

# Energy strategy implementation – eco-management approach

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**Abstract** – The series ISO 14001 of international voluntary standards is an effective tool for improving organizational environmental performance and implementation of sustainable approach to energy management. These standards established and implemented a systematic management plan. Plan is made to continually identify and reduce environmental impacts. Eco-management approach may be suitable because its implementation is a possible way to replace the widely used environmental control system based on legislation and controlling of the application of environmental and energy regulations. Eco-management systems can help companies to integrate environmental efforts into decision making. Application of eco-management system improves compliance with environmental regulations. Today, the number of companies in the world which tend to integrate the system of eco-management in their business strategies is rapidly increasing. They accept advanced technologies. Systems of eco-management encourage companies to consider environmental consequences of their operations. To reduce waste, risks and costs the companies then define strategies which would help them.

**Keywords** – Energy strategy, Implementation, Eco-management.

## 1. Introduction

Eco-management is a formal approach to setting goals, decision making, information gathering, and measuring progress [1]. Certain elements of eco-management provide an opportunity for implementation of assessment and evaluation by the management. A description of the implementation of sustainable energy management system by using eco-management is given in Figure 1. [2].

Eco-management approach is based on documented policy that actuates three key principles. They are in compliance with changing environmental regulations, and continuous improvement of environmental performance [3]. Corporate policy sometimes can be complex and general. In that way it is less clear to employees and the public [4].

Eco-management system identifies and adapts standards related to the work of employees and business partners. Voluntary recommendations include pollution prevention program and also health and safety prevention and sustainable development [5, 6]. The system of eco-management elaborates procedures and objectives [7]. Also it determines environmental responsibility and the ways to respond to the requests of individuals, companies and other interested parties [8].

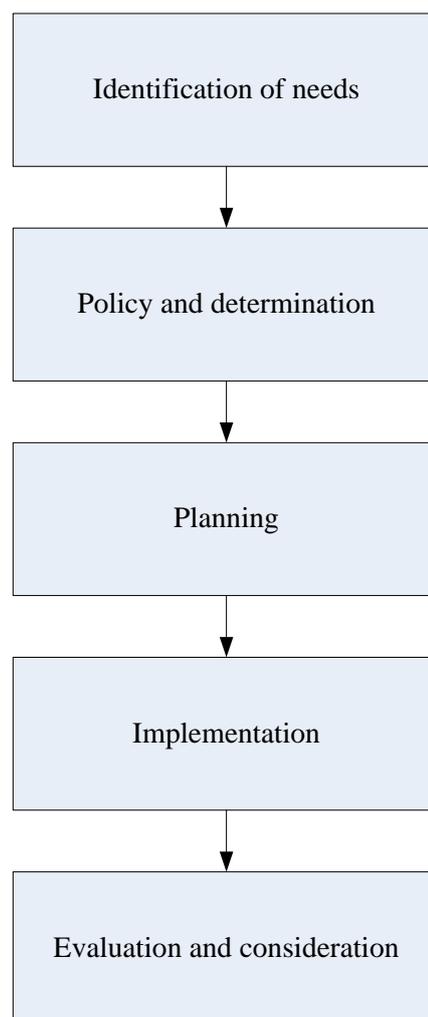


Figure 1. Implementation of the program of sustainable management of energy by application of eco-management approach

Identification of all aspects and their significance is usually the biggest problem in most companies. Because of that, the system of eco-management determines procedures necessary for identification of environmental impacts of business activities and services. Most companies are focused on their negative environmental impacts. Positive environmental impacts are also important, such as recycling [9, 10].

## 2. Identification of needs

The aim of the standard is to establish a common approach to eco-management. The ISO 14001 standard is a standard of the management system [11]. Eco-management provides the system approach for the integration of environmental protection in the business functions and management strategies. It requires developing appropriate business policy by top management. Eco-management approach involves several initial activities that are shown in Figure 2. [12].

