



**Asia-Pacific
Economic Cooperation**

2014/SCSC/WKSP6/002

Training Material

Submitted by: Japan



**Multilateral Recognition Arrangement Readiness in
ISO 50001: Workshop for Accreditation Body and
Its On-site Assessment
Jakarta, Indonesia
16-19 September 2014**




Asia-Pacific
Economic Cooperation

Asia-Pacific
Economic Cooperation
APEC
Pusat Tenaga Kerja Asia Pasifik
Pusat Tenaga Kerja

APEC Project MLA Readiness Project in ISO50001 4 - DAY WORKSHOP TRAINING FOR ACCREDITATION BODY AND ASSESSORS

Jakarta, Indonesia
16-19 September 2014






Asia-Pacific
Economic Cooperation

Introduction to ISO 50001

16 September 2014 Workshop 3
Day 1 Session 1
9:00 am to 10:00 am

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Asia-Pacific
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ISO 50001:2011

ISO 50001 - Energy management

- Using energy efficiently helps organizations save money as well as helping to conserve resources and tackle climate change. ISO 50001 supports organizations in all sectors to use energy more efficiently, through the development of an energy management system (EnMS).
- ISO 50001 is based on the management system model of continual improvement also used for other well-known standards such as ISO 9001 or ISO 14001. This makes it easier for organizations to integrate energy management into their overall efforts to improve quality and environmental management.

{ 3 }



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ISO 50001:2011

ISO 50001:2011 provides a framework of requirements for organizations to:

- Develop a policy for more efficient use of energy
- Fix targets and objectives to meet the policy
- Use data to better understand and make decisions about energy use
- Measure the results
- Review how well the policy works, and
- Continually improve energy management.

{ 4 }

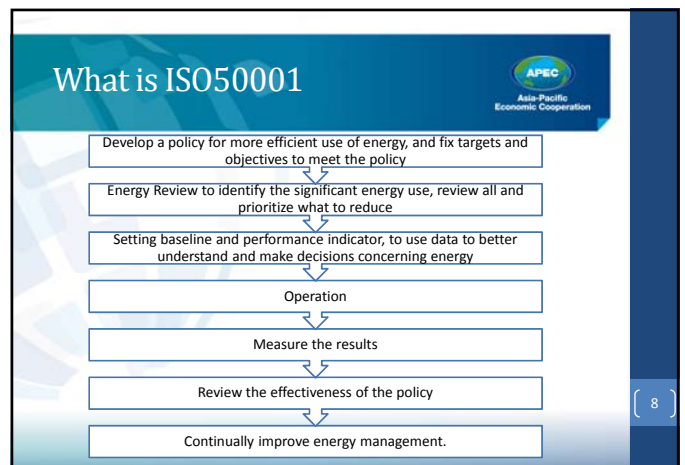


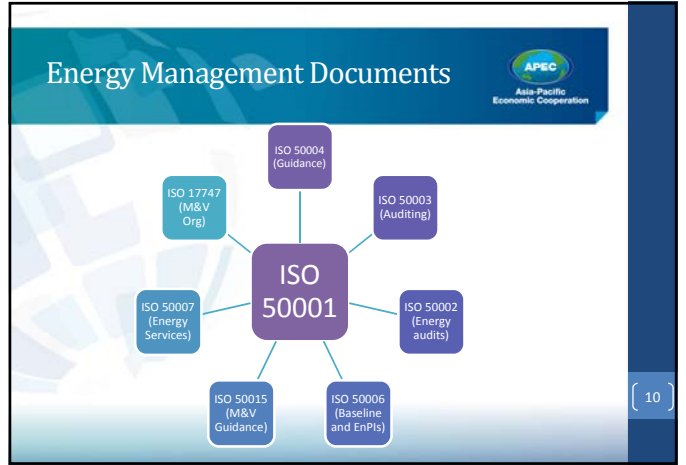
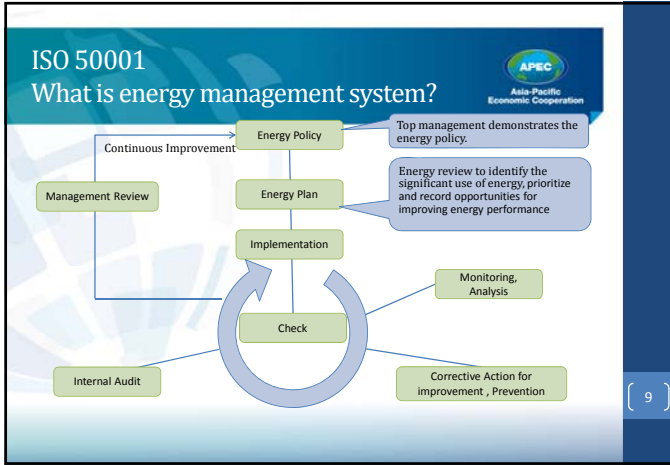
Global Certifications By Country

| Country | Number of ISO 50001 certified sites |
|--------------------|-------------------------------------|
| Germany | 3441 |
| France | 973 |
| Netherlands | 408 |
| UK | 355 |
| Italy | 245 |
| Spain | 227 |
| Sweden | 224 |
| India | 161 |
| Korea | 123 |
| Turkey | 120 |
| Taiwan | 119 |
| Austria | 99 |
| Ireland | 93 |
| Russian Federation | 65 |
| Denmark | 64 |

7345 Worldwide

- ### Examples of National Programs
- China, The Twelfth Five-Year Plan for National Economic and Social Development of the People's Republic of China (2011-2015) Certification of energy management, GB/T 23331 has required by the 10,000 energy saving program.
 - US, SEP Program (Superior Energy Performance Program) supported by US DOE. SEP Program requests participants to set performance target for energy intensity: 5%, 10%, 15% to ensure the energy performance improvement through regression.
 - Europe, revised energy efficiency directive to encourage energy manager and energy management to reduce energy consumption, the energy management can be demonstrated by environmental management

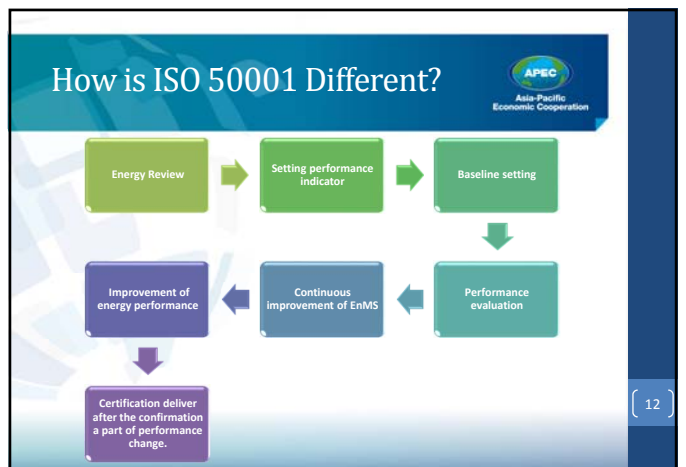





Evaluation of energy savings documents

| Framework | Regions | Projects | M&V Organizations | M&V Guidance |
|-----------|-----------|-----------|-------------------|-------------------------|
| ISO 17743 | ISO 17742 | ISO 17741 | ISO 17747 | ISO 50015 |
| Guidance | Guidance | Guidance | Methods | Guidance and Principles |

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Benefits of EnMS




Organization will be able to

- nominate policy for energy and business continuity, and set policy and fix target covering performance and continuous improvement
- reduce energy use**, additional effect to **reduce CO₂**

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Benefits of EnMS



Contribution to the business impact

- ✓ **Reduce energy cost** and improve earnings
- ✓ Develop **proactive investment plan**
 - ✓ in related with energy management and its fix cost, to introduce the energy conservative equipment
- ✓ **Aware the potential new business** in related to energy saving.
- ✓ **Reduce energy use and risk** against potential incident across supply chain


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ISO 50001: Energy Management System - EnMS

ISO 50001 on energy management systems was published in June 15, 2011. The standard could have a positive impact on some 60 % of the world's energy use to assist organizations in making better use of their existing energy-consuming assets. ISO 50001 assists facilities in evaluating and prioritizing the implementation of new energy-efficient technologies.

| | | |
|--|---|--|
| <p style="text-align: center;"><u>Challenging Issue</u></p> <p>ISO 50001 will provide organizations with management strategies to increase energy efficiency, reduce costs and improve energy performance.</p> | ➔ | <p style="text-align: center;"><u>Benefit for certification</u></p> <ul style="list-style-type: none"> • Reduce energy cost • Facilitate energy management improvements for greenhouse gas emission reduction • Support CSR activities • Promote energy management best practices and reinforce good energy management behaviors |
|--|---|--|

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Requirements of ISO 50001- Part 1


16 September 2014 Workshop 2
Day 1 Session 1
9:00am – 10:00 am

16

Generating a foundation



- Terminology is a critical factor in understanding
- Terminology makes sure everyone is talking about the same thing
- Terminology can provide requirements



(17)

3.5 energy

electricity, fuels, steam, heat, compressed air, and other like media

NOTE 1 For the purposes of this International Standard, energy refers to the various forms of energy, including renewable, which can be purchased, stored, treated, used in equipment or in a process, or recovered.

NOTE 2 Energy can be defined as the capacity of a system to produce external activity or perform work.

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3.6 energy baseline

quantitative reference(s) providing a basis for comparison of energy performance

NOTE 1 An energy baseline reflects a specified period of time.

NOTE 2 An energy baseline can be normalized using variables which affect energy use and/or consumption, e.g. production level, degree days (outdoor temperature), etc.

NOTE 3 The energy baseline is also used for calculation of energy savings, as a reference before and after implementation of energy performance improvement actions.

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3.7 energy consumption

3.8 energy efficiency

3.7 energy consumption
quantity of energy applied

3.8 energy efficiency
ratio or other quantitative relationship between an output of performance, service, goods or energy, and an input of energy

EXAMPLE Conversion efficiency; energy required/energy used; output/input; theoretical energy used to operate/energy used to operate.

NOTE Both input and output need to be clearly specified in quantity and quality, and be measurable.

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3.9 energy management system EnMS

3.9

energy management system EnMS

set of interrelated or interacting elements to establish an energy policy and energy objectives, and processes and procedures to achieve those objectives

3.10

energy management team

person(s) responsible for effective implementation of the energy management system activities and for delivering energy performance improvements

NOTE The size and nature of the organization, and available resources, will determine the size of the team. The team may be one person, such as the management representative.

3.11

energy objective

specified outcome or achievement set to meet the organization's energy policy related to improved energy performance

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3.12 energy performance 3.13 energy performance indicator EnPI

3.12

energy performance

measurable results related to **energy efficiency** (3.8), **energy use** (3.18) and **energy consumption** (3.7)

NOTE 1 In the context of energy management systems, results can be measured against the organization's energy policy, objectives, targets and other energy performance requirements.

NOTE 2 Energy performance is one component of the performance of the energy management system.

3.13

energy performance indicator EnPI

quantitative value or measure of energy performance, as defined by the organization

NOTE EnPIs could be expressed as a simple metric, ratio or a more complex model.

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3.15 energy review 3.16 energy services

3.15

energy review

determination of the organization's energy performance based on data and other information, leading to identification of opportunities for improvement

NOTE In other regional or national standards, concepts such as identification and review of energy aspects or energy profile are included in the concept of energy review.

3.16

energy services

activities and their results related to the provision and/or use of energy

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3.17 energy target 3.18 energy use

3.17

energy target

detailed and quantifiable energy performance requirement, applicable to the organization or parts thereof, that arises from the energy objective and that needs to be set and met in order to achieve this objective

3.18

energy use

manner or kind of application of energy

EXAMPLE Ventilation; lighting; heating; cooling; transportation; processes; production lines.

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3.27 significant energy use

3.27

significant energy use

energy use accounting for substantial energy consumption and/or offering considerable potential for energy performance improvement

NOTE Significance criteria are determined by the organization.

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4 Energy management system requirements

4.1 General requirements

The organization shall:

- a) establish, document, implement, maintain and improve an EnMS in accordance with the requirements of this International Standard;
- b) define and document the scope and boundaries of its EnMS;
- c) determine how it will meet the requirements of this International Standard in order to achieve continual improvement of its energy performance and of its EnMS.

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4.2 Management responsibility

4.2.1 Top management

Top management shall **demonstrate its commitment to support the EnMS and to continually improve its effectiveness** by:

- a) defining, establishing, implementing and maintaining an **energy policy**;
- b) **appointing a management representative and approving the formation of an energy management team**;
- c) **providing the resources** needed to establish, implement, maintain and improve the EnMS and the resulting energy performance;

NOTE Resources include human resources, specialized skills, technology and financial resources.

- d) **identifying the scope and boundaries** to be addressed by the EnMS;
- e) **communicating the importance of energy management** to those in the organization;
- f) ensuring that **energy objectives and targets** are established;
- g) **ensuring that EnPIs** are appropriate to the organization;
- h) **considering energy performance** in long-term planning;
- i) **ensuring that results** are measured and reported at determined intervals;
- j) **conducting management reviews**.

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4.2.2 Management representative

Top management shall **appoint a management representative(s) with appropriate skills and competence**, who, irrespective of other responsibilities, has the responsibility and authority to:

- a) **ensure the EnMS is established, implemented, maintained**, and continually improved in accordance with this International Standard;
- b) **identify person(s), authorized by an appropriate level of management**, to work with the management representative in support of energy management activities;
- c) **report to top management on energy performance**;
- d) **report to top management on the performance** of the EnMS;
- e) **ensure that the planning of energy management activities** is designed to support the organization's energy policy;
- f) **define and communicate responsibilities and authorities** in order to facilitate effective energy management;
- g) **determine criteria and methods** needed to ensure that both the operation and control of the EnMS are effective;
- h) **promote awareness of the energy policy and objectives** at all levels of the organization.

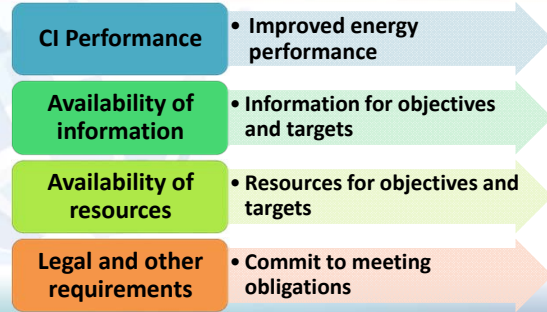
28

4.3 Energy policy

The energy policy shall state the organization's commitment to achieving energy performance improvement. Top management shall define the energy policy and ensure that it:

- a) is appropriate to the nature and scale of the organization's energy use and consumption;
- b) includes a commitment to continual improvement in energy performance;
- c) includes a commitment to ensure the availability of information and of necessary resources to achieve objectives and targets;
- d) includes a commitment to comply with applicable legal requirements and other requirements to which the organization subscribes related to its energy use, consumption and efficiency;
- e) provides the framework for setting and reviewing energy objectives and targets;
- f) supports the purchase of energy-efficient products and services, and design for energy performance improvement;
- g) is documented and communicated at all levels within the organization;
- h) is regularly reviewed, and updated as necessary.

Review of an Energy Policy



Connections



ISO FDIS 50004 energy policy

Annex A (informative) Examples of energy policy

Example 1

As an energy intense manufacturer of specialty glass, the company strives to improve energy efficiency and reduce energy consumption costs and promote the long-term environmental and economic sustainability of its operations.

- reducing energy use per unit of production in our manufacturing operations through the establishment of objectives and targets;
- ensuring continual improvement in our energy performance;
- deploying resources and leveraging information to achieve our objectives and targets;
- upholding legal and other requirements regarding energy use, efficiency and consumption;
- considering energy performance improvements in design and modification of our facilities, equipment, systems and processes;
- effectively procuring and using energy-efficient products, and services.

ISO FDIS 50004 energy policy

Annex A (informative) Examples of energy policy

Example 2. (Continued on next slide)

- This policy applies to all ABC operations.
- The objectives of this policy are to continually improve energy performance, reduce cost, optimize capital investments for energy efficiency, reduce environmental and greenhouse gas emissions, and conserve natural resources.
- ABC will promote the efficient use of energy to produce and deliver products and services to its customers.
- The following steps should be pursued to support this policy:
 - Establish and implement an effective EnMS worldwide that supports manufacturing capabilities while providing a safe and comfortable work environment with the information and resources needed to set and achieve appropriate energy objectives and targets.
 - Emphasize energy performance as a factor in procurement decisions, product development and in process and facility design.

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ISO FDIS 50004 energy policy

Annex A (informative) Examples of energy policy

Example 2.(Continued)

- Secure adequate and reliable energy supplies at the most advantageous rates and implement contingency plans to protect operations from energy supply interruptions.
- Encourage continuous energy performance by employees in their work and personal activities.
- Drive further development of internal and external energy efficient and innovative technologies.
- Support governmental agencies, utility companies and other organisations on energy programs and comply with all legal and regulatory requirements relating to energy use, consumption and efficiency.
- Report progress toward ABC's energy objectives and targets to executive management on a quarterly basis

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Exercise 1: Energy Policy

REDUCE

- Reduce energy use per unit of production by 15% in 5 years in our manufacturing operations
- Ensure continual improvement in our energy performance
- Deploy information and resources to achieve our objectives and targets
- Uphold legal and other requirements regarding energy
- Consider energy performance improvements of our organization
- Effectively procure and utilize energy-efficient products and services

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Exercise 1 11:30 to 12:00

– How would you rate the policy on ?

- Commitment to Continual improvement
- Commitment to information and resources
- Commitment to legal and other



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Energy Policy Discussion



- In your teams review the energy review provided and prepare comments on strengths and weaknesses

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Requirements of ISO 50001- Part 2

16 September 2014 Workshop 3
Day 1 Session 2
10:15pm – 12:00 pm

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Planning process



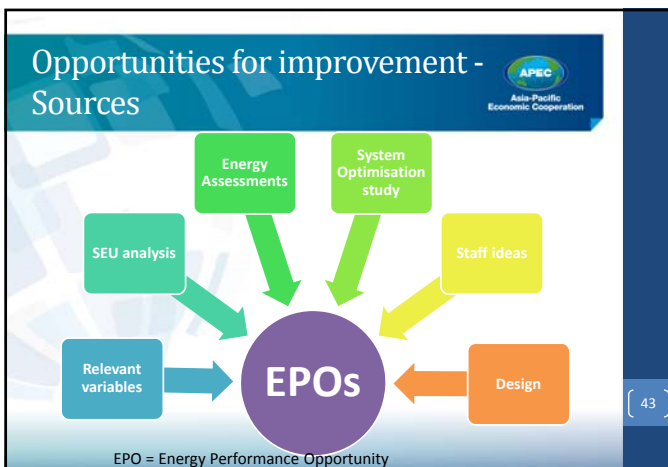
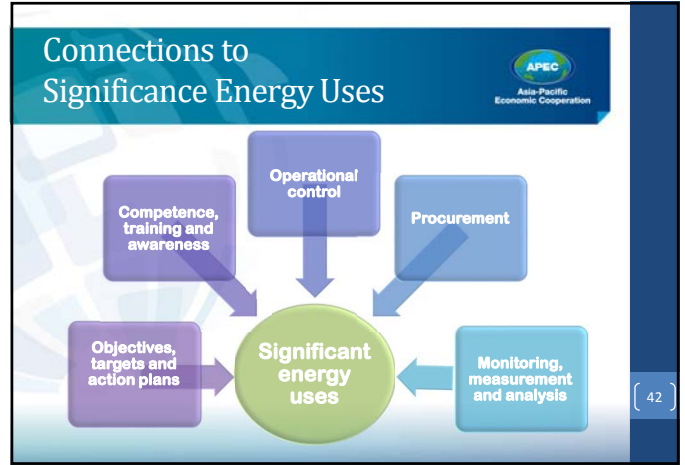
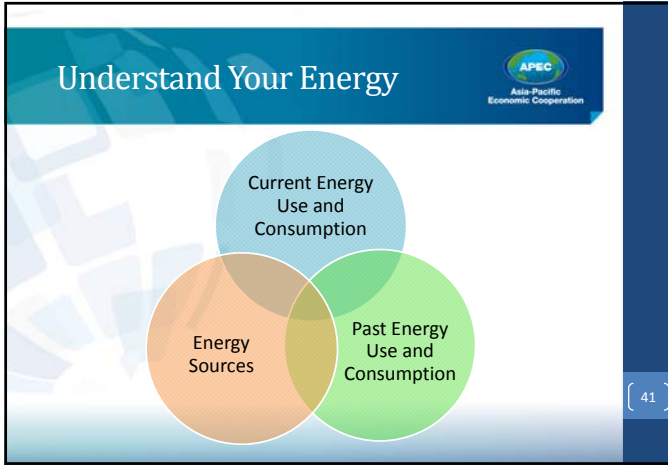
- Step 1 • Legal and Other Requirements
- Step 2 • Energy Review
- Step 3 • Baseline
- Step 4 • EnPIs
- Step 5 • Objectives, Targets, Action plans
- Step 6 • Review and update

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Legal and Other Requirements



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A.4.3 Energy review

The process of identification and evaluation of energy use should lead the organization to define areas of significant energy use and identify opportunities for improving energy performance.

Examples of personnel working on behalf of the organization include service contractors, part-time personnel and temporary staff.


Potential sources of energy can include conventional sources that have not been previously used by an organization. Alternative energy sources can include fossil or non-fossil fuels.

Updating the energy review means updating the information related to the analysis, determination of significance and determination of improving energy performance opportunities.

An energy audit or assessment comprises a detailed review of the energy performance of an organization, of a process, or both. It is typically based on appropriate measurement and observation of actual energy performance. Audit outputs typically include information on current consumption and performance, and they can be accompanied by a series of ranked recommendations for improvement in terms of energy performance.

Energy audits are planned and conducted as part of the identification and prioritization of opportunities to improve energy performance.


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Requirements of ISO 50001- Part 3

16 September 2014 Workshop 3
 Day 1 Session 2
 10:15-12:00

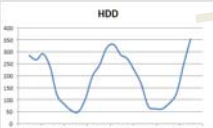
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 Asia-Pacific Economic Cooperation

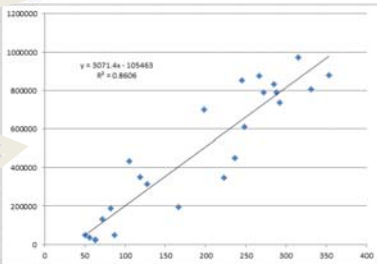
Baseline Information



Consumption(kWh)



HDD

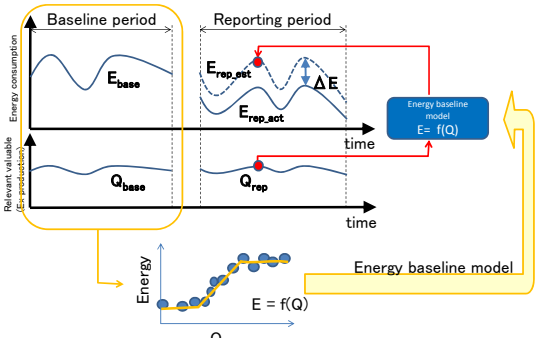


$y = 3071.4x - 105463$
 $R^2 = 0.8806$


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- Estimated energy consumption $E_{rep_est} = f(Q_{rep})$
- Energy savings $\Delta E = E_{rep_est} - E_{rep_act}$

Estimated *Actual*



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Establishing an EnB

1. Determine the specific purpose and corresponding EnPIs for which the EnB will be used;
2. Determine a suitable data period;
3. Data collection;
4. Calculate and test the EnB.


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Source: ISO 50006

EnPIs




- Energy performance indicators and their corresponding energy baselines are metrics that are defined by the organization to measure energy performance. An EnPI can be at a facility, system, process or equipment level and should have an appropriate baseline at the same level for comparative purposes.



Source: ISO 50004

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EnPIs




- The main types of EnPIs are:
 - measured energy value (in total or broken down by energy use);
 - ratio derived from measured values, such as energy efficiency;
 - statistical model: linear and non-linear regressions;
 - engineering based model: simulation.

Source: ISO 50006

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Calculating improvement



- The following approaches are common.
- EnPI difference:** This is the difference between the baseline period EnPI value and the reporting period EnPI values. This could be illustrated in the following equation, where the baseline EnPI value is "B", the reporting value is "R":

$$\text{Difference} = R - B$$
- Percent change:** This is the change in values from the baseline period to the reporting period, expressed as a percentage of the EnB value. This could be illustrated in the following equation.

$$\text{Percent Change} = [(R - B) / B] \times 100$$
- Current ratio:** This is a ratio of the reporting period value divided by the baseline period value.

$$\text{Current Ratio} = (R/B)$$

Source: ISO 50006

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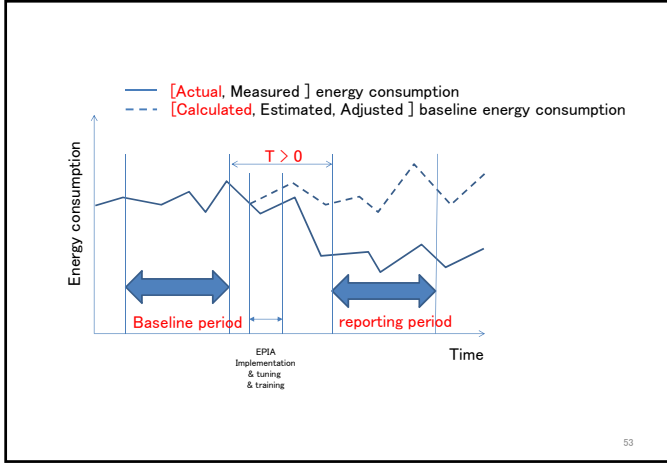
ISO CD3 50006

Energy performance indicator

EnPI= Elements of Energy Performance Indicator

- Energy consumption ex; GJ, kWh
- Energy efficiency
- Specific Energy Ratio (SER) ex; GJ/t, kWh/unit
- Energy Intensity (EI) ex; GJ/ US\$, GJ/t
- Energy (conversion) efficiency ex; %
- Peak power ex; kW

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3.8 energy efficiency
 ratio or other quantitative relationship between an output of performance, service, goods or energy, and an input of energy
 EXAMPLE Conversion efficiency: energy required/energy used: output/input; theoretical energy used to operate/energy used to operate.
 NOTE Both input and output need to be clearly specified in quantity and quality, and be measurable.

| | Name | Key word | Useful for | Calculation | Model |
|-----|-------------------------|--------------------------------|---|--|-------|
| EE | Energy Efficiency | Ratio Between Output and input | Energy conversion efficiency | $\frac{\text{Output Energy}}{\text{Input Energy}}$ | |
| SER | Specific Energy Ratio * | Ratio of Output to input | Index for any organization, equipment | $\frac{\text{Input Energy}}{\text{Output (any)}}$ | |
| EI | Energy Intensity | Ratio of Output to input | Total index for the general manufacturer, regional government | $\frac{\text{Input Energy}}{\text{Output (monetary)}}$ | |

* Specific Energy consumption (SEC) is same concept
 ** narrow definition

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Requirements of ISO 50001- Part 4

16 September 2014 Workshop 3
 Day 1 Session 3
 1:00pm-2:30pm

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Considerations For Setting Objectives

- Legal and Other requirements**
 - Legal registry
 - Corporate Agreements etc.
- Significant energy uses**
 - Consumption
 - Opportunity for improvement
- Opportunities for improvement**
 - Energy review
 - Energy assessments
- Operational and business**
 - Financial
 - Technical
 - Views of interested parties

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4.4.6 Energy objectives, energy targets and energy management action plans

The organization shall establish, implement and maintain documented energy objectives and targets at the relevant functions, levels, processes or facilities within the organization. Time frames shall be established for achievement of the objectives and targets. The objectives and targets shall be consistent with the energy policy. Targets shall be consistent with the objectives.

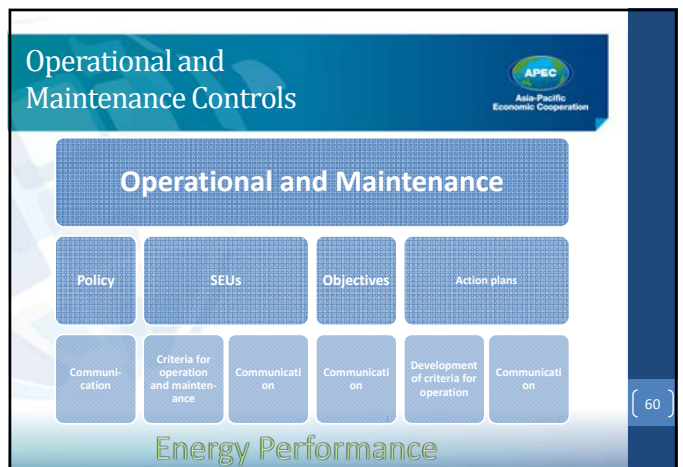
When establishing and reviewing objectives and targets, the organization shall take into account legal requirements and other requirements, significant energy uses and opportunities to improve energy performance, as identified in the energy review. It shall also consider its financial, operational and business conditions, technological options and the views of interested parties.

The organization shall establish, implement and maintain action plans for achieving its objectives and targets.

The action plans shall include:

- designation of responsibility;
- the means and time frame by which individual targets are to be achieved;
- a statement of the method by which an improvement in energy performance shall be verified;
- a statement of the method of verifying the results.

The action plans shall be documented, and updated at defined intervals.



4.5 Implementation and operation

4.5.1 General

The organization shall use the action plans and other outputs resulting from the planning process for implementation and operation.

4.5.2 Competence, training and awareness

The organization shall ensure that any person(s) working for or on its behalf, related to significant energy uses, are competent on the basis of appropriate education, training, skills or experience. The organization shall identify training needs associated with the control of its significant energy uses and the operation of its EnMS.

The organization shall provide training or take other actions to meet these needs.

Appropriate records shall be maintained.

The organization shall ensure that any person(s) working for or on its behalf are aware of:

- a) the importance of conformity with the energy policy, procedures and the requirements of the EnMS;
- b) their roles, responsibilities and authorities in achieving the requirements of the EnMS;
- c) the benefits of improved energy performance;
- d) the impact, actual or potential, with respect to energy use and consumption, of their activities and how their activities and behaviour contribute to the achievement of energy objectives and targets, and the potential consequences of departure from specified procedures.

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4.5.3 Communication

The organization shall **communicate internally with regard to its energy performance and EnMS**, as appropriate to the size of the organization.

The organization shall **establish and implement a process by which any person working for**, or on behalf of, the organization can make comments or suggest improvements to the EnMS.

The organization shall decide whether to communicate externally about its energy policy, EnMS and energy performance, and shall document its decision. If the decision is to communicate externally, the organization shall establish and implement a method for this external communication.

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4.5.4 Documentation

4.5.4.1 Documentation requirements

The organization shall establish, implement and maintain information, in paper, electronic or any other medium, to describe the core elements of the EnMS and their interaction.

The EnMS documentation shall include:

- a) the scope and boundaries of the EnMS;
- b) the energy policy;
- c) the energy objectives, targets, and action plans;
- d) the documents, including records, required by this International Standard;
- e) other documents determined by the organization to be necessary.

NOTE The degree of documentation can vary for different organizations for the following reasons:

- the scale of the organization and type of activities;
- the complexity of the processes and their interactions;
- the competence of personnel.

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4.5.4.2 Control of documents

Documents required by this International Standard and the EnMS shall be controlled. This includes technical documentation where appropriate.

The organization shall establish, implement and maintain procedure(s) to:

- a) approve document
- b) periodically review and update documents as necessary;
- c) ensure that changes and the current revision status of documents are identified;
- d) ensure that relevant versions of applicable documents are available at points of use;
- e) ensure that documents remain legible and readily identifiable;
- f) ensure documents of external origin determined by the organization to be necessary for the planning and operation of the EnMS are identified and their distribution controlled;
- g) prevent the unintended use of obsolete documents, and suitably identify those to be retained for any purpose .nts for adequacy prior to issue;

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4.5.5 Operational control

The organization shall **identify and plan those operations and maintenance activities which are related to its significant energy uses and that are consistent with its energy policy, objectives, targets and action plans**, in order to ensure that they are carried out under specified conditions, by means of the following:

- a) establishing and setting criteria for the effective operation and maintenance of significant energy uses, where their absence could lead to a significant deviation from effective energy performance;
- b) operating and maintaining facilities, processes, systems and equipment, in accordance with operational criteria;
- c) appropriate communication of the operational controls to personnel working for, or on behalf of, the organization.

NOTE When planning for contingency or emergency situations or potential disasters, including procuring equipment, an organization may choose to include energy performance in determining how it will react to these situations.

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4.5.6 Design

4.5.7 Procurement of energy services, products, equipment and energy

4.5.6 Design

The organization shall **consider energy performance improvement opportunities** and operational control in the design of new, modified and renovated facilities, equipment, systems and processes that can have a significant impact on its energy performance.

The results of the energy performance evaluation shall be incorporated where appropriate into the specification, design and procurement activities of the relevant project(s).

The results of the design activity shall be recorded.

4.5.7 Procurement of energy services, products, equipment and energy

When procuring energy services, products and equipment that have, or can have, an impact on significant energy use, **the organization shall inform suppliers that procurement is partly evaluated on the basis of energy performance.**

The organization shall establish and implement the criteria for assessing energy use, consumption and efficiency over the planned or expected operating lifetime when procuring energy using products, equipment and services which are expected to have a significant impact on the organization's energy performance.

The organization shall define and document energy purchasing specifications, as applicable, for effective energy use.

NOTE See Annex A for more information.

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4.6.1 Monitoring, measurement and analysis

The organization shall **ensure that the key characteristics of its operations that determine energy performance are monitored, measured and analysed** at planned intervals. Key characteristics shall include at a minimum:

- a) significant energy uses and other outputs of the energy review;
- b) the relevant variables related to significant energy uses;
- c) EnPIs;
- d) the effectiveness of the action plans in achieving objectives and targets;
- e) evaluation of actual versus expected energy consumption.

The results from monitoring and measurement of the key characteristics shall be recorded.

An energy measurement plan, appropriate to the size and complexity of the organization and its monitoring and measurement equipment, shall be defined and implemented.

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4.6.1 Monitoring, measurement and analysis

NOTE Measurement can range from only utility meters for small organizations up to complete monitoring and measurement systems connected to a software application capable of consolidating data and delivering automatic analysis. It is up to the organization to determine the means and methods of measurement.

The organization shall define and periodically review its measurement needs.

The organization shall ensure that the equipment used in monitoring and measurement of key characteristics provides data which are accurate and repeatable. Records of calibration and other means of establishing accuracy and repeatability shall be maintained.

The organization shall investigate and respond to significant deviations in energy performance.

Results of these activities shall be maintained.

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4.6.2 Evaluation of compliance with legal requirements and other requirements

At planned intervals, the organization shall evaluate compliance with legal requirements and other requirements to which it subscribes related to its energy use and consumption.

Records of the results of the evaluations of compliance shall be maintained.

[70]

Application to Energy Systems

16 August 2014 Workshop 3
Day 1
1:00pm to 2:30am

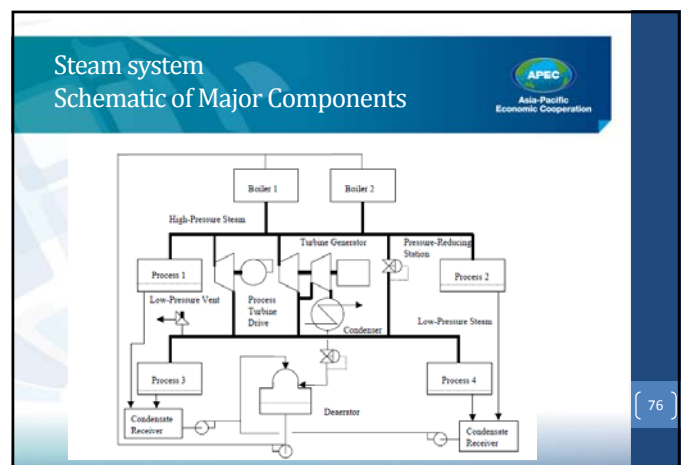
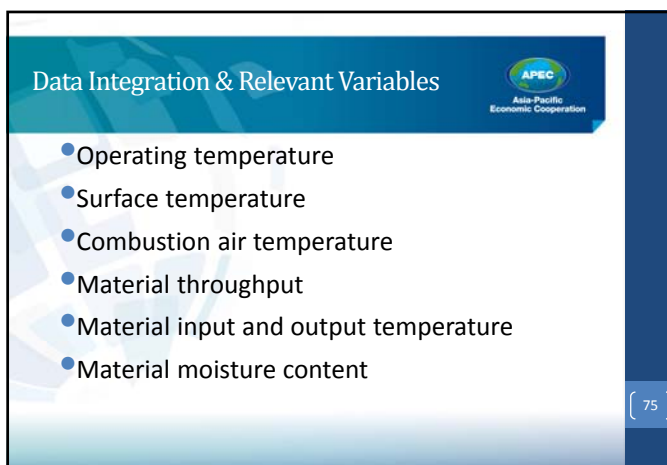
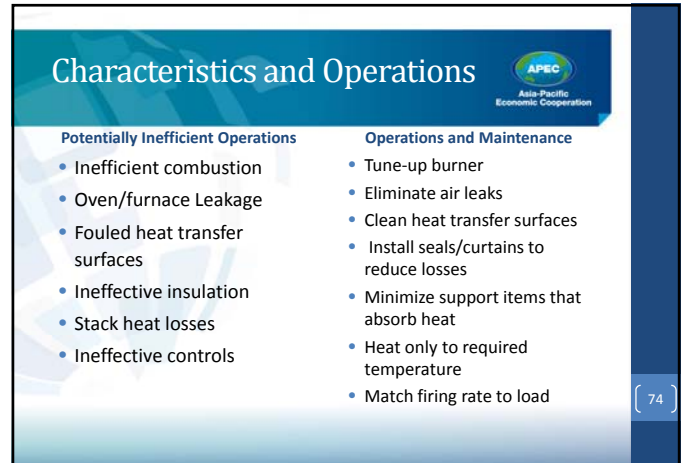
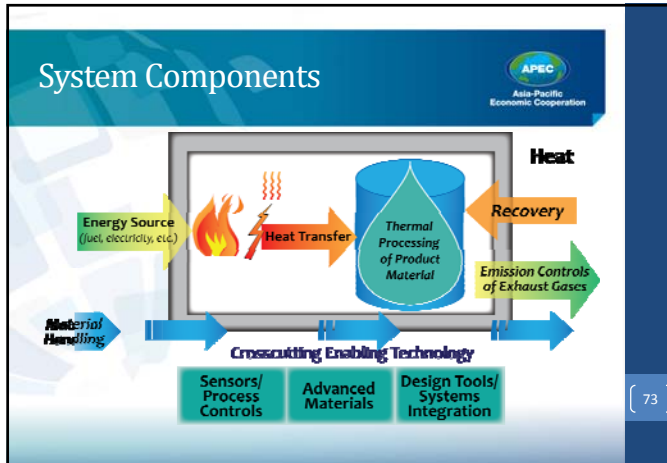
[71]

PROCESS HEATING

General Characteristics

- **PROCESS HEATING** is the application of heat needed to produce basic materials and commodities. Process heating systems may use fuels, electricity or steam to provide the necessary thermal energy.

[72]



Boiler Performance

Boiler performance primarily a function of fuel type



| | | |
|---------|----------------------------|---------------------------|
| Coal | Full load efficiency – 85% | Low load efficiency – 75% |
| Oil | Full load efficiency – 80% | Low load efficiency – 72% |
| Gas | Full load efficiency – 75% | Low load efficiency – 70% |
| Biomass | Full load efficiency – 70% | Low load efficiency – 60% |

[77]

Stream system

Opportunities for Improved Efficiency



Operation and Maintenance

- Eliminate steam leaks
- Reduce boiler pressure
- Boiler combustion tune-up
- Inspect and repair failed steam traps
- Minimize deaerator venting
- Minimize blowdown
- Shutoff backup boiler

[78]

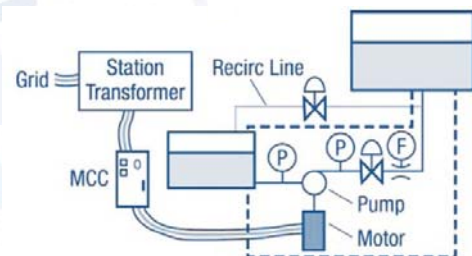
Data Integration & Relevant Variables



- Boiler operating pressure
- Excess combustion air
- Stack temperature
- Boiler load, i.e. steaming rate
- Condensate return temperature and amount
- Makeup water quality
- Makeup water temperature


[79]

Pumps: System Components



[80]


Pump General Characteristics



- Industrial motors are single largest end-user of electricity in the country accounting for 25% of sales
- Pumps represent 27% of the electricity used by industrial systems.

[81]


Pump Factors Affecting Pump Performance



- Liquid flowrate
- Differential pressure
- Liquid density
- Pump suction head
- Operating speed

[82]


Pump Indicators of Inappropriate Applications



- Throttle-valve control for system
- Cavitation noise or damage
- Continuous operation in batch process
- Bypass line normally open
- High system maintenance
- Systems that have changed function

[83]


Pump Opportunities for Improved Efficiency



Operation and Maintenance


- Repair pump leaks
- Turn off pumps when not in use
- Trim or replace impellers on oversized pumps
- Reduce or eliminate by-pass flow and control (throttling) valves
- Optimize parallel pumping systems

[84]

Data Integration & Relevant Variables 

- Pump differential pressure
- Pump head
- Fluid density
- Pump flowrate
- Pump speed

85

Requirement of management system in ISO 50001 

16 September 2014 Workshop 3
Day 1 Session 3
1:00pm to 2:30am

86

4.6.3 Internal audit of the EnMS

The organization shall conduct internal audits at planned intervals to ensure that the EnMS:

- conforms to **planned arrangements** for energy management including the requirements of this International Standard;
- conforms with the **energy objectives and targets** established;
- is effectively implemented and maintained, and **improves energy performance**.

An audit plan and schedule shall be developed taking into consideration the **status and importance of the processes** and areas to be audited as well as the **results of previous audits**.

The selection of auditors and conduct of audits shall **ensure objectivity and impartiality** of the audit process.

Records of the audit results shall be maintained and reported to top management.

87

ISO FDIS 50004

4.6.3 Internal audits

4.6.3.3 EnMS internal audits should be prioritized and conducted **more frequently** for:

- areas that influence energy performance such as objectives, targets, SEUs, operational controls, significant deviations, measurement, monitoring and analysis, and energy review;

- other areas where important nonconformities have been identified in previous audits;
- areas that have experienced changes to equipment, systems, processes and personnel since the last EnMS audit;
- areas where changes are planned that could have a significant impact on energy performance.

88

ISO FDIS 50004

4.6.3 Internal audits

- **4.6.3.4** EnMS internal audits may be conducted **less frequently** for areas:
 - that do not significantly impact energy performance, such as document control;
 - or processes that have fewer nonconformities from previous audits.
- This ensures that the audit process is focused on the areas and processes that assist the organization in improving energy performance and the effectiveness of its EnMS.

89

ISO FDIS 50004

Internal audits

- **4.6.3.5** The organization should **maintain evidence** that all the EnMS requirements were audited within a defined period of time specified on an audit schedule. This can be achieved in a number of ways:
 - a matrix with processes/areas and the requirements applied to them during the audit(s);
 - completed audit plans and audit schedules providing details of processes/ areas and requirements audited;
 - recorded in audit notes, audit report or other format.

90

4.6.4 Nonconformities, correction, corrective action and preventive action

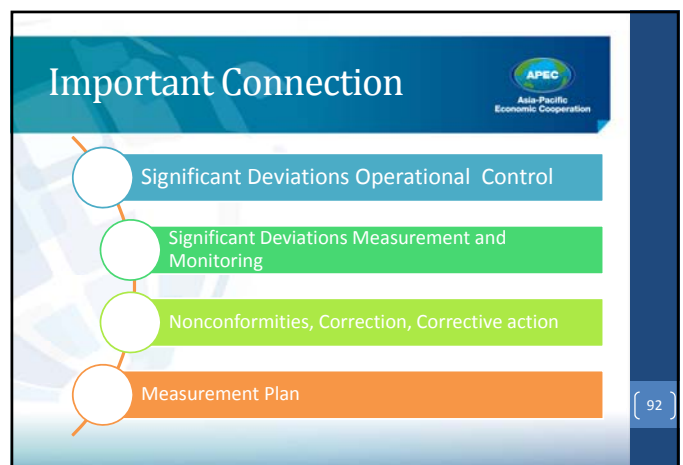
The organization shall address **actual and potential nonconformities** by making **corrections**, and by taking **corrective action and preventive action**, including the following:

- reviewing nonconformities or potential nonconformities;
- determining the causes of nonconformities or potential nonconformities;
- evaluating the need for action to ensure that nonconformities do not occur or recur;
- determining and implementing the appropriate action needed;
- maintaining records of corrective actions and preventive actions;
- reviewing the effectiveness of the corrective action or preventive action taken.

Corrective actions and preventive actions shall be appropriate to the magnitude of the actual or potential problems and the energy performance consequences encountered.

The organization shall ensure that any necessary changes are made to the EnMS

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4.6.5 Control of records

The organization shall establish and maintain records, as necessary, to demonstrate conformity to the requirements of its EnMS and of this International Standard, and the energy performance results achieved.

The organization shall define and implement controls for the identification, retrieval and retention of records.

Records shall be and shall remain legible, identifiable and traceable to the relevant activity.

93

ISO FDIS 50004



The list given below is a minimum list of records based on the requirements of ISO 50001. An organization may maintain additional records according to its needs:

- *energy review;
- *energy opportunities;
- *energy baseline;
- *EnPIs;
- *methodology for determining and updating the EnPIs;
- *competency and training;
- *design;
- *measuring and monitoring of key characteristics;
- *calibration;
- *evaluation of compliance;
- *internal audit;
- *corrective and preventive action;
- *management review.

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4.7 Management review

4.7.1 General

At planned intervals, top management shall review the organization's EnMS to ensure its continuing suitability, adequacy and effectiveness.

Records of management review shall be maintained.

4.7.2 Input to management review

Inputs to the management review shall include:

- a) follow-up actions from previous management reviews;
- b) review of the energy policy;
- c) review of energy performance and related EnPIs;
- d) results of the evaluation of compliance with legal requirements and changes in legal requirements and other requirements to which the organization subscribes;
- e) the extent to which the energy objectives and targets have been met;
- f) EnMS audit results;
- g) the status of corrective actions and preventive actions;
- h) projected energy performance for the following period;
- i) recommendations for improvement.

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4.7.3 Output from management review

4.7.3 Output from management review

Outputs from the management review shall include any decisions or actions related to:

- a) changes in the energy performance of the organization;
- b) changes to the energy policy;
- c) changes to the EnPIs;
- d) changes to objectives, targets or other elements of the EnMS, consistent with the organization's commitment to continual improvement;
- e) changes to allocation of resources.

96

Management Review Discussion

(16:15-16:45)



- Let's take a look at two examples of the organization's management review.
- Discuss with your team
 - Energy performance topics
 - Energy inputs
 - Potential integration



[97]

Connection back to our Case Study



Let's review our case study relative to :

- Energy performance
- Records
- Management review



[98]

Group Exercise

16 September 2014 Workshop 3
Day 1 Session 3
2:45pm to 4:45pm



[99]

Case Study

(2:45pm-4:45pm)



- | Focus | Assignment |
|--|--|
| <ul style="list-style-type: none"> • Scope and Boundary <ul style="list-style-type: none"> • Boundary – physical/site limits/organizational limits • Energy review • EnPI • Baselines • Documents , Records | <ol style="list-style-type: none"> 1. Positives 2. Negatives 3. Concerns 4. Discussion points 5. Areas where more information will be necessary |

[100]

Monitoring and Measurement (4.6.1)



Key Characteristics

- a) significant energy uses and other outputs of the energy review;
- b) the relevant variables related to significant energy uses;
- c) EnPIs;
- d) the effectiveness of the action plans in achieving objectives and targets;
- e) evaluation of actual versus expected energy consumption.

Measurement plan

- An energy measurement plan, appropriate to the size and complexity of the organization and its monitoring and measurement equipment, shall be defined and implemented.

101

Monitoring and Measurement



- The organization shall define and periodically review its measurement needs.
- The organization shall ensure that the equipment provides data which are accurate and repeatable.
- The organization shall investigate and respond to significant deviations in energy performance.
- Records

102

ISO FDIS 50004



The energy measurement plan should describe the following:

- what is measured and monitored,
- why it is measured,
- how it is measured, (device, method, frequency, accuracy and repeatability, calibration)
- the values to be expected,
- a significant deviation for that measurement,
- the action to be taken for a significant deviation,
- personnel responsible for data collection and measurement,
- what and where the record is,
- whether any measurements or parameters are especially process or safety critical,
- future measurement needs.


103

National Hospital S Energy Plan in 2013



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General Information of hospital S



Asia-Pacific Economic Cooperation

Number of hospital bed : 350


Employee : 700
 Number of Doctor 100 Number of Nurse 500 Number of pharmacist 30
 Energy Service: 2 person (Company T inside hospital S)
 Energy audit: 1 person (Company V)

Number of department 22

Floor Structure

| | | |
|----|--|------------------|
| 3E | Operation room : 6 | Anesthetist : 15 |
| 3W | Pediatric and obstetric department | NICU : 4 rooms |
| 4E | cardiovascular department (cardiovascular internal medicine, cardiac surgery) cardiac catheter test room: 2 | CCU : 8 rooms |
| 4W | cardiovascular department (neurosurgery, neurology) | HCU : 4 beds |
| 5E | Cancer (surgery, respiratory) | HCU : 4 beds |
| 5W | Cancer (gynecology, urology) | |
| 6E | Internal medicine department (internal medicine, digestive organs, respiratory medicine, dermatology) | |
| 6W | Surgery department (orthopedic, ophthalmology, otorhinolaryngology) | |


Energy Objective



Asia-Pacific Economic Cooperation

- 10% improvement of energy intensity to reduce

Baseline setting: Past three years: 2010-2012




Asia-Pacific Economic Cooperation

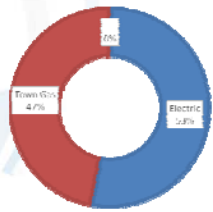
Average of energy use from 2010-2012

| 2010-2012 | | Electricity | Town Gas | LPG | Water | Total |
|-----------------------------------|-----------|-------------|----------|-------|---------|-----------|
| Energy use (crude oil equivalent) | KI (Year) | 1255 | 1131 | 5 | | 2391 |
| Energy Cost | USD/year | 787,700 | 681,360 | 2,670 | 142,490 | 1,615,230 |

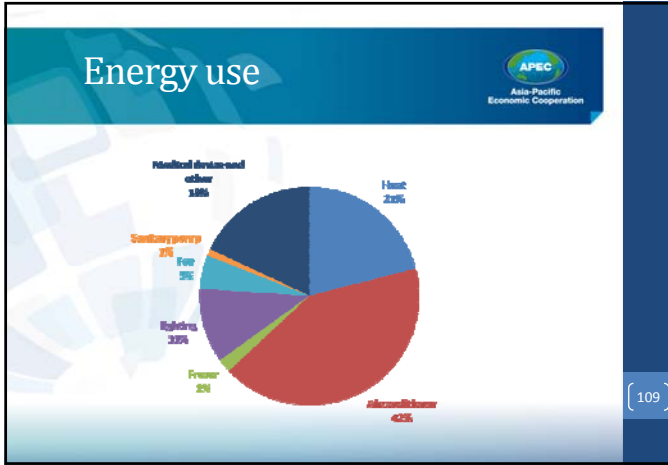
RATIO OF ENERGY USE



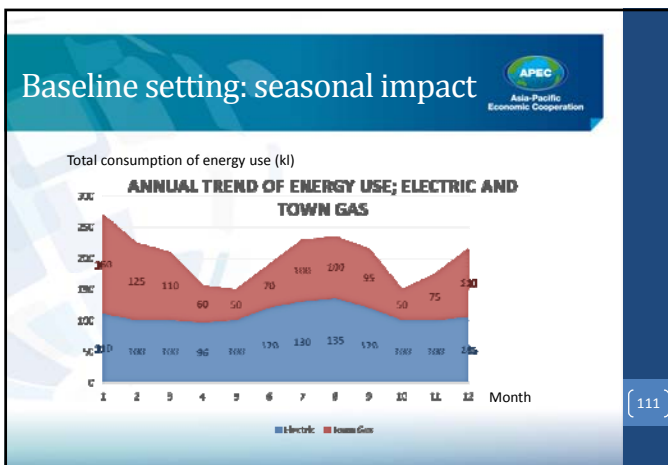
Asia-Pacific Economic Cooperation



Average energy use in Japanese hospital
 Electric : 60%, Town gas:40% (Source: BCCZ)



- ### Significant energy uses
- Electric : Lighting, air-conditioner (PAC and outdoor air processing unit), Medical devices
 - Town Gas : air conditioner (PAC, hot and chilled water generator), water boiler, steam boiler, co-generation
 - **Air-conditioner, hot water** are significant energy use to identify.
 - Energy use is high in summer and winter
 - energy use is not stable due to the temperature change
 - Considerable EnPI : **air temperature**
- 110



Calculation of energy intensity

Energy Baseline

2,390 kL/year
= 92,405 GJ/year
(Average 2010-2012)

Energy intensity

Hospital S: 3,254 MJ/m²
(Average 2010-2012)

Building year: January 2010
• High efficiency building design and energy efficient facility
• Few Performance loss

floor area

28,395.72m²
(7 buildings)

Other Hospital in Japan:

2,700~4,100MJ/m²

112

Energy plan and achievement in 2013 (April to December)



| Action Plan | Measure | Reduction in 2013 | expected cost saving (USD) |
|---|--|---------------------|-------------------------------|
| Operation room and central supply room; aircondition off | After the cleaning of the operation room, the last nurse will set off of the airconditioner. In case of emergency operation, central operation can reactivate soon. | 420,000kWh | 550,000 |
| Steam Boiler maintenance improvement for autoclave sterilizer | Activate only during the use of autoclave sterilizer | 34920m ³ | 227,327 |
| Waste heat use for cold and hot water generation | | 77910 kWh | -31887 |
| Lighting off | Thinning out the illumination in passageways and elevator halls, cutting back on the number of elevators in service and turning off lights that do not need to be always on. Close: medical center 22pm-7am, escalator 20:00-7am | 176400kWh | 314,826 |
| Peak off setting of facilities | Targeted 850kW | 6300kWh, 79kW | 180,000 |
| Washlet setting | set the temperature as low | 65555kWh | 100,000 |
| Awareness and promotion | | Energy efficiency | 7.5 % reduction of energy use |
| | | Total | 1,340,266 |

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Energy data in 2013 (April to December)



| Energy data 2013(month) | (GJ) Electric | (GJ) Town Gas | (GJ) LPG | (GJ) Total |
|-------------------------|------------------|------------------|-------------|---------------|
| 4 | 3,892 | 2,965 | 13 | 6,874 |
| 5 | 3,803 | 2,417 | 9 | 6,234 |
| 6 | 3,865 | 2,821 | 12 | 6,704 |
| 7 | 4,301 | 4,028 | 14 | 8,350 |
| 8 | 4,306 | 4,050 | 15 | 8,379 |
| 9 | 3,181 | 3,199 | 19 | 6,408 |
| 10 | 3,543 | 2,456 | 6 | 6,015 |
| 11 | 3,362 | 3,102 | 13 | 6,488 |
| 12 | 3,934 | 4,123 | 20 | 8,089 |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| Total | 34,187 | 29,161 | 121 | 63,469 |

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Summary of achievement in 2013



- **Achieved energy improvement 7.5% by maintenance (without facility change)**
- Awareness raised among hospital managements, doctors that current energy plan with target 10% reduction of energy intensity, the hospital can reduce energy cost about USD 150,000 annually.

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Appendix: Energy Audit Report in 2012



- Concern 1: No direct measurement and the associated data
- Root causing: No monitoring point (electric and gas) at each floor and area
 - Countermeasure : metering system to allocate at each floor and area
 - Action : Calculation based the floor size by each building
- Concern 2 : Balance of quality of medical service and energy saving
- Root causing : Some medical service needs a certain energy use
 - Countermeasure : Design of the energy efficiency is to support the medical safety (It means 80% of PAC can not change)
 - Action : Plan out the hospital specific energy efficiency

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Group Discussion



- Assign one or two presenters for group presentation
- Each group: 10 mins
- We will start presentation, please be back at **16:15**

117

Group Exercise 1: Group presentation



(16:15-17:00)

- Please comments on
 - Boundary of the organization,
 - Energy policy and Energy review is appropriate or not
 - Setting Energy Baseline
 - Energy performance indicator
 - Actual energy data in 2013
 - Achievement of energy performance change in 2013
- What kind of information do you expect during assessment?

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Hopefully, we provided some new ideas for your consideration today. We look forward to your continued participation tomorrow.

**THANK YOU FOR YOUR HARD WORK
TODAY**

119


APEC Project MLA Readiness Project in ISO50001 4 - DAY WORKSHOP TRAINING FOR ACCREDITATION BODY AND ASSESSORS DAY 2

*Jakarta, Indonesia
17 September 2014*



Questions from Day 1

• Any questions from the Day 1?

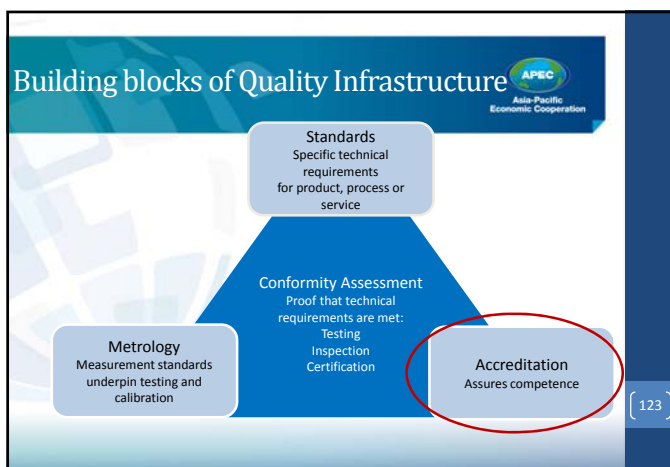


121

ISO 50003, Conformity assessment — Requirements for bodies providing certification audits of energy management systems audits and auditor competency

17 September 2014 Workshop 3
Day 2 Session 1
8:30am to 12:00

122



What is ISO 50003?

ISO 50003:2014

Energy management systems — Requirements for bodies providing audit and certification of energy management systems

- Developed by Technical Committee ISO/TC 242, in collaboration with the *ISO Committee on conformity assessment* (CASCO).
- Applies to Certification and Verification Bodies
- Includes competency requirements for EnMS auditors
- Adds to the requirements of ISO 17021-1

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ISO 50001 and Conformity Assessment

- Must support ISO 50001 requirements
 - continual improvement of **both** the **EnMS** and **energy performance**
- Requires a new combination of skills for the auditing team
 - Management system auditing knowledge and skills (ISO 9001, ISO 14001, etc)
 - Energy efficiency knowledge and skills
- The effectiveness and impact of ISO 50001 is dependent on auditors with these skills

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Standards used in Assessment of an EnMS

| | |
|---------------|-------------------------------|
| ISO 50001 | • Implemented by organization |
| ISO 50003 | • Used by CBs |
| ISO/IEC 17021 | • Used by CBs |
| ISO/IEC 17011 | • Used by ABs |

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Evaluation: Is Energy Performance Improving?

- What does the data from the organization demonstrate?
- How are adjustments made based on the data?
- Are the planned improvements achieved?

Baseline & EnPIs

Monitoring, Measuring & Analysis

Energy Performance

Report performance to management

Action Plans

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Audits Evaluate the Focus of the EnMS

Continual Improvement of the EnMS

- Top Management
- Management review
- Objectives, targets and action plans
- Competency
- Internal audit
- Corrective and preventive action

Continual Improvement of Energy Performance

- ✓ Energy Data Driven
 - Energy Review
 - Energy Baseline
 - EnPIs
- ✓ Objectives, targets, and action plans
- ✓ Measuring, Monitoring and analysis

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ISO/IEC 17021:2011

ISO/IEC 17021:2011

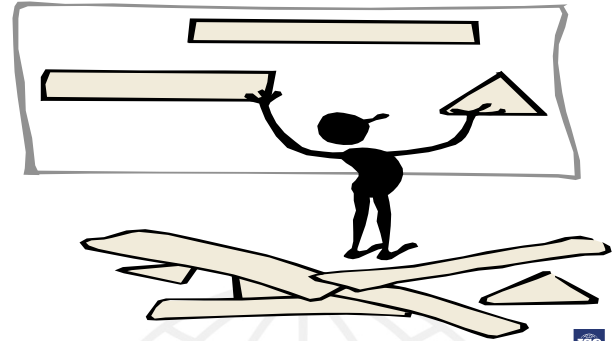
Conformity assessment—Requirements for bodies providing audit and certification of management systems

Published 1 February 2011

As decided by ISO/CASCO prior to the ballot of ISO/IEC 17021:2011, there will be a systematic review of entire document 12 months after publication



Changes due to the systematic review



Revision of ISO/IEC 17021

NWIP—Rationale for the revision

- The 2011 version contains the whole of the 2006 version unchanged as well as additional clauses. It is necessary to determine if the unchanged 2006 clauses need alignment with the new clauses added in 2011.
- Several interpretation requests were addressed since the publication of the standard and should be taken into consideration in any revision.
- Experience gained with the implementation of the standard has highlighted the need for clarification of some of the clauses



Revision of ISO/IEC 17021 to 17021-1

Inputs considered

- Out-of-scope comments on revision of 2006
- CASCO interpretation requests
- IAF application documents
- APG and AAPG papers
- Outcome of WG33—ISO/IEC TS 17022
- Outcome of WG37—ISO/IEC TS 17023
- CASCO PAS documents 17001-17005
- Other CASCO documents—17020, 17024, 17065



Revision of ISO/IEC 17021 to 17021-1

Significant proposed revisions:

- Adopt the approach in 17065 and not require an impartiality committee
- Adopt the approach in 17024 regarding public information with, or without, request
- Improving effectiveness of operational control by CBs of remote offices regardless of their organizational structure
- Classifying nonconformities as major and minor
- Re-organization of Section 9



Revisions in the DIS

- Deleted note 1 to the scope
- Added definition for nonconformity 3.11
- Added definition for major nonconformity 3.12
- Added definition for minor nonconformity 3.13
- Added definition for technical expert 3.14
- Added definition for certification scheme 3.15
- Added definition for audit time 3.16



Revisions in the DIS

- **New requirement to conduct another stage 2 audit for delay in closing a major nonconformity**

9.5.2.2.2 If the certification body is not able to verify the implementation of corrections and corrective actions of any major nonconformity within 6 months after the last day of stage 2, the certification body shall conduct another stage 2 prior to recommending certification.



Revisions in the DIS

- **Revised requirements for the certification decision referencing major and minor nonconformities**

9.5.2.1 General

The certification body shall confirm, prior to making a decision for granting certification, expanding or reducing the scope of certification, renewing, suspending or restoring, or withdrawing of certification, that

- a) the information provided by the audit team is sufficient with respect to the certification requirements and the scope for certification;
- b) for any major nonconformities it has reviewed and accepted the correction and corrective actions and verified the effectiveness;
- c) for any minor nonconformities it has reviewed and accepted the client's plan for correction and corrective action.



Revisions in the DIS

- **New requirement for the audit report requiring a statement of the conformity and effectiveness of the MS (from consideration of ISO/IEC TS 17022:2012 Conformity assessment -- Requirements and recommendations for content of a third-party audit report on management systems)**

9.4.8.3 The report shall also contain a statement on the conformity and the effectiveness of the management system together with a summary of the evidence relating to:

- a) the appropriateness of the certification scope;
- b) the capability of the management system to meet applicable requirements and expected outcomes;
- c) internal audit and management review process.



Revisions in the DIS

- **New requirement when part of the audit made by electronic means**

9.4.1 General

The certification body shall have a process for conducting on-site audits. This process shall include an opening meeting at the start of the audit and a closing meeting at the conclusion of the audit.

Where any part of the audit is made by electronic means or where the location to be audited is virtual, the certification body shall ensure that such activities are conducted by personnel with appropriate competence. The evidence obtained during such an audit shall be sufficient to enable the auditor to take an informed decision on the conformity of the requirement in question.

NOTE "On-site" audits can include remote access to electronic site(s) that contain(s) information that is relevant to the audit of the management system. Consideration can also be given to the use of electronic means for conducting audits.



Revisions in the DIS

- **New requirement for consideration of shifts.**

9.1.3.5 Where the client operates shifts, the activities that take place during shift working shall be considered when developing the audit programme and audit plans.

- **New requirement for multiple management systems**

9.1.6 Multiple management systems

When certification to multiple management system standards is being provided by the certification body, the planning for the audit shall ensure adequate on-site auditing to provide confidence in the certification.



Revisions in the DIS

- Section 9 was revised to re-order requirements to be more in order with how these process requirements occur within a CB, starting with receipt of an application for certification.

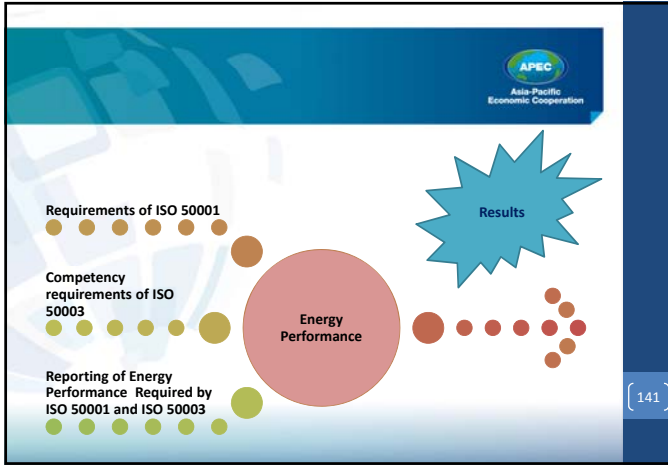
Current section 9

9.1 General requirements
9.2 Initial audit and certification
9.3 Surveillance activities
9.4 Recertification
9.5 Special audits
9.6 Suspending, withdrawing...
9.7 Appeals
9.8 Complaints
9.9 Records

Revised section 9

9.1 Pre-certification activities
9.2 Initial certification
9.3 Planning audits
9.4 Conducting audits
9.5 Certification decision
9.6 Maintaining certification
9.6.5 Suspending...
9.6.6 Appeals
9.6.7 Complaints
9.6.8 Records





What is ISO 50003?

Used in conjunction with ISO/IEC 17021 or ISO/IEC 17021-1

This International Standard provides the additional requirements for EnMS needed to assure the effectiveness of the audit and certification

- audit planning process,
- the initial certification audit,
- conducting the on-site audit,
- auditor competence,
- duration of EnMS audits, and
- multi-site sampling.

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What is ISO 50003?

Clause 4 describes the characteristics of EnMS auditing

Clause 5 describes EnMS auditing process requirements

Clause 6 describes competence requirements for personnel involved in the EnMS certification process

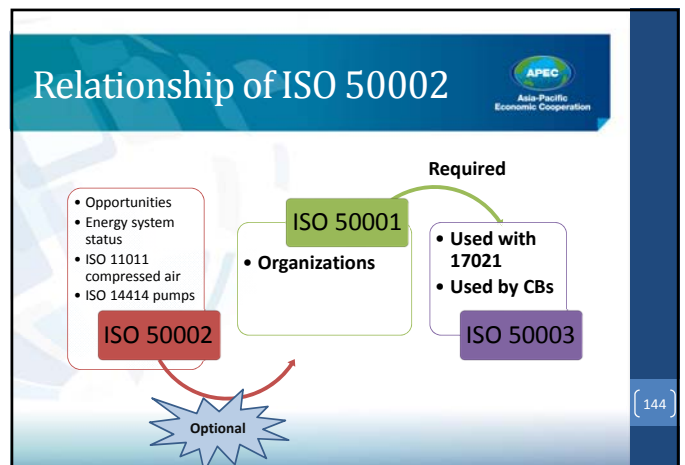
Annex A (normative) Duration of EnMS Audits

Annex B (normative) Multi-site Sampling

Energy audits use **ISO 50002:2014**

Anticipated publication of ISO 50003: September 2014

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ISO 50003 – Specific Requirements



- Key sections adding requirements to ISO 17021-1
- audit planning, the auditing process, certification decisions
 - audit reporting
 - duration of audits
 - multi-site sampling
 - competence requirements for personnel involved in the certification process

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5.2 Confirming the Scope of Certification



- Confirm the scope and boundaries are appropriate at each audit
 - Subset
 - Facility
 - Multi-site

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5.3 Determining Audit Time



- Four factors are used to determine minimum audit duration
 - Energy sources
 - Significant energy uses (SEU)
 - Energy consumption
 - EnMS effective personnel



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SEE ANNEX A For DETAILS

5.3 Determination of audit time



- The audit time includes the on-site time at the organization's location, audit planning, document reviewing, and audit reporting.
- The audit duration may be reduced if the organization has integrated the EnMS with another certified management system. The adjustment in time due to another certified management system shall not exceed a 20% reduction.
- The audit man days are based on eight hours per day. Adjustments may be required based on local, regional, or national legal requirements.


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Multi sampling

12 August 2014 Workshop 2
13:00 to 13:30

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Multi-site Sampling

The processes related to significant energy uses and energy consumption at the site shall be substantially the same or be organized into similar subsets that are operated using similar methods or processes.

The most energy intensive processes are subject to more frequent audits.

The energy performance of the sites can be considered independently or as a whole. This shall be defined in the certification body's processes or justification for the multi-site organization sampling plan.

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Multi-site Sampling

The organization's EnMS shall be under a centrally controlled and administered energy planning process and be subject to a central management review and shall have completed one management review prior to the certification body starting its audit.

The relevant sites (including the central administration function) shall be subject to the organization's centrally managed internal audit programme prior to the certification body starting its audit.

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Multi-site Audits

The central office shall demonstrate its ability to collect and analyse data from all sites included in the scope and boundaries.

Requirements are related to 2 topics

1. Energy Management
2. Energy performance

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Multi-site Audits



- Management system requirements:
 - system documentation and system changes authorized by the central office;
 - management review, compiled from all sites;
 - evaluation of corrective actions;
 - internal audit planning and evaluation of the results;
 - demonstrate its authority to collect information on legal and other requirements and initiate organizational change if necessary; and
 - results of internal audits from sites.

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Multi-site Audits



- Energy performance requirements:
 - consistent energy planning process;
 - consistent criteria for determining and adjusting baseline, relevant variables and energy performance indicators (EnPIs);
 - consistent criteria for establishing objectives and targets and site action plans;
 - centralized processes for evaluating applicability and effectiveness of action plans and EnPI's; and
 - energy performance data centrally aggregated to show organization wide energy performance, as appropriate.

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Multi-site Sampling Considerations



Considerations of differences that can affect sampling may include the following:

- energy performance;
 - significant energy uses;
 - energy sources;
 - monitoring, measurement and analysis;
 - energy consumption; and
 - scope changes.
- The certification body shall identify the central functions (central office) of the organization with which it has a legally enforceable agreement for the provision of certification activities.

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5.3.2 EnMS Effective Personnel



- The number of EnMS effective personnel and complexity criteria, as defined in Annex A, is used as the **basis for the calculation of the audit duration**.
- The certification body shall define and document a process for determining the number of EnMS effective personnel for the scope of the certification and for each audit in the audit programme.
- The process for determining the number of EnMS effective personnel shall **ensure the persons who actively contribute to meeting the requirements of the EnMS are included**. When regulation requires personnel for operations and maintenance of the EnMS activities to be identified, those personnel shall be part of the EnMS effective personnel.

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Who are Effective Personnel? ANNEX A



Consideration shall be given to the personnel who materially impact the EnMS including the following:

- top management;
- manage representative(s);
- energy management team;
- person(s) responsible for the major changes affecting energy performance;
- person(s) responsible for the effectiveness of the EnMS;
- person(s) responsible for developing, implementing or maintaining energy performance improvements including objectives, targets and action plans;
- person(s) responsible for significant energy uses.

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Who are Effective Personnel?



NOTE Persons responsible for significant energy uses might not be considered as EnMS effective personnel depending upon the impact their actions could have on energy performance. It is important to understand their role and impact before including them as EnMS effective personnel.

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Calculating Audit Duration



$$C = (F_{EC} \times W_{EC}) + (F_{ES} \times W_{ES}) + (F_{SEU} \times W_{SEU})$$

* F_{EC} is the Annual energy consumption complexity factor from Table A.1

* F_{ES} is the Number of energy sources complexity factor from Table A.1

* F_{SEU} is the Number of significant energy uses complexity factor from Table A.1

* W_{EC} is the weight of the factor from Table A.1 for annual energy consumption

* W_{ES} is the weight of the factor from Table A.1 for number of energy sources

* W_{SEU} is the weight of the factor from Table A.1 for number of significant energy uses

*Table A.1 provides for each consideration the weight and the associated ranges for the complexity factors needed to calculate the complexity.

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5.5 Conduction the on-site audit

When conducting the on-site audit, the processes on which to collect and verify information for energy performance shall include at a minimum:

- energy planning (all sections);
- operational control;
- monitoring measurement and analysis.

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5.6 Audit report

An audit report shall include:

- scope and boundaries of the EnMS being audited; and
- statement of achievement of continual improvement of the EnMS and energy performance improvement with audit evidence to support the statements.

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5.7 Initial certification audit

5.7.1 Stage 1 audit

The Stage 1 audit shall include the following:

- confirmation of scope and boundaries of the EnMS for certification;
- review of a graphical or narrative description of the organizations facilities, equipment, systems and processes for the identified scope and boundaries;
- confirmation of the number of EnMS effective personnel, energy sources, significant energy uses and annual energy consumption, in order to confirm the audit duration;
- review of the documented results of the energy planning process;
- review of a list of the energy performance improvement opportunities identified as well as the related objectives, targets and action plans.

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5.7 Initial certification audit

5.7.2 Stage 2 audit

During the stage 2 audit, the certification body shall gather the necessary information or evidence to determine if energy performance improvement has been demonstrated prior to making a certification decision.

5.8 Surveillance audit

The certification body shall identify continued energy performance improvement achieved by EnMS during the surveillance audits.

5.9 Recertification audit

During the recertification audit, the certification body shall gather the necessary information or evidence to determine if energy performance improvement has been demonstrated prior to making a certification decision. The recertification audit shall also take into account any major changes in facilities, equipment, systems, or processes.

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ISO 50003/ISO 17021 – Knowledge Competency Summary



- EnMS and principles
- Energy specific terminology
- Basic energy principles
- Energy related legal and other requirements
- Energy performance indicators, energy baseline and relevant variables
- Basic analytical statistics relative to energy performance

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ISO 5003/ISO 17021 – Knowledge Competency Summary



- Energy performance evaluation
- Common energy systems
 - For example: steam systems, refrigeration systems, motor systems, process heat, etc.
- Energy performance improvement actions
- Energy performance improvement technology
- General measurement and verification
- Monitoring and analysis of energy data

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Competency



Competencies are what people need to be successful in their job.

Auditors need *competencies* in two areas :

- Management systems
- Energy performance

- ISO 50003 has defined additional competencies to address energy performance.
- This represents a new set of competencies for the Certification Bodies
- Implementing organizations also need these two competencies

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Competence- Technical Areas



1. Industry- light to medium
2. Industry-heavy
3. Buildings
4. Building Complexes
5. Transport
6. Mining
7. Agriculture
8. Energy Supply

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Group Exercise 2: Group presentation



- How do you evaluate your client CB and the auditor's competence?
- Please discuss
 - What kind of document or evidence do you expect for your client's competency under ISO/IEC 17021-1 and ISO 50003 across education, qualification, working experience?
 - General requirement
 - Technical requirement
 - Sector specific issue
- How do you evaluate your CB and the auditor's competence at the desk review, office assessment and witness?

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Group Exercise 2:

Group discussion (the participant of certification bodies)

(1:00pm-2:30pm)



- What kind of document or evidence would be needed to demonstrate the competency under ISO/IEC 17021-1 and ISO 50003?
- Be prepared to discuss
 - Options for defining the competency
 - Pathways to achieve the competency
 - Timeframes needed for the auditors and lead auditors
 - "Upgrade" from other certifications

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Group Discussion



- Assign one or two presenters for group presentation
- Each group: 10 mins
- We will start presentation, please be back at **13:50**

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Group Exercise 3:

Group discussion

(2:45pm-4:15pm)



- What do you expect your client CB to arrange the stage 1 and stage 2 to evaluate the energy performance to improvement ?
- Please review Annex C of ISO 50003 before discussion.
- Please discuss about the key points of stage 1 and stage 2 to be prepared for presentation

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Group Exercise 3:

Group discussion (for Certification Body)



(2:45pm-4:15pm)



- What do you expect to see to evaluate the energy performance to improvement through the audit at the stage 1 and stage 2 ?
- Please review Annex C of ISO 50003 before discussion.
- Please discuss about the key points of stage 1 and stage 2 to be prepared for presentation

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Group Discussion

- Assign one or two presenters for group presentation
- Each group: 10 mins
- We will start presentation, please be back at **15:45**

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APEC Project MLA Readiness Project in ISO50001

4 - DAY WORKSHOP TRAINING FOR ACCREDITATION BODY AND ASSESSORS DAY 3


Jakarta, Indonesia
18 September 2014




Group Exercise 4:

Group discussion

(60min-100min)




- Draft an accreditation assessment plan for office and witness
- Scope: paper and pulp
- Be prepared to make a role playing and the situation to visit CB at the office assessment
 - Discuss about the questions about certification process include audit days, effective personnel.
 - Discuss about general, technical competencies, and other questions

(175)


Group Exercise 4

Group discussion (for Certification Body)

(60min-100min)



- Audit Planning for Stage 1 and Stage 2, based on pulp and paper
- Consider Team Activity
- Be prepared to discuss



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Group Exercise 3:

Group presentation (The participants of Certification Body)
(8:30am-10:00am)



- Please present
 - Certification process, Stage 1 and stage 2 audit plan
 - Scope: paper and pulp
 - Expected competencies for team leader and team member
 - Expected audit duration
 - How do you audit the energy performance improvement of this case?
- Be prepared to make a role playing and the situation your client AB will visit you at the office assessment
 - Discuss about the questions about appropriate certification process include audit days, effective personnel.
 - Discuss about general, technical competencies, and other questions

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Group Discussion



- Please be ready for role playing at **10:15**



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Office Assessment (Role Playing)

Group discussion-process, audit days, effective personnel
(10:15am-12:00)



Before starting

- CB team: Show your presentation about audit process include audit days, effective personnel and audit plan
- AB team: Show your assessment plan
- AB assessor team; please question about process include audit days, effective personnel
- CB team; please kindly reply
- If the question from AB team is not ready to reply, CB team or member will support answering as a group.

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Office Assessment (Role Playing)

Group discussion -competency
(1:00pm-2:30pm)



Before starting

- CB team: Show your presentation about general and technical competencies, and other questions
- AB team: Show your assessment plan
- AB assessor team; please question about general and technical competencies, and other questions
- CB team; please kindly reply
- If the question from AB team is not ready to reply, CB team or member will support answering as a group.

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Office Assessment Role playing; learning and sharing

(2:45pm-3:30pm)



- Short discussion about 10 mins about the learning points through role playing
- Sharing the learning points by role playing

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For visiting PT. Indah Kiat



For visiting to PT. Indah Kiat

- Learn more about the visiting company:
<http://www.ikserang.com/iks/index.php>
- Review your audit plan or assessment plan in particular onsite
- Clarify what to audit or what to assess
- Update the plan before visiting

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APEC Project MLA Readiness Project in ISO50001 4 - DAY WORKSHOP TRAINING FOR ACCREDITATION BODY AND ASSESSORS DAY 4

*Jakarta, Indonesia
19 September 2014*



Findings at onsite visit and reporting



- Group discussion: Positive and negative impression, any issue during on-site visit ?
- Write report including the non-conformity (major or minor) and observation as group
 - Please assign small team to write report and to write NC or observation

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