

# ISO 50001 – Energy management systems

Reduce energy costs and achieve a  
competitive advantage



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**Add value.  
Inspire trust.**

White paper

## Abstract

ISO 50001 Energy Management Systems – Requirements with Guidance for Use, helps organisations introduce, operate and continually optimise a comprehensive energy management system (EnMS). The successful implementation of this systematic approach can optimise energy use by improving energy performance, reducing energy consumption and/or increasing energy efficiency.

First released in 2011, ISO 50001 has gained wide global acceptance amongst companies wishing to raise awareness of resource efficiency. On 21 August 2018 a revised edition of ISO 50001 was published by the ISO (International Organization for Standardization). On 23 November 2018 the German version of the revised standard DIN EN ISO 50001:2018 was published by DIN.

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# Energy management challenges

## ISO 50001 enables organisations to systematically optimise energy performance in all processes.

Organisations the world over are facing both volatile and rising energy prices, and for many energy represents one of the biggest single cost items. This comes at a time of increasing competitive pressure that is forcing companies to find new ways to reduce their total overheads. Additionally, there are mounting concerns about sustainability and the greenhouse gas emissions produced by organisations. Businesses across the world are also under pressure from a constantly changing regulatory landscape.

In light of these growing multi-dimensional pressures, energy is now on the corporate agenda, in the search

for potential savings and broader business benefits. Consequently, organisations must identify measures to manage energy use while at the same time communicating energy management efforts to an increasingly environmentally conscious public. Effective energy management is therefore not only becoming increasingly important to businesses, it is also evolving into an ever more complex corporate issue.

The development of an energy management system according to ISO 50001 is suitable for every type of company, regardless of their size and industry. A voluntary international standard, ISO 50001 enables organisations to systematically optimise energy performance in all processes and promote more efficient energy management.

### **Benefits of an energy management system**

To manage energy consumption effectively, industry needs a consistent method that extends

across all types of energy end-users. This includes industrial plants, as well as commercial and institutional buildings. Such a systematic energy management approach will enable organisations to successfully evaluate energy use and consumption, identify their significant energy uses, and consequently develop comprehensive strategies to improve energy performance.

ISO 50001 offers measurable cost benefits to organisations. It allows your business to achieve greater transparency and promotes best practice in energy management by demonstrating how energy is consumed throughout your value chain. The ISO 50001 energy management system (EnMS) framework is widely known to improve bottom lines through systematic, data-driven and fact-based processes for improvements in energy efficiency and consumption, while enhancing a company's reputation and environmental performance.

## BENEFITS OF AN ENERGY MANAGEMENT SYSTEM



### **SAVE MONEY**

Improve energy efficiency and reduce energy consumption



### **GAIN A COMPETITIVE EDGE**

Promote energy management best practice



### **IMPROVE TRANSPARENCY**

Clearly communicate energy management efforts



### **OPTIMISE ENERGY-CONSUMING ASSETS**

Identify problem areas



### **ACHIEVE WORLD-CLASS STANDARDS**

Benchmark energy efficiency improvements

# A new energy management approach - ISO 50001:2018



First published in 2011, a revised edition of the ISO 50001 energy management system standard was released in 2018.

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## High-Level Structure

ISO 50001:2018 is based on the High-Level Structure (HLS), which has been established as the common framework for ISO management system standards. The uniform architecture, along with the use of common terms and definitions, facilitates a smooth integration of new and existing management systems within an organisation.

