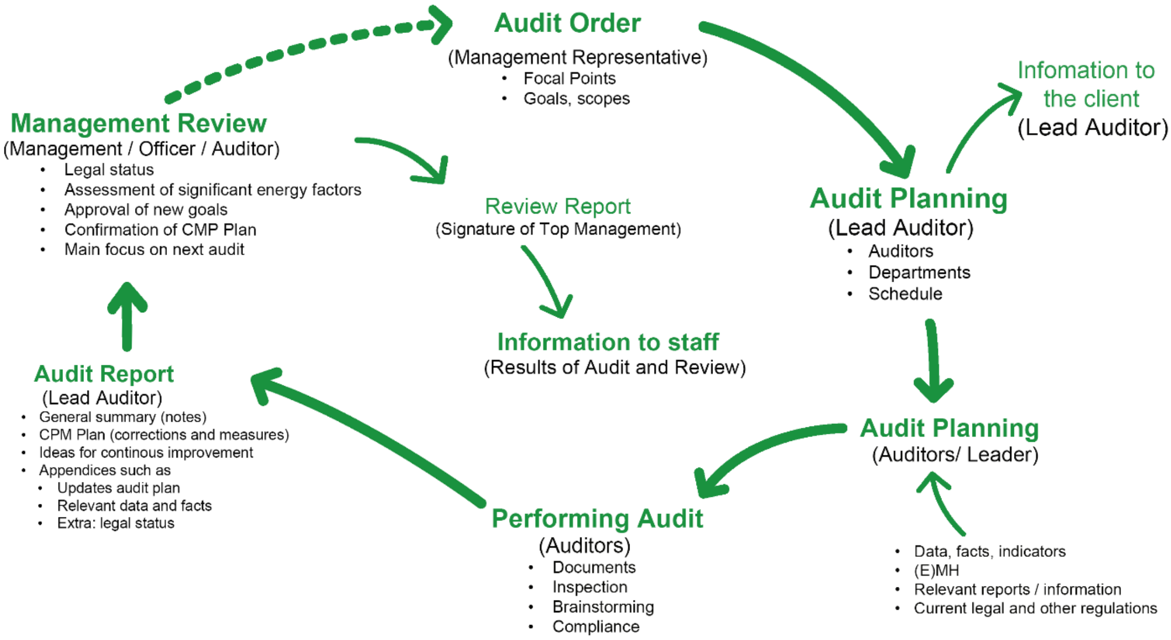

Figure 24: Procedure of an internal audit

Step 17: Annual update of the action plans (Plan I)

The results of the first stage were used to draw up and adopt an energy-saving programme as a central overview and the **energy action plans** derived from it. Implementation is regularly reviewed during meetings within the organisation. After updating the figures, data and facts, or detailed analyses such as load profiles, there are always opportunities for savings. If they are substantiated in preparation for the review, they can be added to the catalogue of objectives.

6.2.3
9.1

Over the course of the year, suggestions for improvement are also made by employees. In conjunction with the updated energy analysis, further energy effi ciency potentials arise. In addition to any necessary corrections, the internal audit should above all capture ideas for new savings potential. In this way, an updated energy saving programme can be systematically developed (from new and updated targets), which is presented in the review and bindingly adopted after discussion and, if necessary, amendment by top management.

Note: Creation of an energy saving programme

It becomes clear that the PDCA cycle is not to be understood as a strict sequence of system components, but rather consists of elements that can run in parallel and interlock with each other in the improvement cycle. This is exemplified by the process of creating an energy saving programme as an overview and the detailed action plans (to be described and defined in step 8).