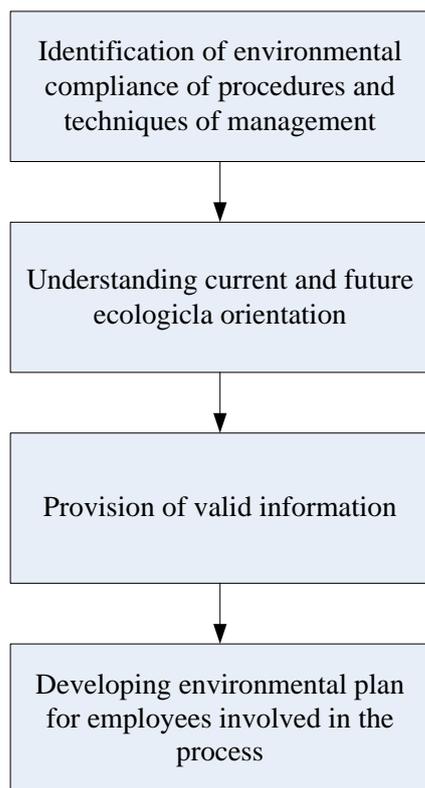


Figure 2. Identification of needs

Many companies analyze the existing energy system as an initial step in the development of the eco-management system. In this way the company is able to review the current status of its own energy performance. They identify areas that require attention when applying eco-management system.

## 3. Environmental policy and determination

The management develops the vision and directions of development of energy system in accordance with the environmental assessment of performance. When defining the energy policy, the management should define the scope of observation. The management must to ensure in consistency with organizational vision, core values, goals and other efforts. The energy policy of the company should include determination to implement pollution prevention program [13]. Defining environmental policy is summarized in Figure 3.

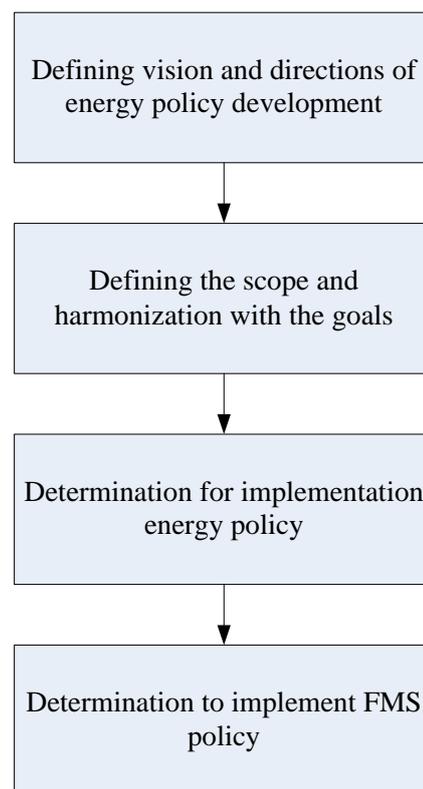


Figure 3. Defining energy policy.

Energy policy is used as a specific guide for developing and understanding organizational energy goals. Eco-management standard does not require defining specific energy goals. It provides general network for company and implementation of goals. These goals are necessary for improving energy performance [14].

Energy policy must be documented, updated and delivered to employees to use it. Many companies already have developed procedures on internal and external communication with their own policy. Eco-management standard recommends announcing the energy policy of the company in public. Annual reports and plans for dealing with emergencies have some environmental and energy information of the company [15].

Eco-management system defines the procedure for responding to external demands for environmental and energy information. Procedures determine who is responsible for contacts, who notes the date and the nature of the request, response, and whether and what kind of written material is sent in reply.

Eco-management also recommends that companies develop and implement procedures for the purpose of internal communication with eco-management policy. All levels of company and business functions that may have an impact on the environment should be associated with eco-management system [16]. Changes may include environmental information, such as review of the objectives, changes in procedures, environmental incidents, etc.

#### 4. Planning

As the company grows and as production lines change, the planning is necessary. The stage of planning within sustainable energy management is summarized in Figure 4.

Insufficiently focused or badly managed will inevitably lead to poor implementation of energy performance. Well developed and effectively implemented programs lead to the achievement of high performance and cost reduction [17]. Important benefit for most companies that use the system of eco-management is improved energy performance. Some companies work under the system of eco-management which systematically follows up environmental activities. Such system of eco-management covers organizational structure, procedures, processes and resources which are needed to implement effective environmental management.

Top management shows the company managers who will monitor the achievement of the objectives set out in the system of eco-management. Managers are in charge to monitor and evaluate the system and report to top management about eco-management activities. Coordinators work with lower organizational levels. They try to generate new ideas that may lead to modification of the system of eco-management [18].

*The identification of aspects and significant impacts.* The system of eco-management is essentially derived from environmental problems and encourages companies to systematically monitor the environmental impacts. This approach can be very effective and can encourage companies to take a proactive and sustainable approach to managing their

environmental impacts and programs. Aspects of impact are elements of organizational activities, products or services which may affect the environment. The organizational aspects may include generation of waste and pollution, use of resources, use and losses of energy and other environmental impacts. Some basic planning activities which are used to implement sustainable energy management are [19]:

- Identification of activities, products and services which have environmental impact
- Identification of legal recommendations in the field of energy which influence organizational activities, products and services
- Ecological impacts of energy consumption according to the degree of importance
- Setting goals whose achievement reduces negative environmental impacts generated by the use of energy
- Selection and implementation of activities during the eco-management program which are necessary for achieving the desired goals.

Planning can serve as a key element of the eco-management plan. Planned assessment is a systematic, periodic research of organizational operations designed to identify potential areas for change of energy performance. Adequate designed system of eco-management can have a greater range than the traditional approach to energy management. The company should consider the use of energy and water, conservation of landscape, the problem of noise and other impacts. In addition, company may request information from its information suppliers about the content of certain materials, the method and type of packaging and delivery [20]. A particularly important aspect of environmental impact includes consideration of the state of the control systems in energy management. The company should develop appropriate criteria for determining the degree of significance of these effects. Criteria may include regulatory activities, management costs and risks associated with the use of energy resources.

*Identification of objectives and targets.* The goals of eco-management are the most important place in the process of achieving the planned efforts to implement sustainable energy management. Objectives are general environmental efforts that the company wants to accomplish, while goals are detailed performances which are recommended in order to achieve the previously defined environmental efforts [21]. The goals have to be consistent with the existing organizational environmental policy.

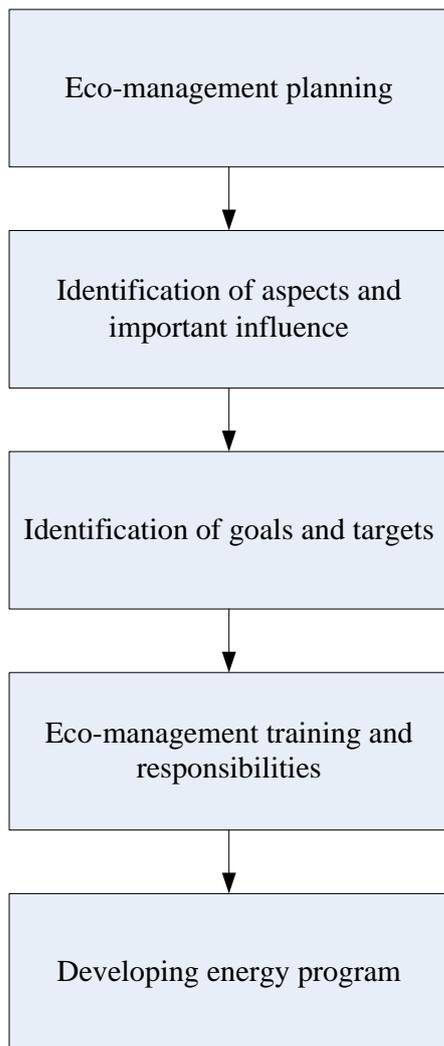


Figure 4. Eco-management planning

If achievable and measurable goals are set the program techniques are the most successful. In the stage of determining the goals, the company should consider the significant environmental impacts. On this level, the possibility to return on investment should be considered. Eco-management approach encourages innovative solutions to the problems of using energy. The objectives must be documented for all levels and business functions of the company which may affect the environment. In short, the eco-management standard recommends companies to set their own goals to reduce harmful environmental impact [22]. The companies choose the activities which lead them to achieving their goals.

*Training and accountability.* After defining the goals it is necessary to conduct appropriate training. The employees must be familiar with their own environmental responsibility and trained to behave as environmentally responsible. Depending on the situation it is necessary to develop appropriate training that is required in order to achieve the desired objectives and integrate it into the existing

environmental programs. Training should provide opportunity to include all employees in the implementation of sustainable energy management. Experience has shown that quality training of the participants is one of the most important factors for successful implementation of the program.

After training for all employees, the company will soon receive numerous proposals from the employees about how to improve certain activities. Depending on the nature of the program, each company will predict the level of knowledge of each employee.

*Developing energy program.* The last element of the planning within eco-management system is the formation of eco-management program. The program should contain an action plan, specified responsibilities at all organizational levels, the execution plan, timeline and resources required to meet objectives. After formation of the program, each individual who has certain responsibilities develops his/her own plan [23]. In this way the stage of achieving goals is separated from the stage of planning, but closely related. The company may have a different number of eco-management programs. Each company should follow the implementation of eco-management programs and make adjustments as needed.

## 5. Implementation

There is a clear need to conduct a careful evaluation of the ways in which the implementation of eco-management system would affect organizational energy performance. It is necessary to decide how to incorporate the eco-management approach into the existing environmental regulations [24]. The stage of implementation of eco-management system is represented in Figure 5.

The first sub stage of implementation involves the development and control of documents. Most companies have already developed procedures for monitoring energy processes. It is important that companies make their own documentation whenever it is appropriate. The documentation provides an answer to the question of how to perform certain actions. System requirements have to be documented necessary for the operation. The documentation should be as clear and simple. Company team needs to identify differences in relation to existing documentation and, if necessary, initiate the creation of new procedures.

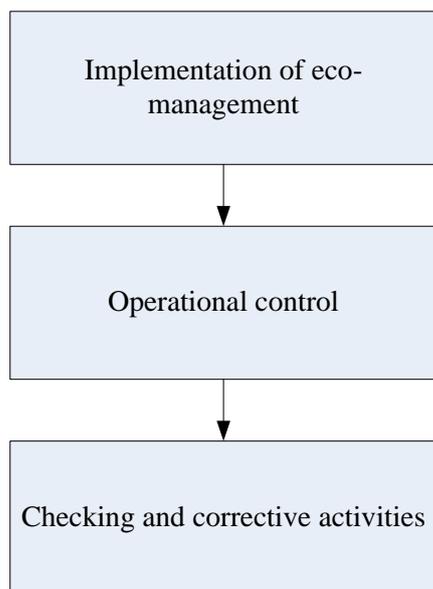


Figure 5. Implementation of eco-management system

Operational control develops procedures for performing certain activities, defines the operational criteria and preventive and corrective measures. Implementation of operational control is the working part of eco-management system [25]. Procedures are instructions which organization uses to implement environmental activities. Written procedures are an essential element of operational control. They often lead to large deviations and discrepancies.

## 6. Evaluation and observation

Eco-management system requires certain procedures in terms of monitoring and measuring energy performance, collecting information needed to monitor and assess the potential for achieving the goals and the assessment of compliance with environmental regulations. A particularly critical moment is the determination as to what should be monitored and measured and which information needs to be collected. The evaluation phase and observation of the functioning of eco-management system is shown in Figure 4.

Eco-management measurements are used as indicators of energy performance. They must be in accordance with legal and other regulations. The number of indicators must be carefully determined. In order to conduct measuring in a high-quality way, it is necessary to determine who is responsible for monitoring, analyzing, collecting and processing data, the frequency of measurement required to obtain quality information, the way the data will be analyzed and the way in which the data would be presented.

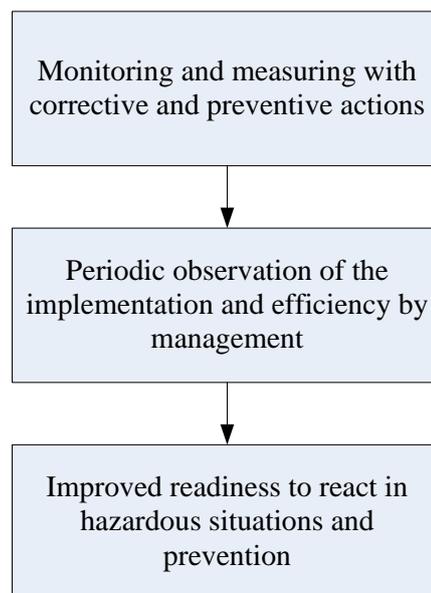


Figure 6. Evaluation and observation of the eco-management system of sustainable management of energy

The company may do monitoring every day or every hour, depending on the needs [26]. Monitoring will be used to determine the existence and character of the trend so that deviation can be quickly and easily identified. Monitoring of the eco-management performance is specific in that it requires monitoring at different levels of work and business functions. It is focused on employees and their effects.

The review and improvement by the management is conducted in order to provide continuous improvement. Continuous improvement is one of the basic characteristics of the systems approach. Top management should periodically examine the implementation of eco-management system and its efficiency [27]. Experience has shown that the efficiency of management directly affects the chances of successful implementation of eco-management system. Eco-management system is a business system that directs the organization to manage its environmental issues in a way that is based on continuous improvement. Eco-management system is focused primarily on the support to top management and involvement of all employees.

If discrepancies are identified during observation, the person responsible should determine the way in which adjustments will be implemented and how the system of prevention would be developed so as not to allow similar situations to repeat in the future [28]. Readiness to respond in emergency situations is a necessary step because these situations can happen in the best-prepared companies. In order to reduce the probability of such events to a minimum, the system of eco-management develops a system of procedures for the implementation of preventive measures.

Studies on the application of preventive and corrective measures and the ways of reacting in emergency situations must be integrated into the operational control procedures [29]. Procedures may include different changes which are necessary to make, from changes in the way of thinking of managers, to changes in the direct production. Preventive procedures should be perceived and updated when needed after an environmental accident or emergency situation.

## 7. Conclusion

Implementation of the strategy refers to running activities and resources of the company so as to achieve the set goals in accordance with the strategic orientation. The transition from traditional to sustainable energy management is a major strategic change. It involves huge utilization of all resources. Implementation of strategic orientation is not a single process but a process that involves provision and allocation of resources, creation of important conditions and making a series of individual plans for undertaking and coordinating activities for the realization of the objectives, taking into account sustainability of the environment. Besides, the implementation of the strategy of sustainable energy management is a never ending process. Implementation of the strategy of sustainable energy management is a complex process of creating conditions and integration of activities to achieve expected results. To manage these activities it is necessary to specify the responsibility and authority, to identify the tasks and budget and allocate them to the carriers.

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## Reference

- [1]. Energy Supply Security: The Emergency Response of IEA Countries – 2014 Edition.
- [2]. Sovacool B.K., Mukherjee, I., Drupady, I.M., D'Agostino, A.L., 2011. Evaluating energy security performance from 1990 to 2010 for eighteen countries, *Energy*, 36 (10), 5846-5853.
- [3]. Kanellakis, M. Martinopoulos, G., Zachariadis, T., 2013. European energy policy—A review. *Energy Policy*, 62, 1020–1030.
- [4]. Augutis, J., Krikstolaitis, R., Martisauskas, L., Peciulyte, S., 2012. Energy security level assessment technology. *Applied Energy*, 97, 143-149.
- [5]. Golušin, M., Muinitlak Ivanović, O., Andrejević, A., Vučenov, S., 2014. Survey of socio economic growth in SE Europe – new conceptual frame for sustainability metrics. *Journal of Economic Surveys*, 28 (1), 152–168.
- [6]. Vivoda, V.: Evaluating energy security in the Asia-Pacific region: A novel methodological approach. *Energy Policy*, 38 (9), 5258-5263.
- [7]. Umbach, F., 2010. Global energy security and the implications for the EU. *Energy Policy*, 38 (3), 1229 – 1240.
- [8]. Downs, E.S., 2014. The Chinese Security Debate, *The China Quarterly*, 177, 21-41.
- [9]. Chester, L., 2010. Conceptualizing energy security and making explicit its poly-emic nature. *Energy Policy*, 38 (2), 887-895.
- [10]. Cherp, A., Jewell, J., 2011. The three perspectives on energy security: intellectual history, disciplinary roots and the potential for integration. *Current Opinion in Environmental Sustainability*, 3, 1-11.
- [11]. Vosylius, E., Rakutis, V., Tvaronavčiene, M., 2013. Economic growth, sustainable development and energy security. *Journal of Security and Sustainability Issues*, 2 (3), 5-14.
- [12]. Savacool, B., Mukherjee, I., Drupady, I.N., D'Agostino, A.L., 2011. Evaluating energy security performance from 1990 to 2010 for eighteen countries. *Energy*, 36 (10), 5846-5853.
- [13]. Blum, H., Legey, L.F.L., 2012. The challenging economics of energy security: Ensuring energy benefits in support to sustainable development. *Energy Economics*, 34 (6), 1982-1989.
- [14]. Energy Security and Climate Policy, IEA, 2007.
- [15]. Risk of Energy Availability Common Corridors for Europe Supply Security, Summary Report, project funded by EC FP7 under the theme “Energy Security of Supply”, Final Workshop, Brussels May 13th, 2011.
- [16]. Martchamadol, J., Kumar, S., 2013. An aggregated energy security performance indicator. *Applied Energy*, 103, 653-670.
- [17]. Jansen, J.C., Seebregts, A.J., 2010. Long-term energy services security: what is it and how can it be measured and valued?. *Energy Policy*, 38 (4), 1654-1664.
- [18]. Geng, J.B., Ji, Q., 2014. Multi-perspective analysis of China's energy supply security. *Energy*, 64, 541-550.
- [19]. Booyesen, F., 2002. An Overview and Evaluation of Composite Indices of Development. *Social Indicators Research*, 59 (2), 115-151.
- [20]. The Routledge Handbook of Energy Security, Edited by Benjamin K. Savacool, Routledge, 2010.
- [21]. Golušin, M., Munitlak Ivanović, O., 2009. Definition, characteristics and state of indicators of sustainable development in countries of Southeastern Europe. *Agriculture, Ecosystems and Environment*, 130 (1-2) 67-74.
- [22]. Patlitzianas, K.D., Doukas, H., Kagiannas, A.G., Psarras, J., 2009. Sustainable energy policy indicators: Review and recommendations. *Renewable Energy*, 33 (5), 966-973.

- [23]. Yuan, J.H., Kang, J.G., Zhao, C.H., Hu, Z.G., 2008. Energy consumption and economic growth: Evidence from China at both aggregated and disaggregated levels. *Energy economics*. 30 (6), 3077-3094.
- [24]. Warr, B.S., Ayres, R.U., 2010. Evidence of causality between the quantity and quality of energy consumption and economic growth. *Energy*. 35 (4), 1688–1693.
- [25]. Fiorito, G., 2013. Can we use energy intensity to study “decoupling” in modern economies? *Journal of Cleaner Production*. 47, 465-473.
- [26]. Narayan, P.K., Smyth, R., 2008. Energy consumption and real GDP in G7 countries: New evidence from panel co-integration with structural breaks. *Energy Economics*. 30 (5), 2331-2341.
- [27]. Lambiri, D., Biagi, B., