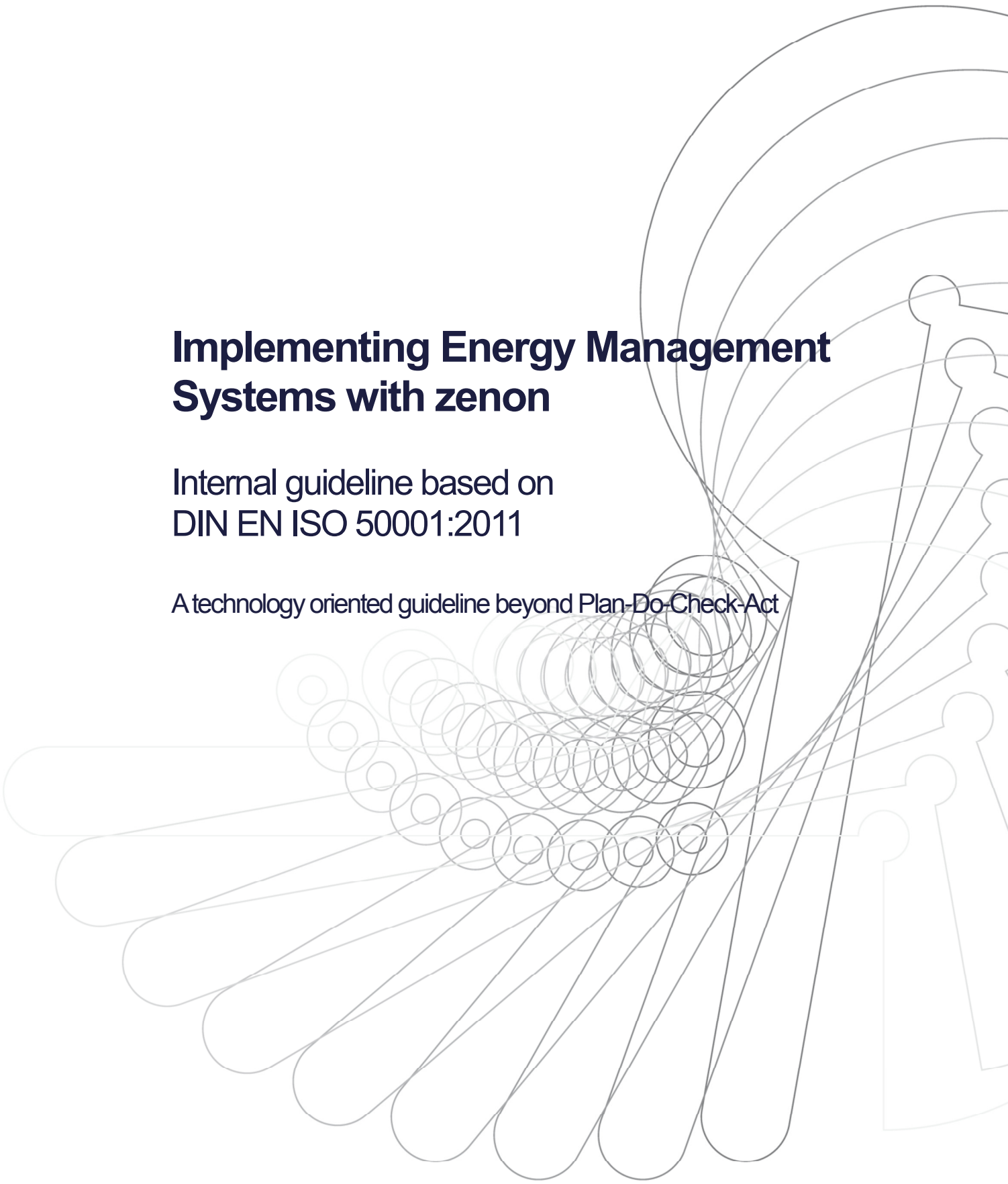
Implementing Energy Management Systems with zenon

Internal guideline based on DIN EN ISO 50001:2011

A technology oriented guideline beyond Plan-Do-Check-Act



zenon®

History

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Contents

1 Executive Summary

Professional energy management is becoming increasingly important for companies in all regions of the world for several reasons. The efficient utilization of different energy media supports the prosperity of an enterprise in various ways, such as direct cost savings from reduced energy consumption or indirect savings from governmental subsidies. Furthermore, a global sustainability trend requires organizations to act responsibly. Thus, increasingly energy management initiatives are introduced in companies in order to adopt this methodology into an existing set of management systems.

Supplementary standards are being developed to provide a complete and consistent framework for the implementation and operation of professional energy management. These standards, however, are formulated in a rather generic way, allowing them to be utilized in different types and sizes of organizations. This might leave the persons in charge with some questions regarding the practical implementation of an Energy Management System.

Hence, the aim of this document is to:

- Give you an overview of the main characteristics of Energy Management Systems (EnMS) based on ISO 50001, beyond the Plan-Do-Check-Act perspective
- Help you to picture the main requirements of Energy Management Systems in your company, especially with respect to the necessary tools and methods
- Demonstrate the most striking functionalities of zenon, allowing for an efficient implementation, operation and evolution of corporate energy management

..to ultimately **help you to get started** with professional energy management!

The information in this document is based on the original version of the DIN EN ISO 50001 International Standard definition with the title: "*Energy management systems – Requirements with guidance for use (ISO 50001:2011)*".

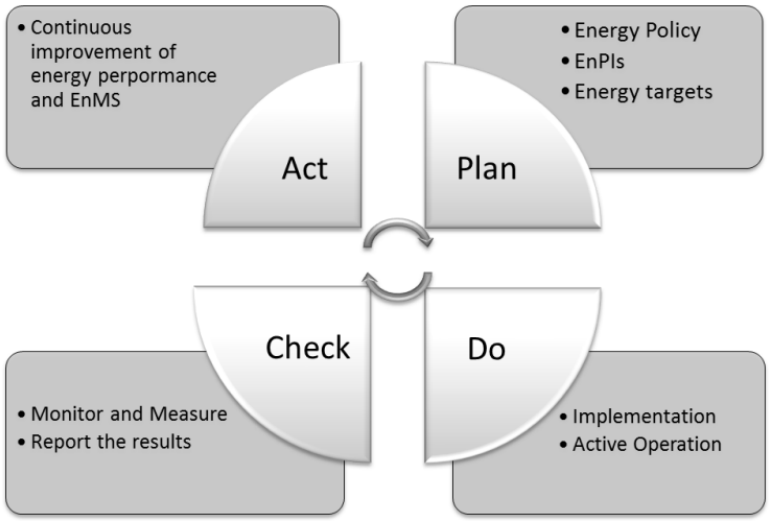
2 A Discussion about Energy Management Systems in Corporate Practice

Energy Management Systems (EnMS), as specified by the DIN EN ISO 50001, represent a systematic approach of an enterprise to comprehensively **analyze, monitor and manage corporate energy consumption** and correspondingly **improve the energy performance**. From a management perspective this is linked to the formation of an initiative for the development of a respective energy policy and the definition of energy targets to be achieved. Statistics based on **continuous recordings of relevant variables** as well as actual values enable the so called **Energy Management Team** to picture the situation and to develop measures for a further improvement of the energy performance as well as for the EnMS system itself.