The harmonization of the ISO management system standards through HLS ensures a stronger focus on common topics that are

vital for the success of a management system. Examples include:

- **Role of top management** – Design and communication of policies and responsibilities
- **Context of the company** – Internal and external issues which influence your organisation
- **Interested parties** – Expectations of parties impacted by your organisation
- **Risk and opportunity evaluation** – Broad approach to address risks and opportunities

Consequently, the updated ISO 50001 includes a greater emphasis on the responsibilities of top management and highlights the importance of instilling a cultural change in the organisation - elevating energy

management into corporate management governance, just as quality and safety practices are. ISO 50001:2018 provides a framework of requirements for organisations to:

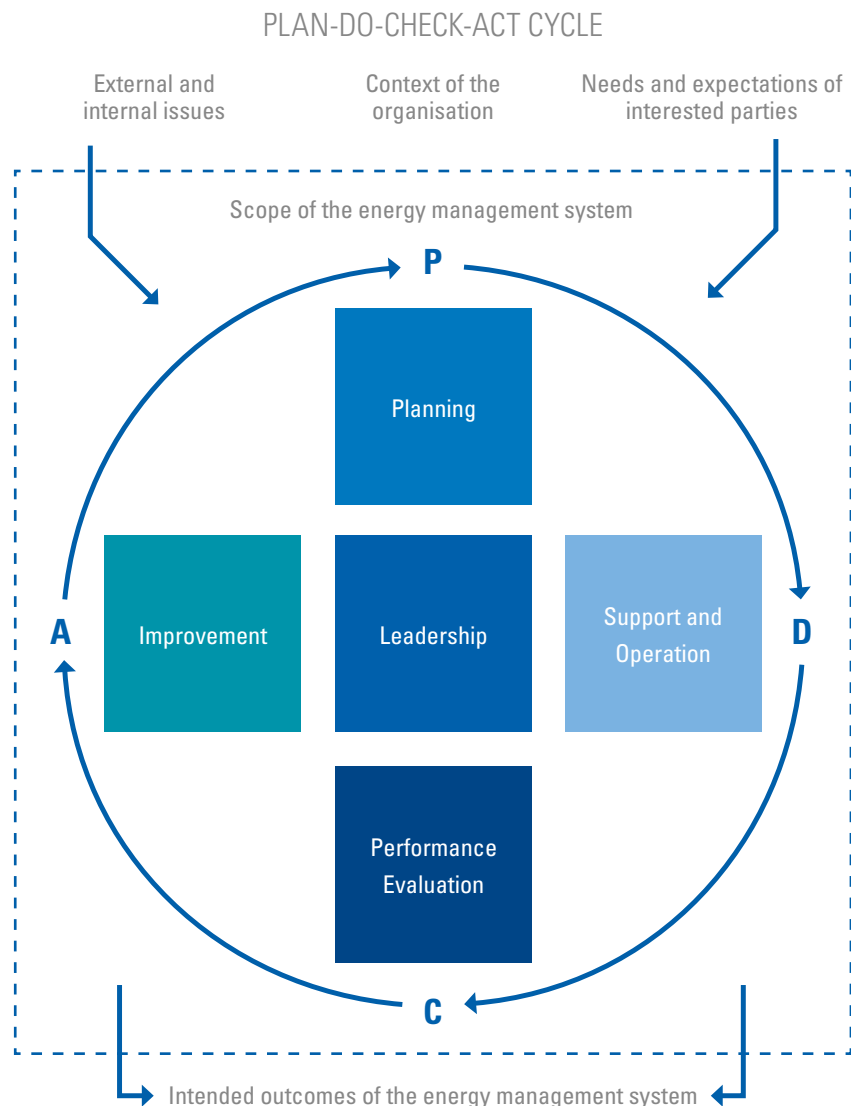
- Develop a policy for more efficient use of energy.
- Fix targets and objectives to meet the policy.
- Identify, measure, monitor and analyse the key characteristics of operations affecting energy performance.
- Facilitate data-based analysis and decisions about energy use.
- Measure the results.
- Review how well the policy works.
- Continually improve energy performance and energy management systems.

# Plan-Do-Check-Act

As foreseen by the High-Level Structure, the requirements of ISO 50001 are described in sections 4 – 10, and follow the Plan, Do, Check, Act (PDCA) cycle. With a focus on identifying significant energy uses, as well as opportunities to reduce consumption and improve efficiency, this approach will help organisations to continually improve performance.