Step 18: Management review (Act to Plan II)

The EnMS must be reviewed by top management at regular intervals to ensure its effectiveness and appropriateness. Right from the start, the management committed to continuous improvement and systematic pursuit of the PDCA cycle in the energy policy. 9.3

The review always marks the end of the old cycle and the start of the new one. It always combines the important "Act" and "Plan" elements of the improvement cycle after it has been completed for the first time. It makes sense to involve all persons entrusted with key energy relevant functions in the review. It is important that the review is written as a collection of decisions on all agenda items. This results from the hierarchy of system elements:

- The review begins by assessing the context: have the relevant internal and external issues remained the same compared to the previous year or have there been changes? The results of the analysis must therefore be evaluated in order to make a statement on the status of the current situation with regard to risks and opportunities (Act/Plan).
- The energy policy and legal conformity are then reviewed and evaluated as part of the EnMS to ensure they are up to date . If necessary, the policy must be adapted or immediate measures must be taken to ensure legal compliance (Act/Do).
- The energy report on the ebL as a collection of all technically relevant information is discussed and analysed (Act/ Plan).
- Only then can a final decision be made on possible energy saving targets and a new energy saving programme be adopted. The energy targets now form the basis of the updated energy utilisation planning (plan).
- The improvement measures pursued throughout the year (corrective and improvement measures) are also part of the continuous improvement of the EnMS. Their status should also be discussed and confirmation of their timely implementation should be part of the decisions of the review (Act).

The energy review is recorded and should be made available together with the accompanying information documents (see above) at least to the persons entrusted with energy-relevant functions.

The review process is similar to that of other management systems and - like the internal audit - can be integrated into the review of other standards such as quality or environmental management.

The input data and decisions from the energy review form the basis for the new cycle of continuous improvement in energy efficiency that is now beginning .

Welcome to systematic energy management!

You have now taken all the necessary steps to manage the efficient use of energy. You have repeatedly made decisions to continue on the basis of the path you have travelled and the success you have achieved. In particular, the implementation of steps II and III has created a systematic structure that has set in motion a cycle of continuous improvement.

If we have aroused your interest in certification with this practical guide, we will of course continue to be there for you and will be happy to make you appropriate offers.

The GUTcert Academy offers numerous training courses for all levels of knowledge, from beginners to experts, to deepen your knowledge of optimising energy management systems. Many courses are also available in-house and online, so that even larger groups of your employees can be trained flexibly and efficiently.

You can find the current training programme at www.gut-cert.de/akademie.html.

Once a year, we also offer all players in energy management and other interested parties a platform with exciting presentations and plenty of room for dialogue - the GUTcert Energy Excellence Network.

The GUTcert team wishes you every success, especially in saving energy and money and improving your environmental performance!

Please contact us if you have any questions.

Your GUTcert energy team

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Annex I - Ecological compensation: Overview, deadlines, explanations

Overview

	Wer?	Was?	Bis wann?	Überprüfungspflicht	VALERI	Zuständige Behörde
EnSimiMaV	∅ > 10 GWh	Energieeffizienz-maßnahmen	18 Monate Umsetzungsfrist (01.04.2024)[3]	✓	✓	Energieauditor/ Umweltgutachter
EnEfG	∅ > 2,5 GWh ∅ > 7,5 GWh	Maßnahmen-umsetzungspläne Umsetzungspläne + EnMS oder EMAS	Innerhalb von 3 Jahren EnMS/EMAS bis 18.07.2025	✓	✓	BAFA
BesAR nach EnFG	Mind. 1 Abnahmestelle > 1 GWh	Energieeffizienzmaßnahmen (EnMS oder EMAS) / 30% erneuerbare Energien / Dekarbonisierungsmaß-nahmen	Jeweils 30.06. für das Folgejahr[4]	✓	✓	BAFA
Kostenlose Zuteilung von Emissionszertifikaten (EU-ETS)	Emissionshandels-pflicht	Energieeffizienz-maßnahmen/Klimaneutrali tätspläne	21.06.2024	✓	✗	DEHSt
SPK	Zugehörigkeit zu bestimmten Sektoren[1]	Energieeffizienzmaßnahmen (EnMS oder EMAS) / 30% erneuerbare Energien / Dekarbonisierungsmaß-nahmen	Jeweils 30.06. für das Vorjahr[5]	✓	✓	DEHSt
BECV	Zugehörigkeit zu bestimmten Sektoren[2]	EnMS oder EMAS / Energieeffizienzmaßnahmen / Dekarbonisierungsmaß-nahmen	Jeweils 30.06. für das Folgejahr[6]	✓	✓	DEHSt

Figure 25: Overview of ecological compensation

Explanations to the overview

[1] Eligible for aid are companies that manufacture products in one or more plants that fall under one of the categories listed in Annex I of the

Guidelines on certain State aid measures in the context of the greenhouse gas emission allowance trading scheme.

[2] A company is eligible for aid if it belongs to an eligible sector or subsector. Eligible sectors and subsectors are those that

1. are listed in Tables 1 and 2 of the Annex to this Ordinance, or

2. were subsequently recognised in the procedure under Section 6

(§5 BECV).

Energy efficiency measures identified by 1 October 2022 must be implemented within 18 months, i.e. by 1 April 2024, in accordance with Section 4 EnSiMimaV.

[4] 30.06.2023: Proof of implementation of all economic energy efficiency measures or self-declaration with intended investments within the next three years (alternatively other ecological counter-performance).

[5] For 2021 to 2024: Implementation of the identified economic energy efficiency measures, at least in the amount of the aid disbursed (from 2025 for the previous year). If the investment amount corresponds to less than 50% of the aid amount, Section 11 BECV applies with definition of economic efficiency and verification to DEHSt.

[6] Settlement year 2023: Until 30 June 2024 (annually thereafter) Proof to DEHSt of investments made or no identification of economically feasible measures (alternatively other environmental offsets).

Deadlines

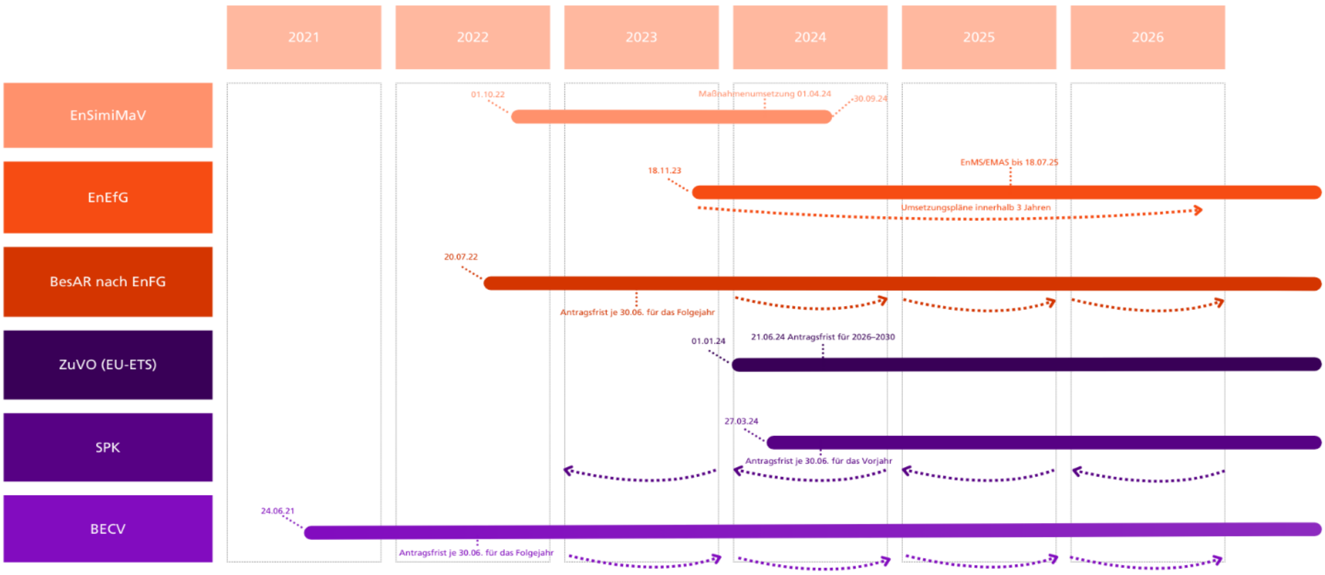


Figure 26: Deadlines for ecological compensation

Further links

DIN EN 17463

Energy Efficiency Act (EnEfG)

- More info

EnSimiMaV

- More info

Special equalisation scheme (BesAR) in accordance with the Energy Financing Act (EnFG)

Amended EUZuVO of 31 January 2024

- Information page of the DEHSt

Aid for indirect CO_2 costs (electricity price compensation SPK)

- More info

BEHG Carbon Leakage Ordinance - BECV

- More info
- Guideline BECV of the DEHSt
- Assistance with the application process and proof of ecological compensation

Annex II - HS or HLS as the basic structure of ISO standards

The new ISO 50001:2018 is based on the so-called High Level Structure (HLS). The HLS was replaced by the Harmonised Structure (HS) in May 2021. This applies to both new management system standards and those worked on via and will be applied to the next revision.

There will be no major changes in terms of content, as the core requirements of the HLS have largely been retained. Thanks to the uniform structure and the definition of terms that apply across standards , the HLS/HS creates a solid basis for incorporating various management systems in an organisation into a comprehensive integrated management system.

Introduction

1st area of application

2 Normative references

3. terms

4. context of the organization
- 4.1 Understanding the organization and its context
- 4.2 Understanding the requirements and expectations of interested parties
- 4.3 Defining the scope of application of the XXX management system
- 4.4 XXX management system

5. leadership
- 5.1 Leadership and commitment
- 5.2 XXX policy
- 5.3 Roles, responsibilities and powers in the organization

6. planning
- 6.1 Measures for dealing with risks and opportunities
- 6.2 XXX objectives and planning to achieve them

7. support
- 7.1 Resources
- 7.2 Competence
- 7.3 Awareness
- 7.4 Communication
- 7.5 Documented information
  - 7.5.1 General
  - 7.5.2 Creating and updating
  - 7.5.3 Control of documented information

8. operation
- 8.1 Operational planning and control

9. evaluation of performance
- 9.1 Monitoring, measurement, analysis and evaluation
- 9.2 Internal audit
- 9.3 Management assessment

10. improvement
- 10.1 General
- 10.2 Non-compliance and corrective actions
- 10.2 Continuous improvement

This is the standard structure of the HLS, which since 2012 must be used by all new and revised standards must be used as a binding basis.

The **XXX** stands for the respective special topic, for example energy, quality, occupational safety or the environment.

Figure 27: Overview of the HLS

Integrating energy management into other existing management systems (EMS, QMS, ISMS) not only reduces the internal workload but also the external audit times and therefore the costs.

Annex III - Possible contents of energy action plans

Energy-saving projects must be described in detail in action plans to ensure that third parties can verify the improvement. The following table of contents provides an overview of the information that should be included in an action plan and the reviews that should be gun documented. A link to the respective target in the energy saving programme is recommended here. Action plans should be drawn up for each savings project and are approved by top management as part of the management review. The documentation should be appropriate to the complexity of the project and the investment costs.

Action plan no. 001

1. Preliminary remarks/description of the savings project
2. Energy consumption in the reference year / categorisation by energy source
3. System description, balance sheet limits, current status, influencing factors including starting point for M&V
4. Planned measure(s) to optimise the savings project
   4.1. Interactions
   4.2. M&V design/budget taking into account the influencing factors
5. Investments, value of savings
   5.1. Provision of costs/cost centres
   5.2. Avoided CO_2 emissions / other benefits where applicable
6. Profitability calculation
7. Methodology for verification
8. Timeframe and sequence of implementation
9. Responsibilities, workload
   9.1. Labour/production losses
   9.2. Responsible for implementation (project management)
10. Appendices/Miscellaneous
    c) Example: List of illustrations
       Figure 1: Definition of system boundaries
       Figure 2: Measuring points
       Figure 3: Material and energy flows in the current production process
       Figure 4: Material and energy flows according to planned measure

Example: List of tables
Table 1: Energy analysis of the current state
Table 2: Energy analysis TARGET condition
Table 3: Cost analysis of the planned new investment
Table 4: Discounting the annual energy cost savings

Authorisation: ____________________ ________________________________ DateSignature Management Notes: ____ Realisation takes place: ____________________ ________________________________ DateSignature Management Notes: ____

The GUTcert - Who are we?

GUTcert is an internationally recognised company for the certification of

- management systems
- products (carbon footprints, emissions trading - no "material tests")
- Personnel
- Suppliers

and offers knowledge transfer in these areas.

As part of the AFNOR network, GUTcert now has access to more than 1,800 auditors from over 90 countries worldwide and is increasingly active internationally.

Certification

ISO 9001
ISO 14001
ISO/IEC 27001
ITSK Networks and Energy Systems
KRITIS § 8a (3) BSIG
ISO 45001
AZAV
ISO 50001
ISO 55001 Asset Management

Verification

Emissions & allocation applications (ETS)
Carbon Footprint / ISO 14064
Carbon Neutrality (not accredited)
ACA Airport Carbon Accreditation

Validation

EMAS according to DAU
DIN EN 17463 (VALERI)

In Association with Afnor

IRIS Rev 03 (ISO TS 22163)
IATF 16949
AS 9100

Sustainability Standards

Sustainability Reporting (GRI/ DNK)
ASI Aluminium Stewardship Initiative
RS ResponsibleSteel
ISCC / REDcert / RSPO
SURE
ISO 20121 Sustainable Event Management

Additional assessments

Waste management
EEG 2009 / 2012 / 2014 / 2017 / 2021
Biomethane feed-in
Green Power
Proof of Power Origin (HkN)

GUTcert Academy

Auditor and Representative Trainings
Technical Training Courses

Inhouse Training
Customized E-Learning Programs

Berlin Cert

Notified Body for

Medical Devices Regulation (EU Regulation 2017/745 "MDR")
Systems (Annexes II, V, VI)
Products (Annex IV)

Certification Body for

ISO 13485

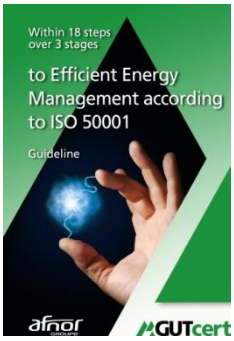
The GUTcert Academy pools the specialist knowledge of auditors and other experts in compact training courses. Participants at all levels of knowledge receive the necessary skills to reliably understand and fulfil standard requirements in everyday operations.

Would you like to take responsibility for your organisation's management systems or work as an auditor for a certification body? No problem, our courses prepare you for your tasks in a practical way and fulfil the applicable training requirements.

The training programme covers the entire range of services offered by GUTcert. In addition to the established management standards (ISO 9001, ISO 14001, ISO 27001, ISO 45001 and ISO 50001), we also train you on topics such as sustainability, emissions trading, AZAV, EEG and RSPO.

International EnMS guidelines

Our guide is available in various languages - but not in the current version:



English (V 4.2)

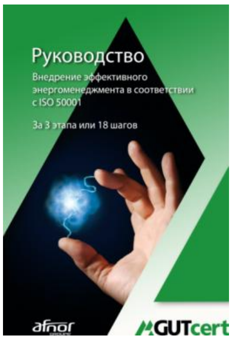
French (V 4.2)

Spanish (V 4.2)

Mandarin (V 4.2)

Polish (V 4.2)

Russian (V 3.0)



Bulgarian (V 3.0)