"*When establishing and reviewing objectives and targets, the organization shall take into account legal requirements and other requirements, significant energy uses and opportunities to improve energy performance. It shall also consider its financial, operational and business conditions, technological options and the views of interested parties.*" (ISO 50001:2011, p. 13)

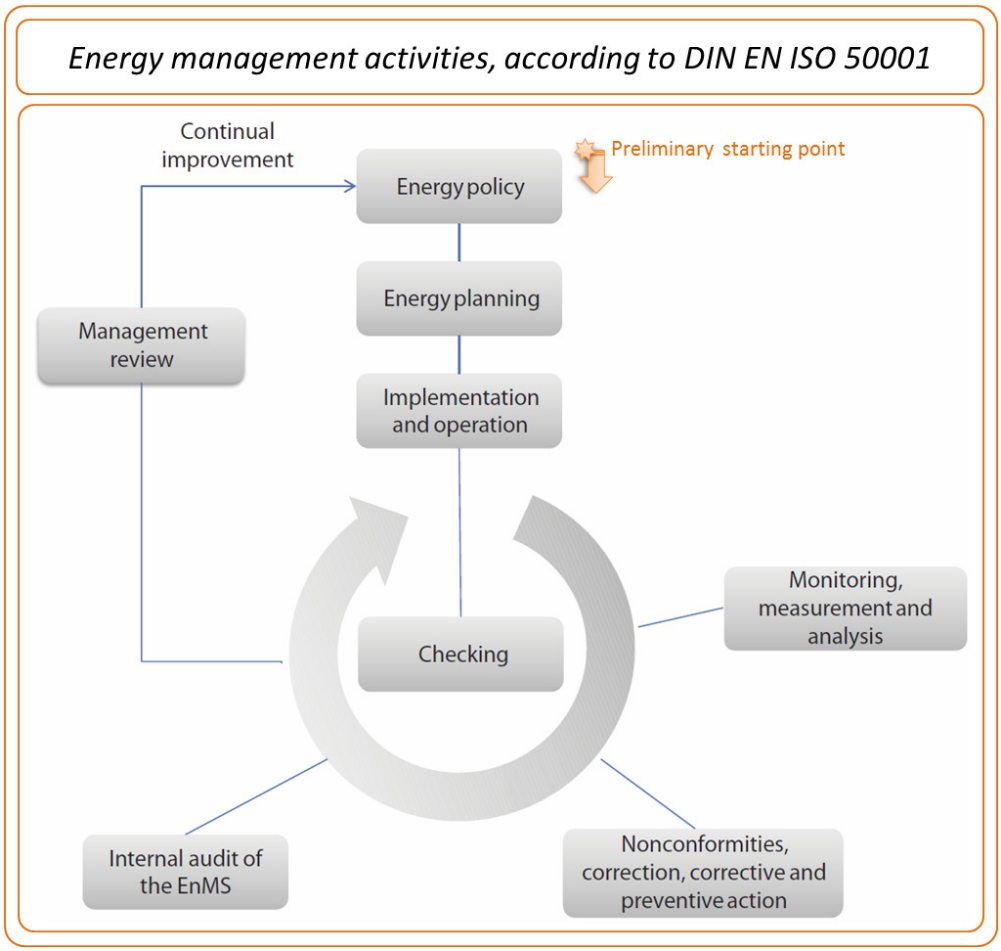
The **Plan-Do-Check-Act** cycle briefly describes the main character of an energy management initiative and its evolutionary character of continuous improvement:

Plan	*conduct the energy review and establish the baseline, energy performance indicators (EnPIs), objectives, targets and action plans necessary to deliver results that will improve energy performance in accordance with the organization´s energy policy;*
Do	*implement the energy action plans;*
Check	*monitor and measure processes and the key characteristics of operations which determine energy performance in order to compare it to the energy policy and objectives, and to continuously report the results;*
Act	*take actions to continually improve energy performance and the EnMS;*



"Plan-Do-Check-Act Cycle of Energy Management according to ISO50001"

However, the Plan-Do-Check-Act model only gives us a first impression and will most likely leave the practitioner with some questions about specifics regarding the conception and implementation of a respective management system. The well-defined International Standard ISO 50001 declares respective requirements and related processes more specifically. A more detailed view of respective activities is given in the following diagram. This illustration shall mainly serve us further on to depict respective activities and requirements.

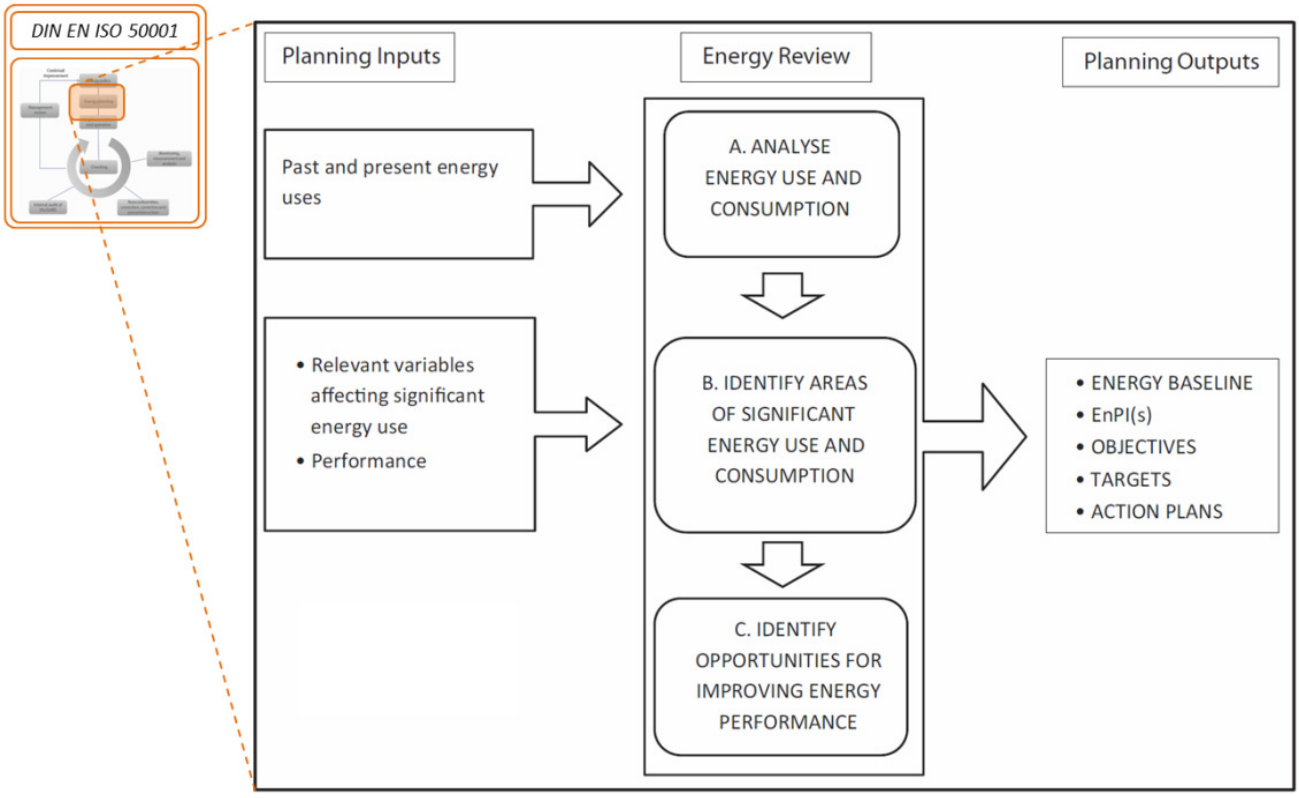


"Energy Management System Model, according to DIN EN ISO 50001:2011"

The energy management initiative is largely based on the so called **Energy Policy**, which is comparable to a "mission statement" for corporate energy management, formulated by top management. The Energy Policy shall express the overall intentions and directions of energy management of the company. Therefore, the Energy Policy somehow "shapes" all subsequent activities in the context of energy management. As the internal as well as the environmental conditions change in time, the Energy Policy might be exposed to specific alterations.

Energy planning represents a first operational sub process within an energy management cycle. Based on a thorough assessment of present energy uses in the facility, the Energy Management Team derives adequate energy performance targets as well as appropriate instruments and measures to further keep track of

the upcoming developments. Energy planning is best illustrated by the ISO 50001 International Standard – see the diagram below:



"Energy Planning Process Concept Diagram, according to DIN EN ISO 50001:2011"

What does this sub process imply?

- Information regarding relevant energy uses has to be made available in a substantive way for conducting analysis and derivation of follow-up targets and (new) measures. This concerns the need for a **sufficient timely recording of energy consumption** as well as the collection and relation of **all relevant variables** being necessary for **assessing and interpreting corporate energy consumption**. The simple measurement of direct energy consumption is often not sufficient.