## Plan

- Understand the context of the organisation.
- Identify and determine relevant external and internal issues that affect the organisation's ability to achieve the intended outcome of the EnMS and improve its energy performance.
- Establish an energy policy and an energy management team with assigned roles, responsibilities and authorities.
- Conduct an energy review to analyse energy use and consumption, based on measurement and other data.
- Identify significant energy uses (SEUs), and determine and prioritise opportunities for improving energy performance.
- Establish energy performance indicators (EnPIs) and energy baseline(s) (EnBs), to enable the organisation to demonstrate energy performance improvement.
- Establish objectives and energy targets, as well as action plans necessary to deliver results that will improve energy performance.
- Define and implement an energy data collection plan to monitor the key characteristics of the organisation's operations that are



- affecting its energy performance.
- Determine actions to address risks and opportunities to prevent or reduce undesired effects, and achieve continual improvements of the EnMS and energy performance.
- Operational and maintenance controls of the processes related to an organisation's SEUs.
- Ensure competence of person(s) doing work, who are under the organisation's control and affect both its energy performance and EnMS.
- Determine the internal and external communication relevant to the EnMS.
- Consider energy performance improvement in design and procurement.

## Do

- Implement the action plans to achieve objectives and energy targets and to address risks and opportunities.

## Check

- Monitor, measure and analyse the key characteristics (effectiveness of action plans to achieve objectives and energy targets, EnPIs, operation of SEUs, energy consumption).
- Evaluate the organisation's energy performance by comparing EnPI value(s) against the corresponding EnB(s) and the effectiveness of the EnMS.
- Conduct internal audits to confirm if the EnMS conforms to the standard's requirements and

improve energy performance, and if it is effectively implemented and maintained.

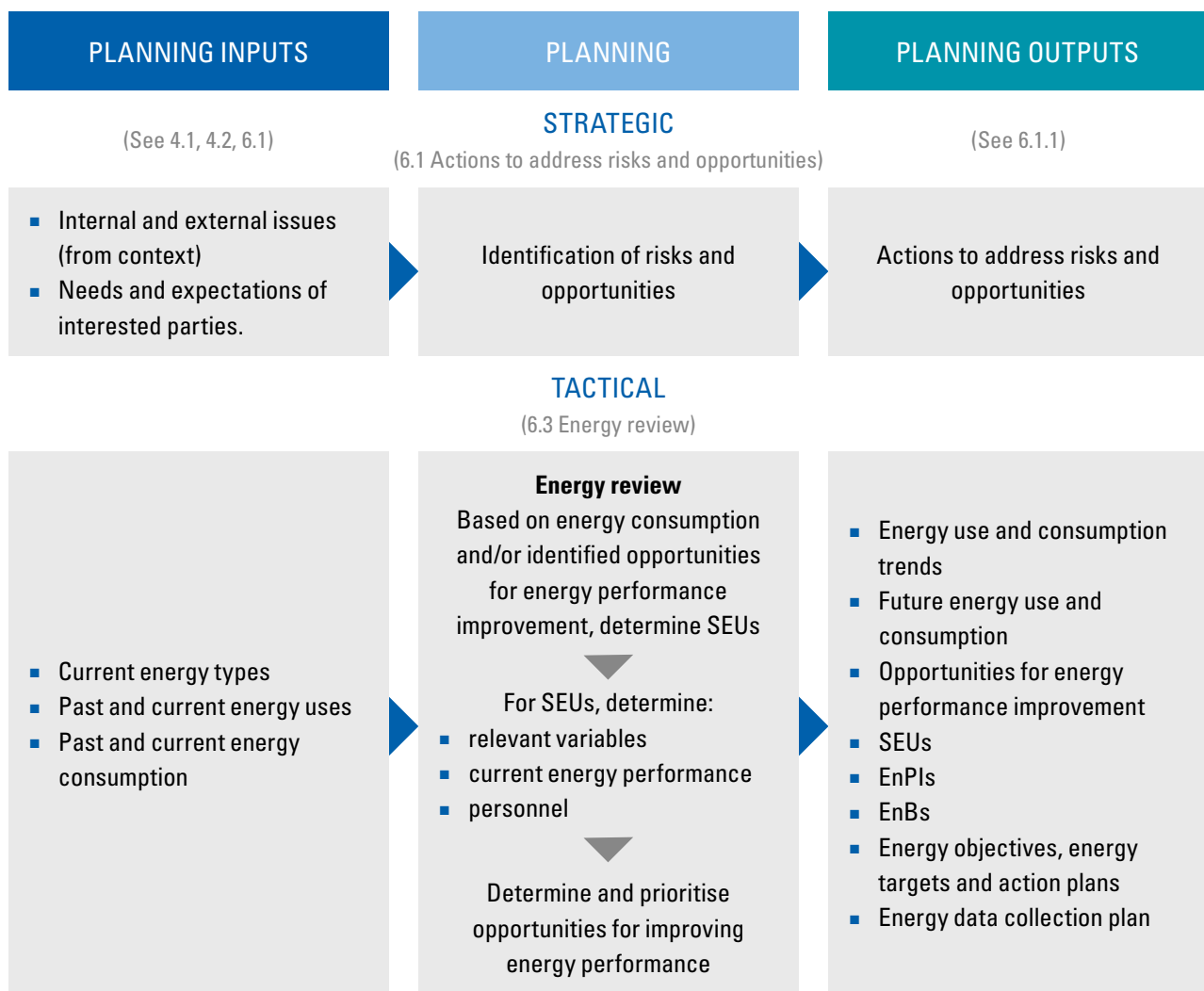
- Conduct management review(s) to ensure the continuing suitability, adequacy and effectiveness of the organisation's EnMS, and its alignment with the strategic direction of the organisation.

## Act

- Take actions to address nonconformities, and continually improve energy performance and the EnMS.

With a focus on identifying significant energy uses, as well as opportunities to reduce consumption and improve efficiency, this approach will help organisations to continually improve performance.

## ENERGY PLANNING PROCESS



Source: ISO 50001 - Energy Management Systems, requirements with guidance for use

# Requirements

The requirements of ISO 50001 are described in clauses 4 – 10 and follow the PDCA cycle

## Clause 4 - Context of the organisation

When setting up an energy management system, ISO 50001 requires that internal and external issues in the context of the company (which affect its ability to achieve the intended outcome of the EnMS and improve its energy performance) must be considered as part of the energy planning process. This includes identifying interested parties and understanding their relevant needs and expectations in relation to the organisation's energy performance and the EnMS. It must also ensure that it has access to, and takes into account, relevant legal requirements and other requirements related to its energy efficiency, use and consumption.

The organisation shall determine the boundaries and applicability of the EnMS to establish its scope. It must also ensure that it has the authority to control its energy efficiency, energy use and energy consumption within the scope and boundaries of the EnMS. Neither must the organisation exclude an energy type within the



scope and boundaries. Outsourced SEU's, or processes related to its SEU's which are performed by external organisations are within the scope (see clause 8).

## Clause 5 – Leadership

ISO 50001: 2018 places greater demands on senior management and its commitment to ensuring that the EnMS achieves the desired energy-related performance results. Top management must ensure that the responsibilities and authorities for relevant roles are assigned and communicated within the

organisation. They must also ensure that the EnMS is compatible with the organisation's wider strategic direction, and consequently that the EnMS's requirements are integrated across the business processes. Unlike the old version of the standard, this responsibility can no longer be delegated to a representative.

Top management must also ensure the formation of an energy management team, and ensure that the responsibilities and authorities for relevant roles are assigned.



# **Clause 6 – Planning**

The energy planning and review process must take into consideration the issues relating to its understanding of the organisation and its context (Clause 4.1) and requirements relating to the needs and expectations of interested parties (Clause 4.2). This will help them to identify the activities and processes that impact energy performance, and how this can be continually improved.

The organisation must identify its opportunities and risks to ensure that:

- The EnMS can achieve its intended goals.
- Undesirable effects are prevented or reduced.
- A continual improvement of the EnMS and the energy-related performance is achieved.

Once the opportunities and risks have been identified, the organisation must plan how they will be addressed, as well as their integration and implementation within the EnMS, and how effectiveness can be evaluated. This should include the establishment of objectives and energy targets, as well as conducting an energy review.

To identify areas of SEU and opportunities for energy performance improvement, the energy review analyses energy efficiency, energy use, and energy consumption based on data and other information. The energy review helps to create

THE ENERGY REVIEW SHALL:	
<b>Analyse energy use and consumption</b>	<ul style="list-style-type: none"> <li>■ Based on measurement and other data, i.e.:               <ul style="list-style-type: none"> <li>– Identify current types of energy</li> <li>– Evaluate past and current energy use(s) and consumption</li> </ul> </li> </ul>
<b>Identify significant areas of energy use (SEU)</b>	<ul style="list-style-type: none"> <li>■ For each SEU:               <ul style="list-style-type: none"> <li>– Determine relevant variables</li> <li>– Determine current energy performance</li> <li>– Identify the person(s) doing work that affect the SEUs</li> </ul> </li> </ul>
<b>Determine and prioritise opportunities for improving energy performance</b>	
<b>Estimate future energy use(s) and energy consumption</b>	

EnPIs, Energy Baselines (EnB) and objectives and targets for improvement.

The energy review shall be updated at defined intervals and in response to any major changes in facilities, equipment, systems or energy-using processes.

The organisation must also determine the EnPIs that will measure energy performance, so that a demonstrable improvement can be monitored. An EnB can be established using information from the energy review. If data indicates that relevant variables affect energy performance significantly, the organisation shall carry out normalisation of both the EnPI value(s) and the EnB(s).

The “Plan for Energy Measurement”, which was previously required by the old standard under “Monitoring, Measurement and Analysis”, is now an integral part of EnMS planning in the new ISO 50001:2018 and is referred to as the “Energy Data Collection Plan”. This ensures that the data required to identify, measure, monitor and analyse the key characteristics is captured. Data shall include relevant variables for SEUs; energy consumption related to SEUs and the organisation; operational criteria related to SEUs; static factors (where applicable); and data specified in action plans. Based on the collected energy data, the improvement in energy-related performance and the effectiveness of the EnMS can then be demonstrated.



## Clause 7 – Support

The organisation is responsible for determining and providing the resources needed for the establishment, implementation, maintenance and continual improvement of energy performance and the EnMS. The EnMS must be actioned by competent people, who are supported by the appropriate level of resource (financial and infrastructure). There is a requirement to retain evidence of workers' competence, while ensuring appropriate education and training, as well as awareness raising about energy performance issues.

A communication process must make workers aware of the EnMS. The organisation is also required to have a process for communicating information relevant to the EnMS, both internally and externally, as well as keep documented evidence of these practices.

## Clause 8 – Operation

This clause covers how the organisation shall plan, implement and control the processes, related to the SEUs identified in the energy review (Clause 6.3), and which are needed to meet requirements and to implement the actions during the objectives setting phase (Clause 6.2).

To achieve this, they must establish process criteria that include the effective operation and maintenance of facilities, equipment, systems and energy-using processes, where their absence can lead to a significant deviation from intended energy performance. These criteria must

be communicated to the relevant people that are under the control of the organisation. It must also ensure that the processes are controlled, as laid out in the criteria. Documented evidence must also be kept, to show that the processes have been carried out in accordance with the plan. If the organisation makes arrangements with an external organisation to perform SEU's or processes to its SEU's as a part of an organisation's function or processes, the organisation must also ensure that outsourced SEU's or processes to its SEU's are controlled.

During the design of facilities, equipment, systems and energy-using processes, the organisation must consider if there will be any significant impacts on energy performance over the operating lifetime, to identify improvement opportunities and operational control. It must also establish criteria for evaluating the energy performance for any energy-consuming products, equipment and services that are procured, if this is expected to have a significant impact on the organisations's energy

performance.

## Clause 9 – Performance evaluation

Organisations must ascertain what must be measured and monitored, by whom and with what frequency, to give an indication of how the energy management system is performing and if the main focus of continual energy performance improvement is achieved. This must include internal audits of the EnMS at planned intervals and documented evidence must be retained.

Top management is also responsible for reviewing the organisation's EnMS, to ensure its continuing suitability, adequacy, effectiveness and alignment with the strategic direction of the organisation. The standard gives in-depth detail about what such a management review shall include; the energy performance inputs that must be covered; and how the outputs of the review must cover decisions relating to continual improvement and any necessary updates to the EnMS.



## Clause 10 – Improvement

The organisation must identify opportunities for improvement and take action to support the intended outcomes of the energy management system. Emphasis is given to investigating and taking corrective actions, as well as reviewing the effectiveness of any corrective actions and to reporting of nonconformities. Nonconformities include significant deviation from

established criteria or unintended changes for the effective operation of processes, facilities, equipment, systems and energy-using processes; significant deviation from intended energy performance, deviation of compliance with legal and other requirements. The organisation is required to continually improve the suitability, adequacy and effectiveness of the EnMS, to demonstrate continual energy performance improvement.

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The organisation must identify opportunities for improvement and take action to support the intended outcomes of the energy management system.

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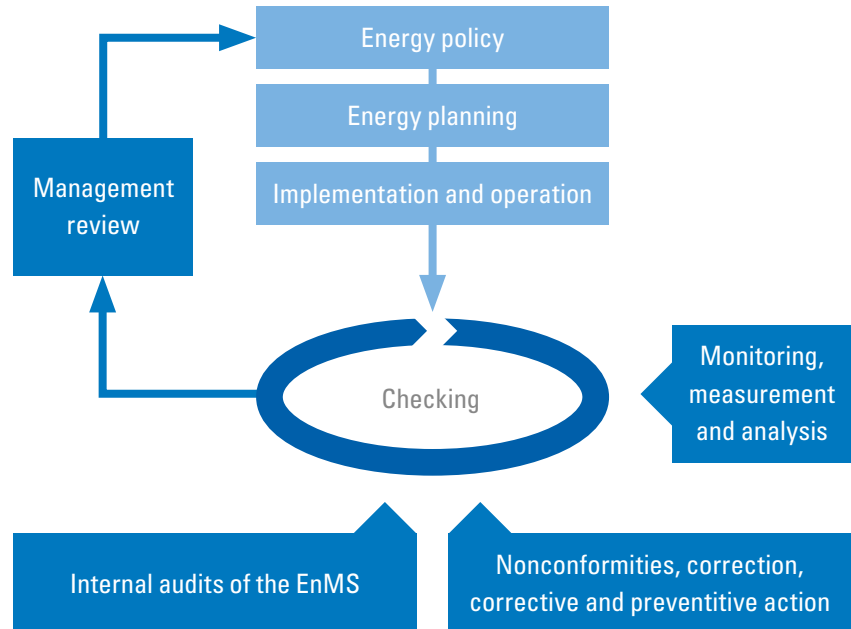


# How to get started

Key to the success of an ISO 50001 management system is the ability to demonstrate continual improvement in energy performance, and you will be measured against this during your certification audit cycles.

The decision to introduce the EnMS independently, or whether to integrate it into an existing management system, is at the discretion of the individual business. However, in most cases it is advisable to integrate the EnMS into an existing ISO 14001 environmental management system, or an ISO 9001 quality management system. In this way synergies can be exploited, allowing organisations to leverage their existing investments in management system compliance.

## ISO 50001 AUDIT PROCESS



## PREPARE FOR A SMOOTH CERTIFICATION PROCESS



### UPSKILLING

Become familiar with ISO 50001 objectives and requirements



### GAP ANALYSIS

Identify gaps against ISO 50001 requirements



### IMPLEMENTATION

Outline and implement measures to comply with ISO 50001 requirements



### DOCUMENTATION

Record measures and key performance indicators to document effectiveness and compliance

# Third-party certification by TÜV SÜD

An internationally accredited Certification Body, TÜV SÜD provides the necessary expertise and experience to assess your organisation against the requirements of ISO 50001 and other management system standards.

During a certification process, TÜV SÜD's independent and qualified auditors apply the following techniques:

## Document review

Evaluation of the organisation's requirements and/ or documentation to ensure the systematic control of all

processes relevant to ISO 50001.

## On-site-audit

Verification (in the form of interviews and on-site inspection at the customer's premises) that the requirements of ISO 50001 are being implemented effectively. This involves checking processes based on records kept by the organisation. Such records include available scope and boundaries of the EnMS, energy policy, energy review, definition of EnB(s), EnPI(s), energy data collection plan, energy data, implemented targets and energy targets, an action plan to perform

energy performance improvements, training and qualification records, evidence of effective operation of processes in line with established criteria, results of monitoring and measurement, results of the evaluation of compliance with legal and other requirements, results of internal audits and management review.

In addition to offering comprehensive evaluations and reports, we can provide you with our TÜV SÜD certification mark, which is globally recognised and synonymous with quality and safety.

## GET YOUR ISO 50001 CERTIFICATION



### DOCUMENTATION REVIEW AUDIT

TÜV SÜD evaluates your documentation and company records



### ON-SITE AUDIT

TÜV SÜD reviews the compliance of your actual activities to standard requirements and company records



### CLOSING THE GAP

Your organisation identifies and implements measures to correct the root cause of any non-conformances identified by the audit



### CERTIFICATION ISSUANCE

TÜV SÜD issues the ISO 50001 certification and certification mark



### SURVEILLANCE AUDITS

Annual audit required to maintain certification validity (Unannounced audits may occur in special cases)

# Why choose TÜV SÜD

TÜV SÜD is an internationally accredited certification body, so you can be assured that we conduct certifications with the highest degree of professionalism and conformance to international guidelines and standards. TÜV SÜD's experts hold various international and national accreditations to satisfy local requirements for combined

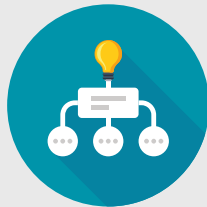
auditing exercises. In addition, our auditors are required to follow a strict code of conduct through Auditor Codex, which assures both you and your customers of our complete independence and professionalism.

Our international network enables us to offer certification and auditor engagement services on every

continent, certifying organisations' compliance to ISO 50001 on a global scale. Furthermore, TÜV SÜD has the broad sector expertise required to help organisations from various industries in different geographical locations to achieve compliance.



Internationally  
accredited Certification  
Body for a wide range  
of management system  
standards



Helps to optimise  
energy efficient  
business operations  
across industries



Globally  
recognised TÜV SÜD  
certification mark



Available in all  
key regions across  
the world



# Conclusion

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ISO 50001 provides all kinds of organisation with a systematic approach to monitor and reduce their energy consumption, thereby increasing energy efficiency and improving profitability.

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Organisations across all industries are faced with increasing cost of energy. It is now vital that they can objectively evaluate their energy consumption, to maintain or reduce costs and lessen their negative impact on the environment. ISO 50001 provides all kinds of organisation with a systematic approach to monitor and reduce their energy consumption, thereby increasing energy efficiency and improving profitability.



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# Demonstrate commitment to energy management

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## **Add value. Inspire trust**

TÜV SÜD is a trusted partner of choice for safety, security and sustainability solutions. It specialises in testing, certification, and auditing services. Through more than 25,000 employees across over 1,000 locations, the company adds value to customers and partners by enabling market access and managing risks. By anticipating technological developments and facilitating change, TÜV SÜD inspires trust in a physical and digital world to create a safer and more sustainable future.

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