



## July 2019 Development Paper

### MariEMS Learning Material

This is the 35th compilation by Professor Dr Reza Ziarati on the work of the EU funded Erasmus + MariEMS' partners and material extracted from the IMO TTT Course. The material is composed from Chapter 35 of the learning material. Readers are also advised to refer to the papers on IdeaPort and IdealShip projects led by C4FF and published by MariFuture.

#### 35. ISO 50001 Energy Management System

##### 35.1 Overview

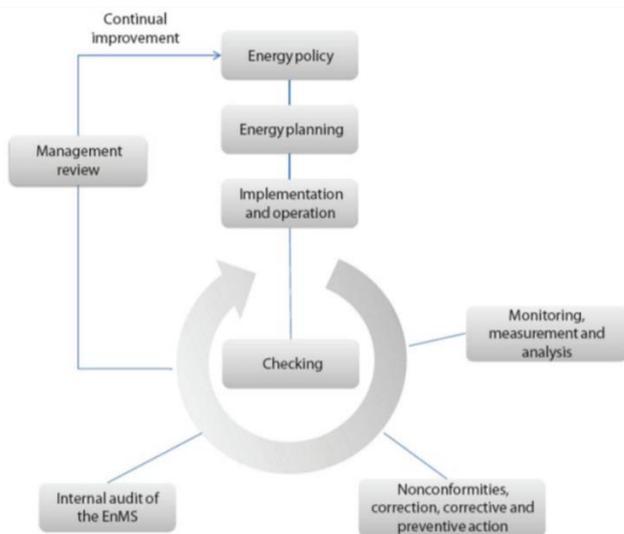
ISO 50001 is a voluntary international standard developed by the International Organization for Standardisation (ISO) to provide various organizations with an internationally recognized framework to manage and improve their energy performance. The standard addresses the following:

- Energy use and consumption evaluation via conducting energy reviews and development of energy policies.
- Measurement, documentation and reporting of energy use and consumption.
- Design and procurement practices for energy-using equipment, systems, and processes.
- Development of an energy management plan and other factors affecting energy performance that can be monitored and influenced by the organization.

ISO 50001 applies to all different types of companies and industry sector. It provides a framework for an "Energy Management System (EnMS)" through which each organization can set and pursue its own goals for improving energy performance. From the ISO 50001 perspective, an EnMS is a series of processes that enables an organization to use data and information to maintain and improve energy performance, while improving operational and energy efficiencies and reducing environmental impacts.

Using the ISO 50001 framework provides a systematic approach to managing energy within a company. Conformance to the standard provides proof that a company has implemented international energy management systems, completed and developed a baseline of its energy use and is committed to continual improvement in energy performance. ISO 50001 is designed for widespread use by all industries (power, oil and gas, manufacturing, transport, etc.), buildings and other organizations; thus it is applicable beyond shipping. The use of ISO 50001 is expected to be driven by factors such as regulatory/legislative developments, corporate social responsibility (CSR), environmental management programs as well as the economic benefits of energy and CO<sub>2</sub> reductions.

As discussed in previous section, ISO 50001 is based on a standard management system model based on the Plan-Do-Check-Act approach already employed in ISO 9001, ISO 14001 and IMO SEEMP. Figure 35.1.1 shows the continual improvement process of the ISO 50001.



Source: ISO 50001:2011

Figure 35.1.1 – ISO 50001 energy management cycle [ISO 50001]

The Plan-Do-Check-Act features of the IMO 50001 are best shown in Figure 35.1.2 where various sections of ISO 50001 are shown together with the standard relevant headlines.

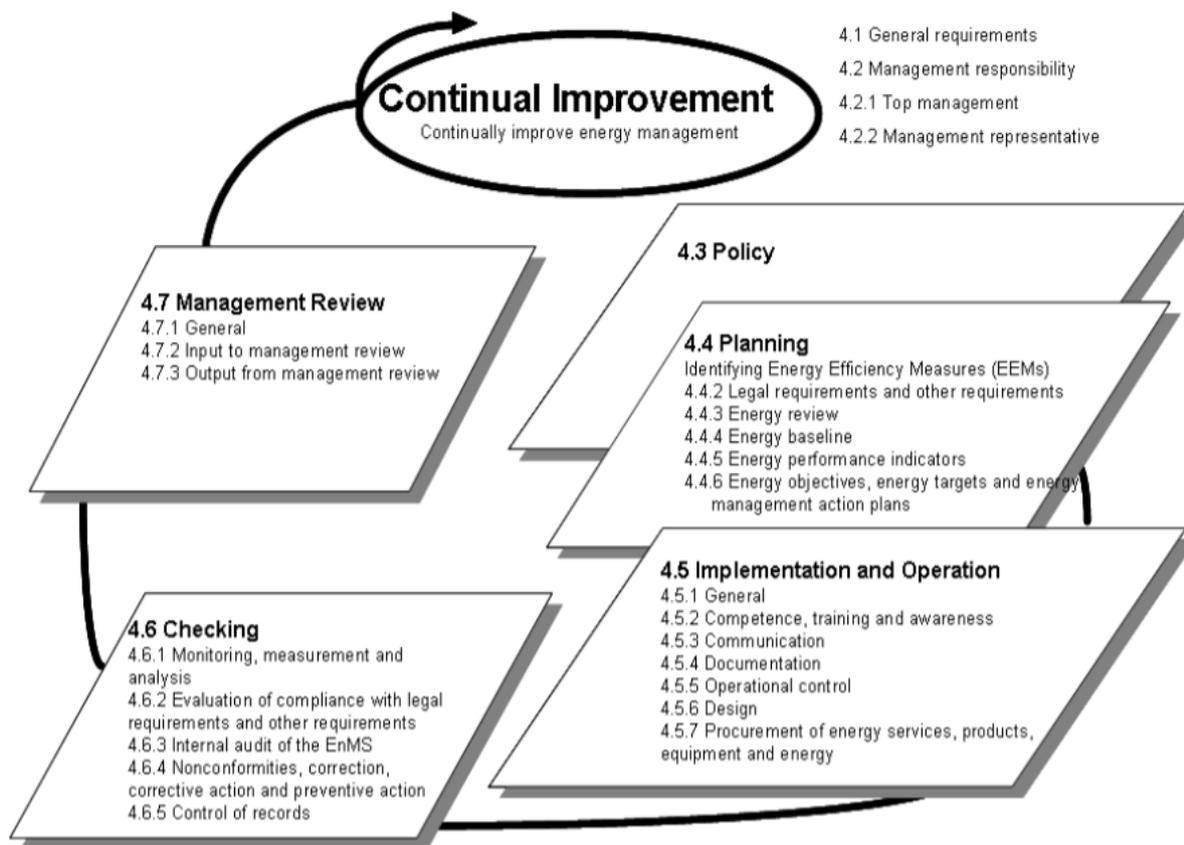


Figure 35.1.2 – Structure of ISO 50001 [Bazari 2012]

In order to develop and implement the ISO 50001, normally some level of preparatory work needs to be undertaken. These include, inter alia, aspects such as:

- Development of an energy policy that includes commitment to the EnMS from top management



- Assignment of a management representative to lead the implementation of the EnMS
- Establishment of a team from various departments that have influence on ship fuel procurement, treatment, storage and use.

Upon completion of the preparatory work, the steps towards planning for implementation of an EnMS could include aspects such as:

- Undertaking an energy review to identify significant energy users, their energy consumption, and opportunities for improvement
- Establishment of energy baselines for the company and various facilities
- Identification of energy performance indicators and benchmarks for tracking energy performance improvement against the baseline.

### **35.2 Target Setting and Performance Criteria**

ISO 50001 does not prescribe specific performance criteria or target levels with respect to energy efficiency performance; however, it requires the organization to continually improve energy performance. For a shipping company this practically implies that it should select key performance indicators in order to demonstrate improved energy performance. IMO has developed the Energy Efficiency Operational Indicator (EEOI), which may be used as a performance indicator for a company when applying the EnMS to shipping. Of course, other indicators may be used for this purpose.

### **35.3 Scope of EnMS**

A shipping company EnMS will include features that need to be undertaken both at head office and on-board ships. The ship-related aspects include:

- Defining each ship's energy efficiency measures (EEMs).
- Documenting each ship EEMs and their implementation, monitoring and improvement processes.
- Implementation of energy saving projects on-board ships.

The above will normally be included in a ship's SEEMP. The shipping company's EnMS should also include provisions for activities at shore-based offices. These include, but not limited, to the following activities:

- Planning improvement and management of the whole fleet energy efficiency.
- Gathering of fleet (all ships) information with a view to benchmarking and data sharing.
- Analysis and evaluation of actual state of energy use by ships in a fleet.
- Preparation of the SEEMP for each ship and its implementation and monitoring activities.
- Fleet benchmarking, monitoring and reporting to top management.

As will be argued in the following Section, the application of EnMS in a shipping company should be fully in harmony with ship-board SEEMP and vice a versa.

### **35.4 Certification**



There are a large number of companies who offer ISO 50001 certification. These are normally accredited certification bodies via their national standardisation agencies (e.g. British Standard in the case of UK) that are competent to certify organizations for conformance to ISO 50001. These companies normally employ certified ISO 50001 auditors to assess an organization's or company's compliance to ISO 50001. As discussed earlier, in shipping, normally classification societies provide these services.

It should be noted that ISO 50001 certification is voluntary and companies are free to take action to start improving energy management without becoming certified. However, certification to ISO 50001 provides a structured approach that incorporates energy management into company culture, resulting in sustained energy savings and continual improvements in energy performance over time.

This can help justify initial investments in energy projects and ensure return on investment. Without a structured approach, there is no guarantee that energy savings will be sustained or that return on investment will be maximised. As such, the certification is a useful exercise and is highly recommended.

### **35.5 Responsibilities**

Within ISO 5001, definition of roles and responsibilities for various activities are foreseen. Amongst these, the responsibility of top management is crucial. Within ISO 50001, a significant responsibility is given to top management. Accordingly, top management shall demonstrate its commitment to support the EnMS and to continually improve its effectiveness by:

- Defining, establishing, implementing and maintaining an energy policy;
- Appointing a management representative and approving the formation of an energy management team;
- Providing the resources needed to establish, implement, maintain and improve the EnMS and the resulting energy performance;
- Identifying the scope and boundaries to be addressed by the EnMS;
- Communicating the importance of energy management to those in the organization;
- Ensuring that energy objectives and targets are established;
- Ensuring that “energy performance indicators” are appropriate to the organization;
- Considering energy performance in long-term planning;
- Ensuring that results are measured and reported at determined intervals;
- Conducting management reviews.

Top management should also appoint a management representative(s) with appropriate skills and competence with responsibility and authority to:

- Ensure the EnMS is established, implemented, maintained, and continually improved;
- Identify person(s), to work with the management representative in support of energy management activities (energy team);
- Report to top management on the actual and the performance of the EnMS;



- Ensure that the planning of energy management activities is designed to support the organization's energy policy;
- Define and communicate responsibilities and authorities in order to facilitate effective energy management;
- Determine criteria and methods needed to ensure that both the operation and control of the EnMS are effective;
- Promote awareness of the energy policy and objectives.

Other roles and responsibilities needs to be defined according to the requirements.

### **35.6 Energy Policy**

ISO 50001 requires that a company should have an “energy policy”. Accordingly, the energy policy shall state the organization's commitment to achieving energy performance improvement. This energy policy shall be defined and endorsed by top management and ensure that it:

- Is appropriate to the nature and scale of the organization's energy use and consumption;
- Includes a commitment to continual improvement in energy performance;
- Includes a commitment to ensure the availability of information and of necessary resources to achieve objectives and targets;
- Includes a commitment to comply with applicable legal and other requirements;
- Provides the framework for setting and reviewing energy objectives and targets;
- Supports the purchase of energy-efficient products and services, and design for energy performance improvement;
- Is documented and communicated at all levels within the organisation?
- Is regularly reviewed, and updated as necessary.

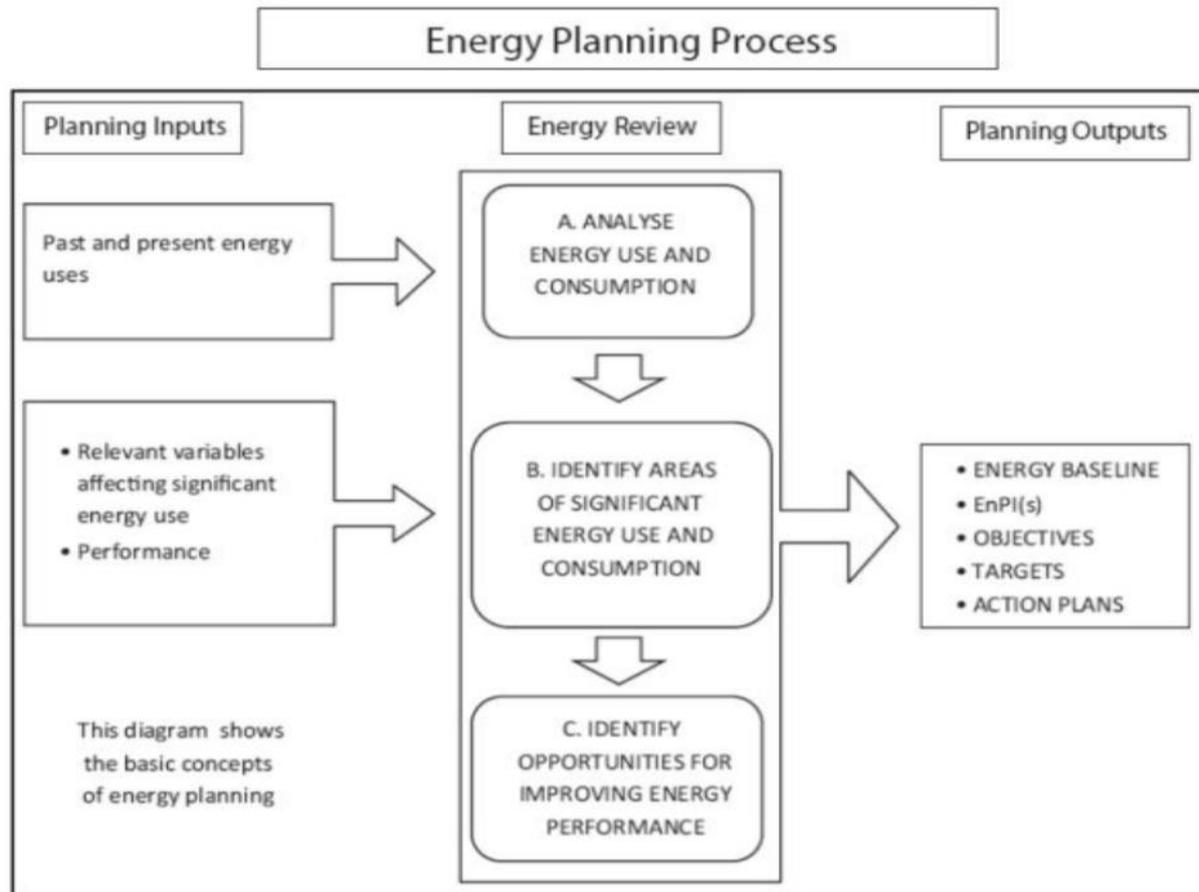
The energy policy is one of the first documents that need to be prepared as it will show the intentions of the top management. All other planning activities then will be based on energy policy.

### **35.7 Planning**

ISO 50001 requires that the company shall conduct and document an “energy planning” process. Accordingly:

- Energy planning shall be consistent with the energy policy and shall lead to activities that continually improve energy performance.
- Energy planning shall involve a review of the organization's activities that can affect energy performance.

A concept diagram illustrating energy planning processes is shown in Figure 35.7.1 that at its heart requires an “energy review” of the company.



Source: ISO 50001:2011

**Figure 35.7.1 – ISO 5001 energy planning process [ISO 50001]**

ISO 5001 stipulates that based on this, the company shall develop, record and maintain an energy review. The “energy review” advocated by ISO 50001 is similar to an “energy audit”. The output of energy review will include the following:

- Energy baseline(s)
- Energy performance indicators
- Objectives,
- Targets
- Energy efficiency measures

The above outputs will be directly used for the design and implementation of the EnMS.

### 35.8 Monitoring

ISO 50001 stipulates that the company shall ensure that the key characteristics of its operations that determine energy performance are monitored, measured and analysed at planned intervals. A combination of methods such as performance monitoring, etc. is advocated by the ISO 50001. ISO 5001 also advocates the effective use of internal audits as a monitoring method. Accordingly, an audit plan shall be developed taking into consideration the importance of the processes and areas to be audited as well as the results of previous audits. Records of the audit results shall be maintained and reported to top management



### 35.9 Management Review

Within ISO 50001, the management review has been clarified and is a requirement. For the review purposes, some inputs to management review meetings are required and some output is expected to be generated. Inputs to the management review include:

- Follow-up actions from previous management reviews;
- Review of the energy policy;
- Review of energy performance and related indicators;
- Results of the evaluation of compliance with legal and other requirements;
- The extent to which the energy objectives and targets have been met;
- The EnMS audit results;
- The status of corrective actions and preventive actions;
- Projected energy performance for the following period;
- Recommendations for improvement.

Outputs from the management review are expected to be items such as:

- Changes in the energy performance of the organization;
- Changes to the energy policy;
- Changes to the energy performance indicators;
- Changes to objectives, targets or other elements of the EnMS.
- Changes to allocation of resources.

Based on the above outputs, a new cycle of continual improvement will begin.

### 35.10 Summary points

In this section, the main aspects of the ISO 50001 standard on “energy management system” are described. It was advocated that a company EnMS is a useful, structured and systematic way for improving the corporate energy performance. Although the development of an EnMS is a voluntary undertaking by a company, its implementation by shipping companies will help them with more effective compliance with the IMO energy efficiency regulatory framework, environmental (climate change) protection and energy (fuel) cost savings. For the development of the company EnMS, ISO 50001:2011 provides the best-practice available framework. ISO 50001 requirements include development of an energy policy, performing energy reviews, identification of energy performance indicators and baselines, defining various energy efficiency projects and action planning and effective use of monitoring techniques and internal audits and management reviews. Also, ISO 50001 require full commitment by the top management that will be reflected in a written “energy policy” and effective review of the system in formal EnMS performance review meetings. Certification for ISO 50001 is not mandatory but having a certificate is part of best-practice and a way of demonstrating to external organisations that company’s EnMS is fully in place.

### 35.11 References and further reading



The following list provides references for this section and additional publications that may be used for more in-depth study of topics covered in this section:

1. ISO 50001:2011 “Energy management systems -- Requirements with guidance for use”, ISO publications.
2. ISO website, “ISO 50001 - Energy management”, <http://www.iso.org/iso/home/standards/management-standards/iso50001.htm>, viewed Dec 2016.
3. ISO brochure “Win the energy challenge with ISO 50001”, [http://www.iso.org/iso/iso\\_50001\\_energy.pdf](http://www.iso.org/iso/iso_50001_energy.pdf), viewed Dec 2016.
4. “IMO train the trainer course material”, developed by WMU, 2013.