- **Organizational conditions**, i.e. shifts, order situation, processing of orders or forecasts might be relevant for a valid interpretation of energy consumption

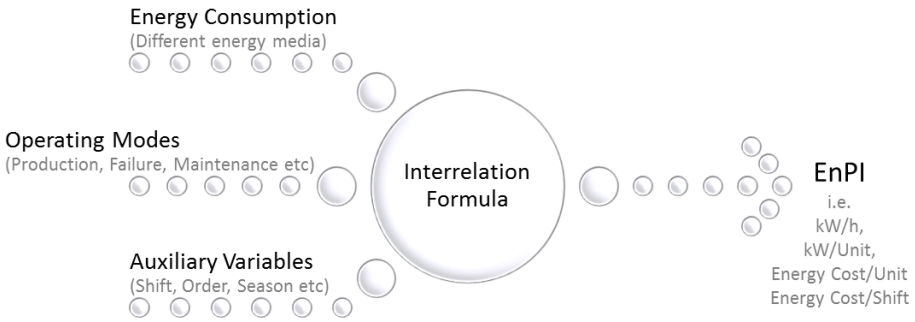
- **Process-related conditions**, i.e. thermal conditions, operating states of machinery or individual machine performance indicators might be relevant for a valid interpretation of energy consumption

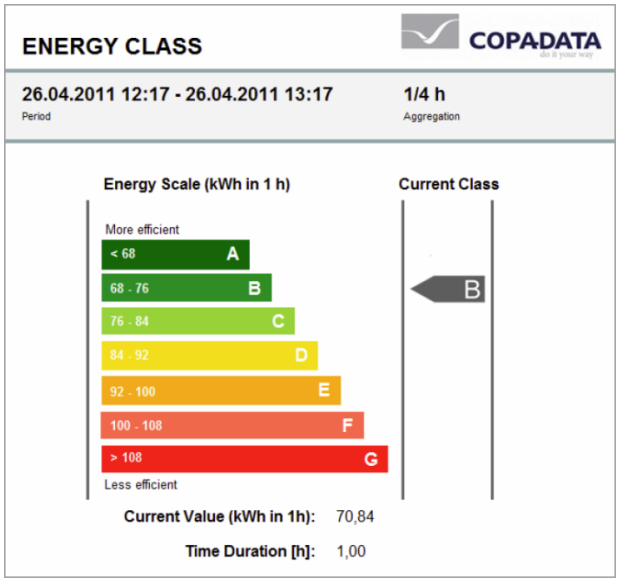
- **Auxiliary conditions**, i.e. weather, seasonal fluctuations or energy market conditions might be considered as well

An IT platform has to be able to consistently capture and aggregate relevant data. Furthermore, it has to provide a means to adequately relate specific variables and thus enable the Energy Management Team to interpret resulting trends correctly.

A brief discussion about Energy Performance Indicators:

Energy Performance Indictor (EnPI) is a synonym for a value which quantifies energy consumption, energy use or energy performance and which can be potentially used for monitoring. The ISO 50001 defines EnPIs as *"quantitative value or measure of energy performance, as defined by the organization. EnPIs could be defined as a simple metric, ratio or more complex model" (ISO 50001:2011, p. 8)*. This means, a company can "freely decide" which values and measurements might be the most meaningful ones to monitor its energy efficiency. A popular way of monitoring energy performance in industrial production is to either measure the energy consumption per time-period or to relate the energy consumption to a respective production output. However, it is most likely that additional variables will be required to sufficiently interpret energy consumption. It could be interesting, for instance, to relate produced units to the occurring energy costs.





"Energy class statement – dynamically determined and visualized by zenon"

The process of Energy Planning results in a description of the general situation and areas of energy usage of the organization, along with the formulation of detailed energy management objectives and targets for the upcoming observation period. Furthermore, EnPIs and measures for the improvement of the energy performance are being defined. This information is formally aggregated in a so called **Energy Baseline**. Hence, energy planning has far-ranging consequences for the further continuation of the energy management initiative. It is quite obvious that the outcomes of energy planning will vary, requiring the organization to dynamically respond to changing requirements.

With the **implementation of measures for improving and monitoring energy performance** a **new observation period begins**. Within this period the following aspects are of specific importance:

- Comprehensive collection **of all relevant data (measurements values) in adequate time intervals**
- **Consistent archiving** for later **analysis and statistical evaluations** and interrelation on different aggregation levels
- A **reliable reaction to non-conformities or irregular situations**, i.e. by alarming and respective messaging (instant messaging, E-Mail, SMS)
- Automatic **corrective actions and optimization activity** according to defined instructions and based on internal and auxiliary variables (i.e. load curve optimization)
- **Simple and task-adequate access to respective data and control instruments**

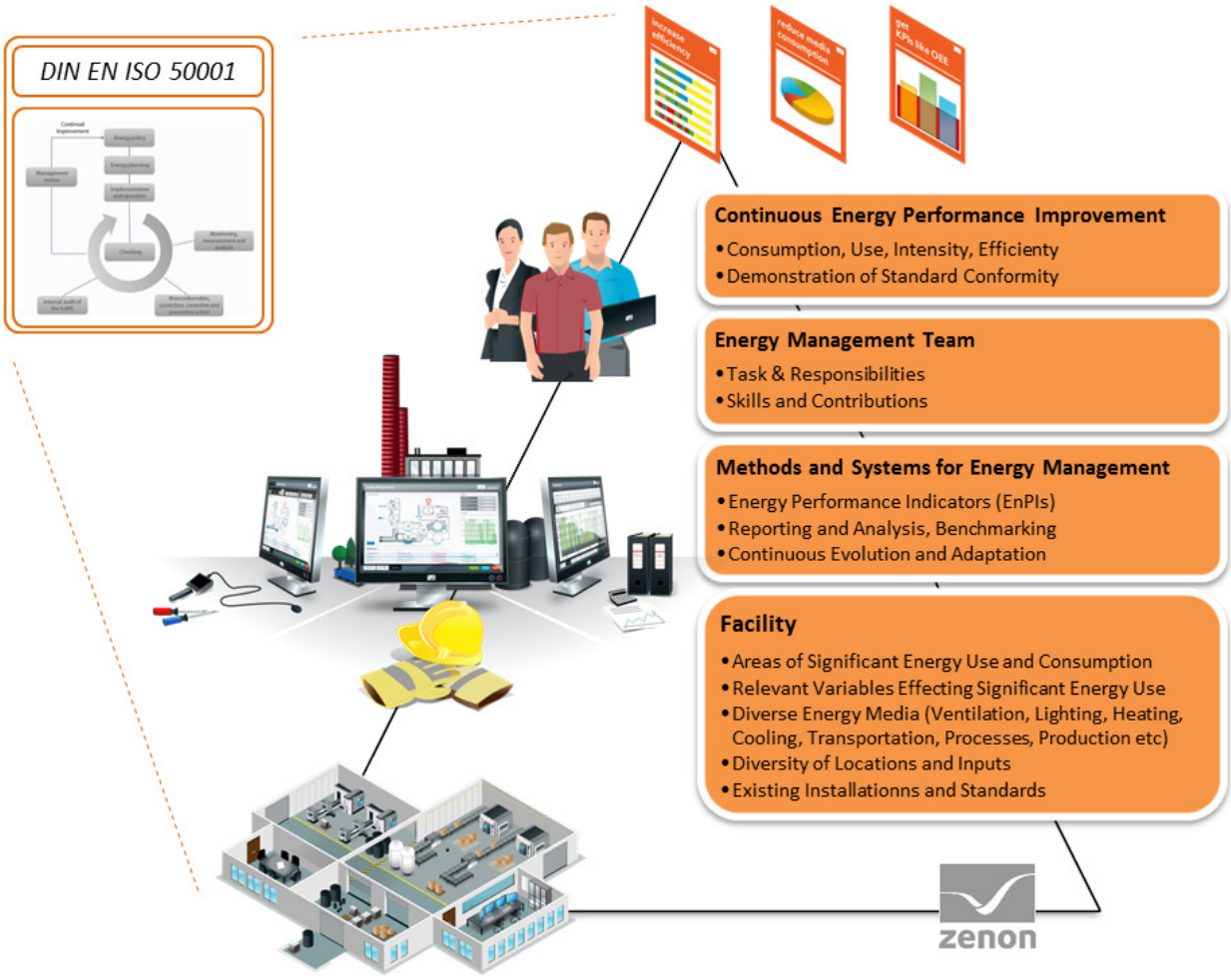
A guaranteed access (high availability) to relevant information and trends is essential and shall allow the Energy Management Team to conduct internal assessments and to continuously keep track of the fulfillment of the energy targets.

Formal **Management Reviews** shall be conducted on a regular basis in order to determine an organizations´ energy performance based on the available observation data as well as other information. This shall lead to the identification of further improvement possibilities. This activity is most likely to be based on respective **energy performance reports**, which allow for tracking and interpreting emerging trends and which allow for checking performance results against specific benchmarks.

*"**Benchmarking** is the process of collecting, analyzing and relating energy performance data of comparable activities with the purpose of evaluating and comparing performance between or within entities. Different types of benchmarking exist, ranging from internal benchmarking, for the purpose of highlighting good practices within the organization, to external benchmarking, in order to establish the "best in industry/sector" performance of an installation/facility or a specific product/service in the same field or sector." (ISO 50001:2011, p. 21)*

The ISO 50001 furthermore defines the so called **Energy Management Team** as "*the persons responsible for effective implementation of the energy management system activities and for delivering energy performance improvements" (ISO 50001, p. 8)*. Dependent on the size, structure and evolution of a respective organization, the team may consist of members from different corporate areas. Adequate means of accessing and interacting with respective measurement installations as well as monitoring units and data recordings are essential for a prospering energy management initiative. Individual awareness, experience and existing skills have to be taken into account and probably need to strengthened through further education or training.

The objectives of an energy management initiative are manifold and shall be jointly attained by all members involved in the initiative. **A structured and consistent management of respective information flows across multiple areas of a company is of paramount importance**.

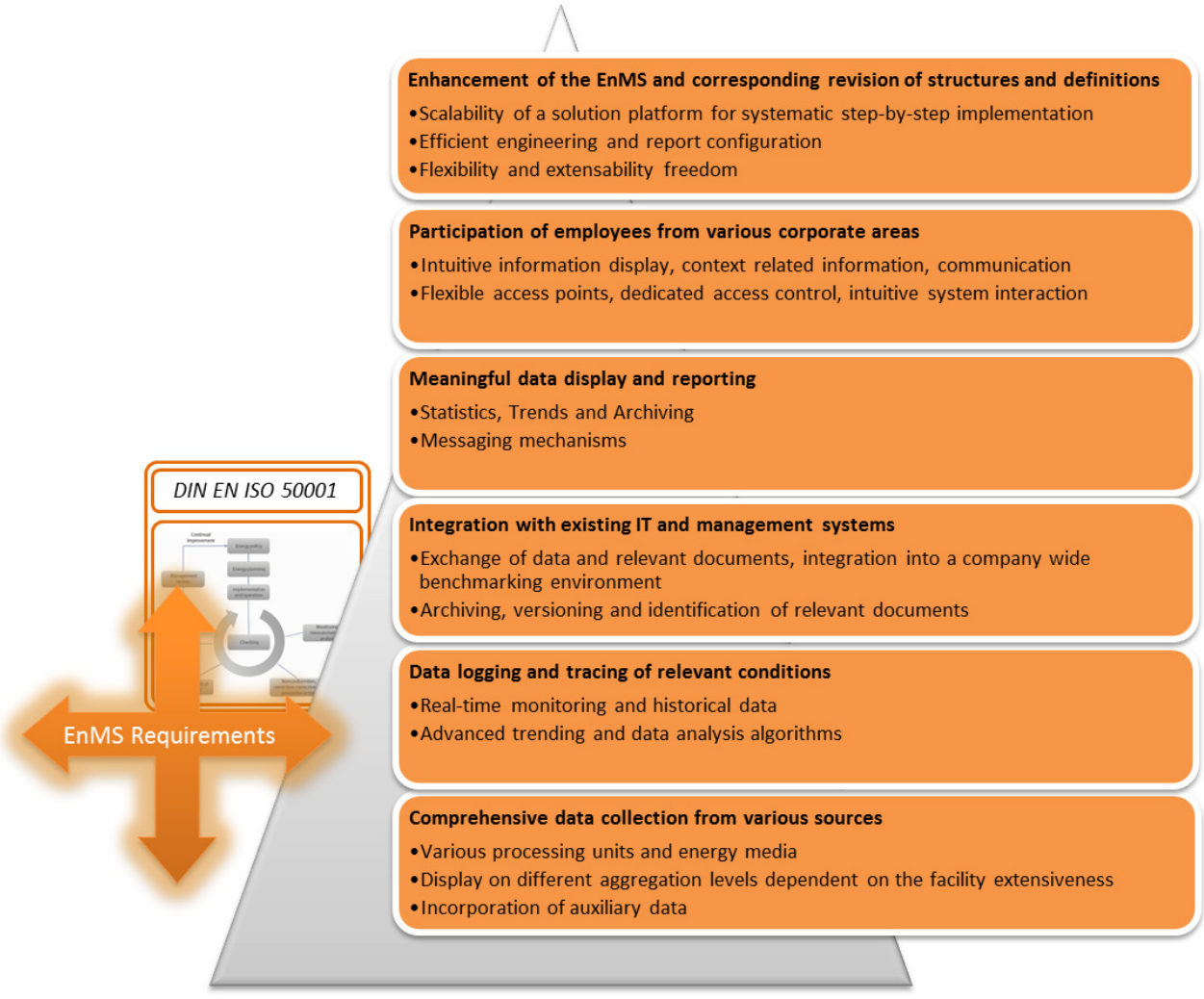


"Elements of corporate energy management"

Moreover it shall be assumed, that the evolutionary nature of the EnMS, namely its **cyclic revision and enhancement,** is a crucial aspect to be considered. Respective tools and methods must cope with this requirement in an efficient way, in order not to jeopardize the gained energy performance improvements.

3 Getting Started with Energy Management

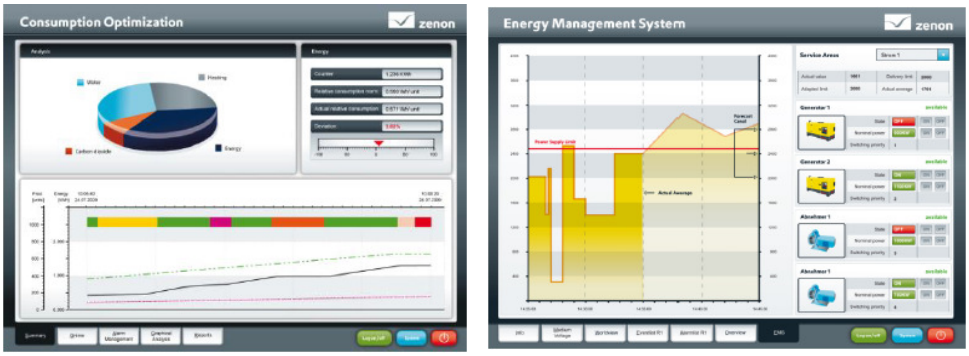
In a next step we want to gain a more detailed overview of the specific requirements of energy management in relation with a supportive information technology platform. Following the definitions of the ISO 50001, the successful operation of an Energy Management System (EnMS) is mainly characterized by the following requirements:



"Requirements to corporate energy management"

An information platform for energy management should comprehensively support respective requirements. The success of an energy management initiative is largely based on the capability to consistently **collect and manage information within a heterogeneous environment** and to display that information in a meaningful way. All members of the Energy Management Team shall be invited to contribute with their **creativity and experience in the process of continuous energy performance improvement**. A data acquisition and reporting technology shall provide inspiring means for achieving a constructive spirit here, rather than binding the initiative to static definitions made at the front end of the initiative.

Thus, a modern and appealing design of human-machine-interfaces, considering **the tasks and needs of individual members** of the energy management initiative is essential, avoiding mistakes and keeping training efforts at a low level. Compact and meaningful reports for the strategic evaluation of trends and measures are required by corporate management. Means for defining, **creating and distributing those reports shall be provided in an intuitive way**, not requiring any specific system or programming knowledge.



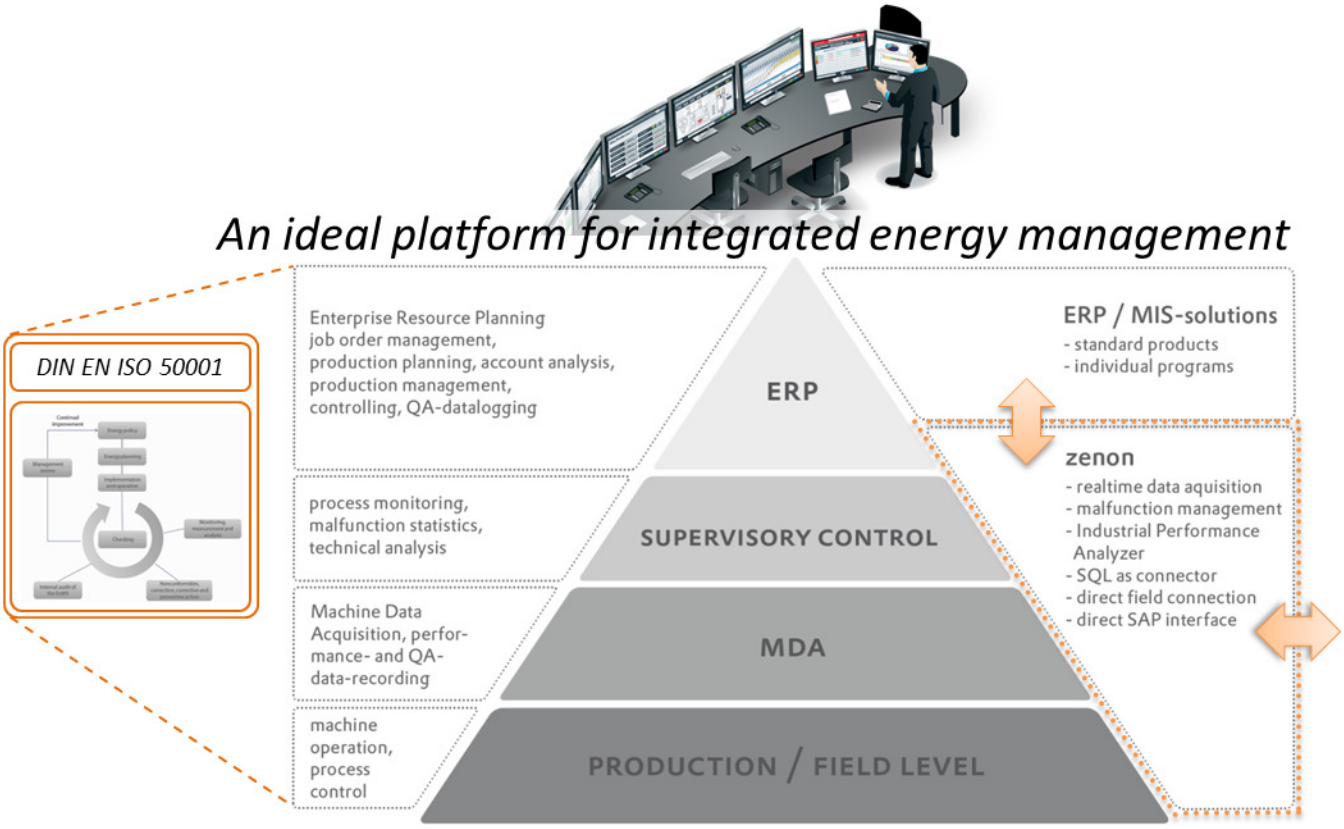
"Meaningful visualization of relevant information in zenon"

The prosperity and enhancement of the energy management initiative shall not be disrupted by any unforeseen **requirements to operational or strategic business**, i.e. in case of modernizations or new technology acquisition or in case of a desired integration of several decentralized facilities.

The following section illustrates how zenon adheres to these requirements in a comprehensive manner, providing substantial and well-conceived functionalities for professional corporate energy management.

4 Successful Implementation with zenon

The zenon Product Family is perfectly suited to drive corporate energy management for a variety of reasons. A consistent set of functionalities for data management and visualization in industrial and automation environments arises from COPA-DATA's substantial experience with practical challenges and respective requirements, as well as a visionary anticipation of future needs in production operations and industrial management. A highly flexible product architecture which ideally fits into a modern corporate IT and automation environment and comprehensively meets organizational as well as individual needs, is represented by the zenon Product Family.



"zenon reaches from field to ERP level"

As illustrated in the above scheme, zenon ranges over several layers of the industrial information and automation landscape. Hence, zenon integrates respective tasks and functionalities into a homogeneous platform. The support of over 300 communication protocols for both, well defined IT communication standards as well as proprietary automation systems (i.e. energy counters, PLCs, sensors, actuators etc.) allows for a **barrier-free integration of all relevant entities**.

Subsequently, the most striking functionalities of zenon for fulfilling the given tasks of the ISO 50001 process will be illustrated. This time we will start from the implementation step in the International Standard, proceeding in a chronological order. As some functionalities of zenon will most definitely be utilized in different respects, the explanation will just give an exemplary overview.

"Implementation and Operation"

What the International Standard requires:

"The organization shall use the action plans and other outputs from the planning process for implementation and operation" (ISO 50001:2011, p. 13). The securing of sufficient ***competence****,* ***training*** *and* ***awareness*** *about energy related topics of involved persons has to be ensured by the organization. Furthermore, involved persons shall understand their* ***specific roles****,* ***responsibilities*** *and* ***authorities*** *in the context of the energy management initiative. The benefits of energy management in general, as well as their* ***individual contributions shall be clearly visible*** *to involved persons.*

Among other managerial documents, relevant recordings and reports have to be consistently managed and stored (identification, versioning, traceability). During ***operation and maintenance*** *respective facilities (processes, systems, and equipment) shall be managed under* ***defined conditions****. This shall be ensured by respective* ***monitoring and messaging mechanisms****. Finally, design of new facilities and procurement of energy services, products, equipment and energy shall be supported by past* ***energy performance observations****.*

How zenon supports the fulfillment of these requirements:

- zenon offers advanced ergonomic features. Hence, visualizations and interfaces can be created in a flexible way, taking specific user preferences into account. A meaningful illustration of processes and values helps to avoid mistakes and lowers necessary training efforts and related costs.

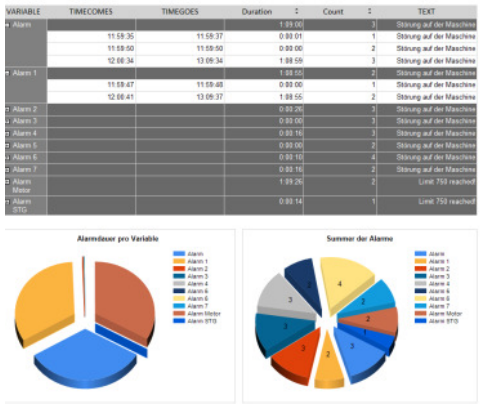
"Meaningful illustration and control elements for reliable system interaction"

A variety of visual elements help the user to picture relevant activities at a glance, avoiding confusion or misinterpretation. Features include touch or multi-touch operation, process animation or the zenon "World View" option for visualization of extra-large objects, facilities or maps. Of course zenon supports flexible language switching.

- User administration is a build within the zenon functionality. Various user levels can be flexibly arranged and linked to specific permissions. This allows for a secure and controlled operation. Furthermore, the user administration within zenon can be based on Active Directory and thus be seamlessly integrated into existing IT-infrastructures.

"Individual displays and access rights for all users "

- The creation of reports is another striking functionality of zenon, allowing for meaningful evaluations on the basis of the entire data volume being available in a facility. The seamless integration of process data from any data source for reporting on a corporate management level is one of the most striking functionalities of zenon. Process data can be comprehensively archived (Microsoft SQL Server 2012) in defined cycles. The historic data can be used along with actual process values for evaluations. This allows for instant benchmarking based on real-time and historical data.

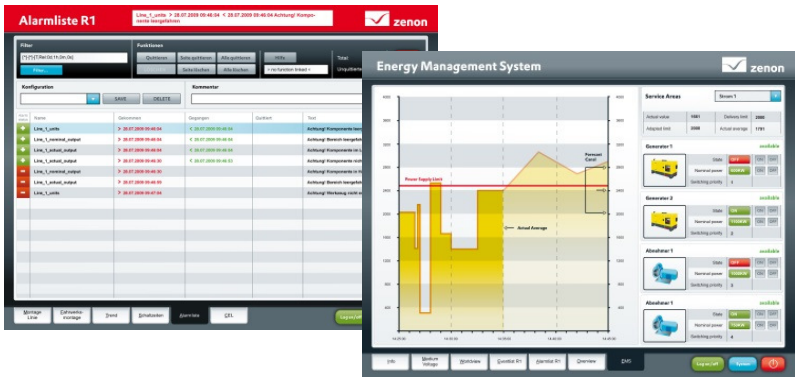


"User definable reports for analysis of trends and developments"

Respective documents can be either displayed immediately (client terminal, HMI or Web-client), sent to involved persons via E-Mail for further investigation or can be archived. Reports can be exported to well-known office application standards. Moreover, zenon can interact with established document management systems in order to store and archive important documents.

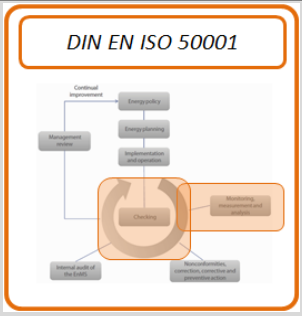
A link to ERP level allows the providing of KPIs or statistics to existent management dashboards. Respective values can be freely defined and calculated by zenon on the basis of the available process values.

- Online monitoring of process values and respective alarming and messaging (instant messages, SMS, E-Mail) is a built-in function within zenon. Every person involved in the Energy Management initiative can be informed about important developments and incidents in real time.



"Versatile monitoring, alarming and messaging functions of zenon"

“Monitoring, Measurement and Analysis”



What the International Standard requires:

This section of the ISO 50001 Standard relates mostly to ***the technical requirements to measuring, monitoring and analyzing relevant energy uses****. Relevant variables must be recorded (sampled) at planned intervals and compared to planned energy performance and performance objectives. Although this part of the energy management definition is one of the most specific ones, it shall be assumed that it is also one of the most demanding ones.*

Typically, a ***variety of different automation systems and measurement equipment*** *as well as* ***other IT-systems*** *are relevant for energy monitoring.* Manual data input will most likely be necessary in order to complement the information base. A respective energy management platform shall allow for a **seamless integration of all relevant inputs**. Furthermore, current standings as well as statistics have to be made available to the relevant people or archived for later investigations and audits.

How zenon supports the fulfillment of these requirements:

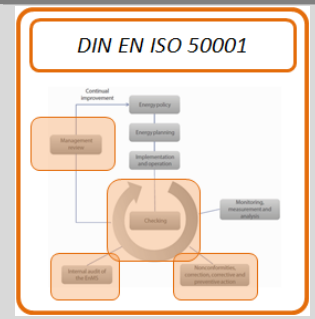
- zenon comes with more than 300 protocols of proprietary and standard industrial networks and field-busses. Hence, without any further development effort zenon can be hooked up to a variety of industrial control systems, sensors and actuators. Through the support of proprietary communication protocols, zenon can be integrated in a “non-intrusive” manner. Solely reading from existing installations means that the existing automation environment and control programs don´t have to be adapted. This allows for fast implementation and an immediate indication on the validity of improvement steps taken. Moreover development, debugging and commissioning costs can be reduced drastically.

- Values can be visualized and monitored in flexible ways. zenon Logic offers possibilities to define control and monitoring programs in IEC 61131-3. Each event of data alteration or received commands from other stations or simply time based events can be used to trigger respective actions. Automatic alarming is integrated into zenon as well as the possibility of logging each user interaction. Respective lists (alarm lists, event lists etc.) can be filtered as well as exported into universal text based formats (XML) for use in other applications.

- zenon offers a variety of functions for advanced visual design. This allows for a meaningful display of the process status and statistics based on historic and real-time data. With the advanced networking capabilities of zenon, visualization clients can be flexibly arranged within all levels of the facility.

“Seamless integration of process values in combination with powerful control & visualization functions ”

"Internal Audits, Management Reviews and Reaction to Non-Conformities"



What the International Standard states:

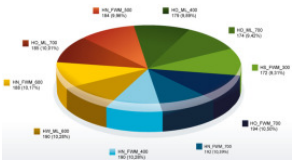
The activities highlighted in the diagram on the left shall be jointly discussed as all of them are largely based on respective energy statistics and reports. ***Internal audits*** *shall be conducted in a cyclic manner to check the ongoing adherence of energy performance objectives and the effective implementation of energy management.* ***Management Reviews*** *shall be conducted to strategically assess the effectiveness of corporate energy management.*

Respective definitions, i.e. the Energy Management Policy or respective action plans as well as ***measures and EnPIs*** *may be adapted or extended during these review processes. All controlling and* ***reviewing activities shall reveal existing non-conformities or potential problems****. Corresponding corrective or preventive action shall be taken.*

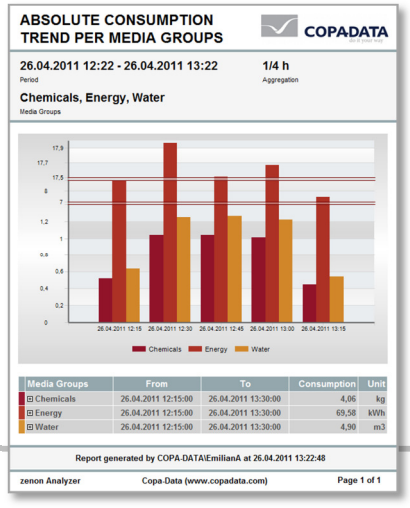
How zenon supports assessment and reviewing activities:

- zenon offers reporting functionality based on the data collected from the processes. Data can be aggregated, statistically analyzed and EnPIs can be compiled. For that purpose, historic data from the MS-SQL-Server 2012 database as well as real-time data directly from the field level can be incorporated. This allows for a fast and precise reaction to upcoming trends and processes. Moreover, the creation of reports can be scheduled on specific dates (i.e. repeated each week or month) or triggered by specific events and automatically archived for later inspection or directly forwarded to inform respective persons.

- zenon supports a data exchange to systems on corporate management levels, i.e. SAP ERP (certified direct connection). A bidirectional information exchange between SAP and zenon builds the foundation for a seamless integration of process level control and strategic production and business management. Process and Energy Management related KPIs can be integrated into a company-wide reporting and benchmarking system. Furthermore, this direct connection to management platforms builds the foundation for the efficient integration of commercial tasks, relating energy and resource consumption with energy prices. Hence, optimization and evaluation takes place on the most actual and reliable information base.



"Generation of reports from both, historical and real time process data"



"Direct SAP/ERP connection"

"Continuous Improvement"

What the International Standard states:

Continuous improvement of energy performance is the ***guiding idea of the ISO 50001****. It is therefore an integral requirement to all energy management related activities. Not only shall the measured energy performance be improved but the whole energy management system shall be continually revised, based on the observations and progress which is being made. It shall be assumed that, amongst other criteria, especially the following aspects play an important role in the process of continual improvement.*

The ***active involvement of persons from different corporate areas*** *will be crucial to the prosperity of the energy management initiative. In addition to communicating the basic energy policy, the targets and objectives of energy management in each area and on each level must be communicated. Hence,* ***professional energy management is a demanding collaborative and communicative process****. Furthermore, a* ***systematic improvement procedure*** *based on consistent findings shall be pursued. This requires a clear structure of managing respective data and transparent means of data evaluation – the simpler the better. Information once attained shall be available for alternative assessments in the future. Furthermore, it is essential to be able to prove evidence of actions taken and to allow for tracking respective evolvements. Finally, the* ***adaptive nature of corporate energy management*** *inherently requires the system to be able to change. Moreover* ***rearrangements or extensions within a company*** *will require the energy management system to grow correspondingly. An information system for corporate energy management must therefore promote this evolution with* ***maximum flexibility without any constraints****.*

How zenon supports continual improvement:

- zenon is a modular system which supports alterations and extensions with great flexibility – technically and economically. Any kinds of control and measurement equipment can be connected to zenon without extensive implementation effort. This is also a great advantage if additional control sequences are required, incorporating actuation in the process.

- The flexible creation and adaptation of energy performance reports and related figures help the Energy Management Team to incorporate new ideas and observations without having to invest time into programming. This perfectly suits the required tasks of reviewing and evaluating the ongoing developments in defined time periods as well as the enhancement of the entire Energy Management System.

- zenon´s development suite is offering highly practicable and universal engineering features based on the principle of "setting parameters instead of programming". Engineering templates such as alarming, monitoring and data-archiving features can be used right from the beginning. Self-made features can be preserved for later usage. Moreover, the zenon Editor comprehensively supports team development scenarios.

- zenon sees to the specific needs of members of the Energy Management Team. Meaningful visualization elements and well-conceived interactive dialogs provide maximum orientation to any person getting in touch with zenon. Furthermore, descriptive illustrations and documents

can be dynamically incorporated in respective views. Due to highly sophisticated networking features, zenon makes visualization, data and reporting available on each level of the facility, dependent on the desired access points and individual authorities.

“Scalable coverage of all relevant facility levels with individualized access and control points”

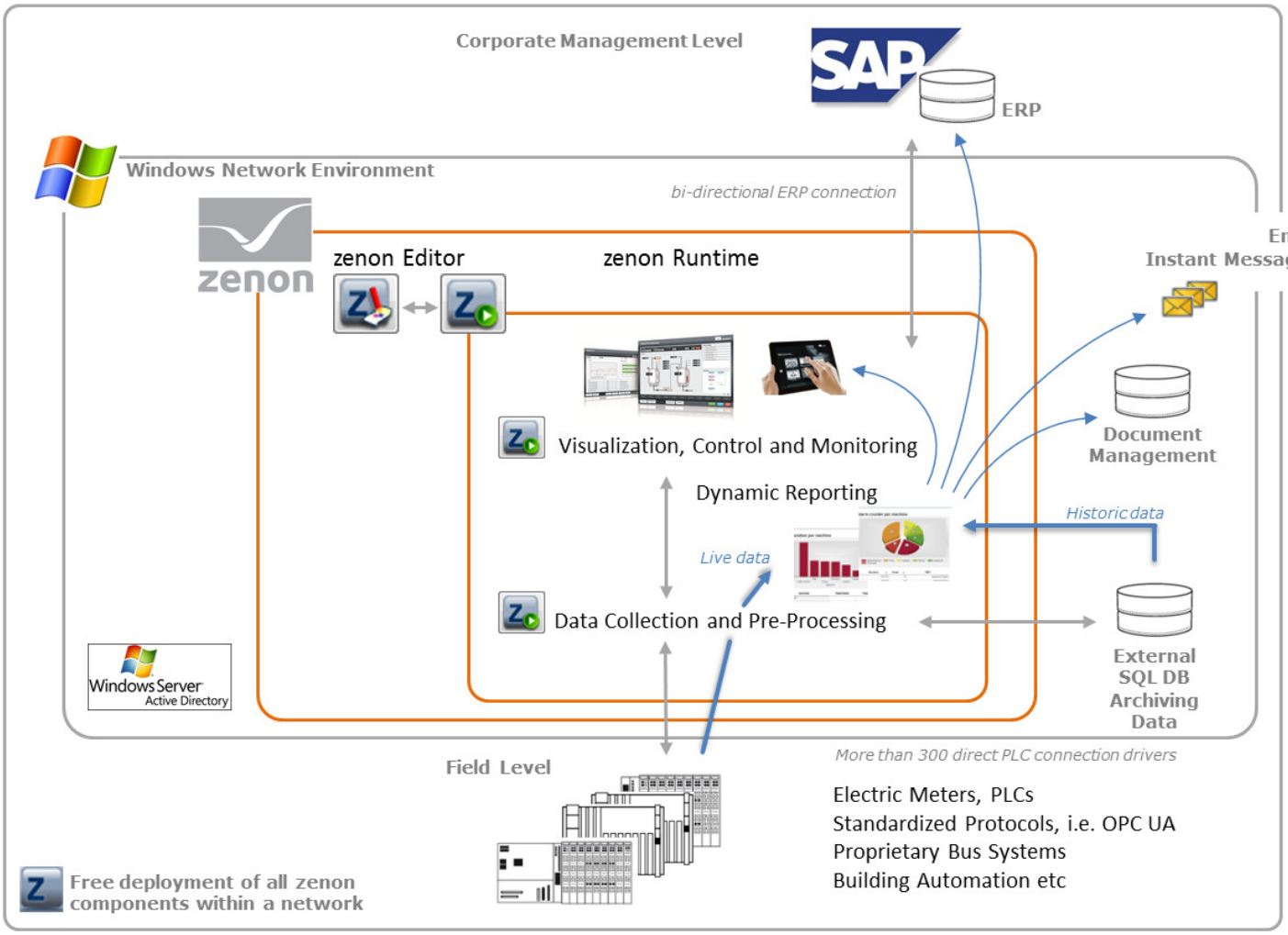
- The cooperation with companies using zenon for corporate energy management results in valuable experience for both, the users and COPA-DATA. Users tend to be very creative in utilizing the potential of zenon in order to create an energy management platform that perfectly suits their specific needs. Hence, corporate energy management initiatives will be very well supported by zenon in the future. Moreover the scalable architecture of zenon allows for a seamless integration of energy management with other production management or automation and visualization tasks.

5 Seamless Integration of zenon

This section will give you some additional insight and should help you to picture how zenon integrates different levels of an industrial IT-Environment.

- ***How does zenon integrate into an existing IT-Environment?***
  zenon is designed to consistently integrate into a network with all current Windows and web-based systems of Windows CE through Windows XP/7/8 Server 2003, 2008 (R2), 2012 including 64-bit versions, to WWW. With the integration of database technology based on Microsoft SQL Server 2012, zenon is equipped with superior possibilities for consistent data logging and ex-post evaluations including historical as well as real-time information.

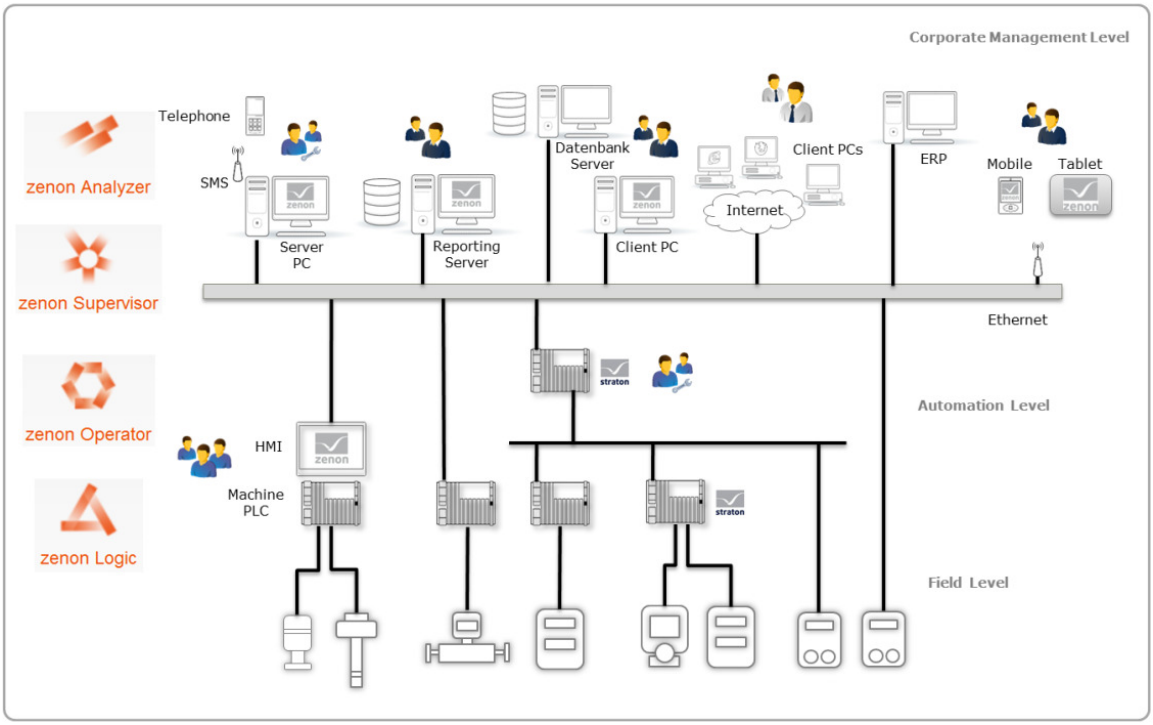
  The following diagram displays briefly, how zenon integrates into the corporate IT-environment, integrating data from various information sources (logical view, data flow):



"How zenon integrates into an existing IT and automation environment"

zenon Editor: The engineering suite of zenon provides a powerful means for the conception and implementation of automation and visualization as well as data handling functions. An intuitive and consistent engineering concept supports the development team in realizing adequate functionalities and future-proof solution architectures. Tasks for different facility areas can be split up into multiple projects within a logical workspace and distributed over a variety of server and client stations – tailored to the respective structure of a facility. Various mechanisms for the reuse of already engineered parts of the software project enable the development team to foster their efficiency. A variety of wizards and templates support the user with the creation of screens and functions. Thus, programming skills are not required for large parts of the development.

zenon Runtime: The runtime environment of zenon represents the operation and execution of the engineered functionalities. Flexible interfaces and ready-made standard and proprietary communication drivers enable the user to hook up to a great number of different control and measurement appliances. Hence, respective variables are instantly available for further use in measurement, monitoring and controlling tasks. Moreover, specific interfaces to office systems as well as supported bi-directional SAP ERP communication allows for integration with managerial applications. For archiving larger amounts of data, the integrated archiving functionalities of zenon in combination with Microsoft SQL Server (2012) can be used in order to store monitoring values in meaningful intervals. Reports are generated and displayed or forwarded to other information systems (E-Mail, document archive, etc.). Information can be retrieved from data archives as well as from field level devices.



"Reporting, Monitoring, Visualizing and Controlling – zenon´s scalable architecture"

The diagram above illustrates the possibilities of distributing zenon based on an exemplary architecture (physical network view). All of zenon´s building blocks can be individually engineered and flexibly “placed” within the IT- environment, according to the desired solution architecture. The zenon Editor supports the user to keep track of specific settings and system topologies. Hence, the system architecture can be tailored according to the existing infrastructure. zenon´s modular and scalable architecture allows for starting an implementation with the most beneficial item. Step by step advancements can be realized without running into any limitations. This allows for a comprehensive integration of data collection and control mechanisms in both, horizontally – across the borders of different corporate areas and different proprietary systems – and vertically, from corporate management to field level.

Moreover, built in redundancy features can be utilized in order to ensure consistent and lossless data collection. Just define a backup server which seamlessly takes over control, if the primary system quits operation due to any unforeseen reasons (power outages, hardware defects etc.).

- See also: Fact Sheets “Ergonomics in the zenon network”

- ***How can I become familiar with zenon and respective functionalities of zenon?***
  zenon provides a large variety of functionalities for both, ergonomic engineering with the zenon Editor as well as ergonomic and intuitive design of human-machine-interfaces and SCADA applications for use in daily facility management (supervision) and operation (plant floor level). To explain all relevant features for Energy Management would go far beyond the scope of this document. However, most up-to-date information is provided on the COPA-DATA website and in respective fact sheets and white papers.

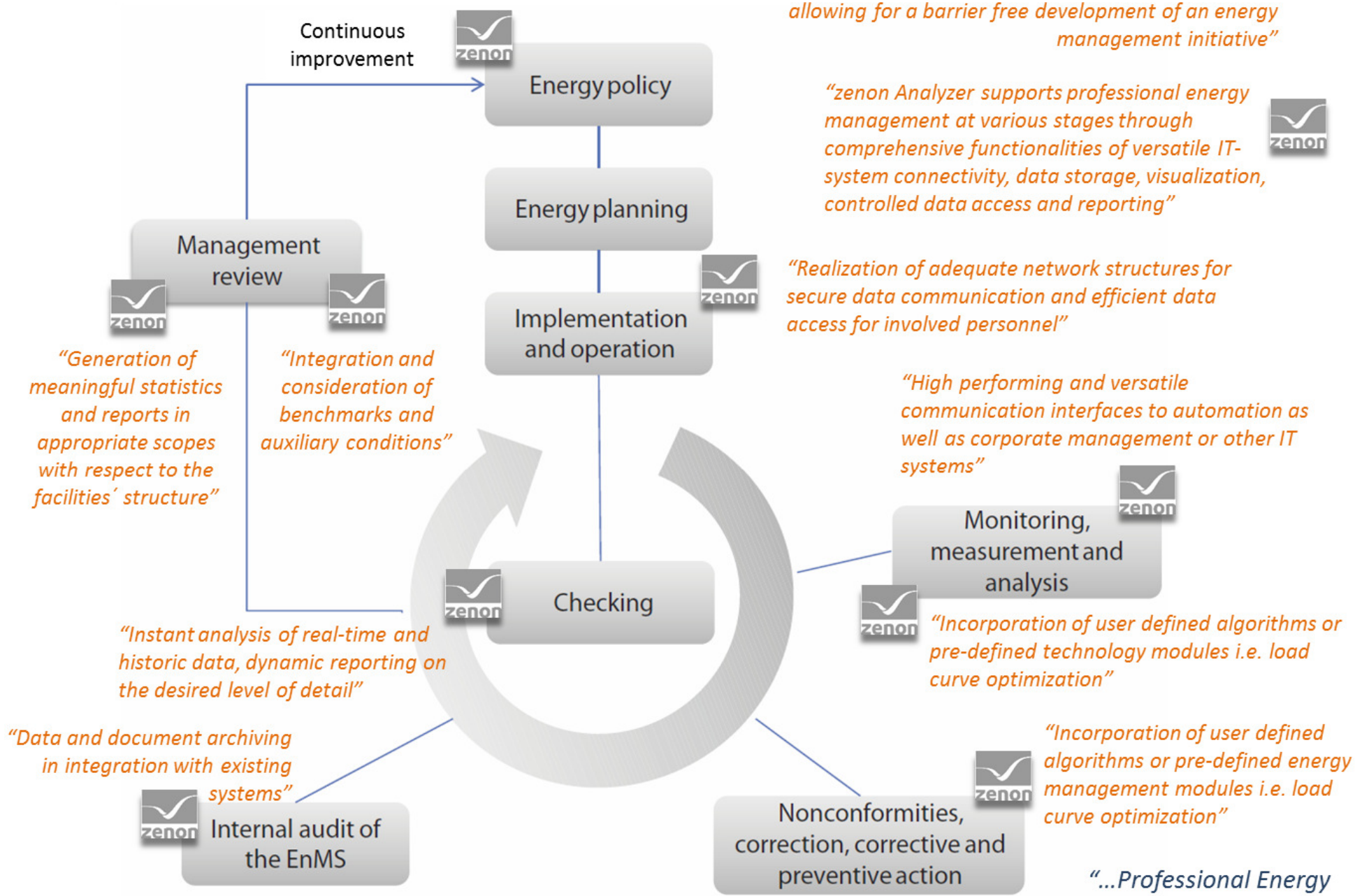
  - See also: Fact Sheets “Ergonomics in engineering”, “Ergonomics for the user”

  Standard as well as industry- and technology specific training courses are provided by COPA-DATA. For up-to-data schedules please consult http://www.copadata.com/en/support/training/training.html;

Please don´t hesitate to send your requests to the COPA-DATA sales and support team or tell us about your experiences with Energy Management and zenon:

Contact Email: sales@copadata.com; support@copadata.com;

"DIN EN ISO 50001 …"



"zenon ideally supports a flexible alteration and extension on energy management, allowing for a barrier free development of an energy management initiative"

"zenon Analyzer supports professional energy management at various stages through comprehensive functionalities of versatile IT-system connectivity, data storage, visualization, controlled data access and reporting"

"Realization of adequate network structures for secure data communication and efficient data access for involved personnel"

"High performing and versatile communication interfaces to automation as well as corporate management or other IT systems"

"Incorporation of user defined algorithms or pre-defined technology modules i.e. load curve optimization"

"Incorporation of user defined algorithms or pre-defined energy management modules i.e. load curve optimization"

"Generation of meaningful statistics and reports in appropriate scopes with respect to the facilities´ structure"

"Integration and consideration of benchmarks and auxiliary conditions"

"Instant analysis of real-time and historic data, dynamic reporting on the desired level of detail"

"Data and document archiving in integration with existing systems"

"…Professional Energy Management."

Some space for your notes: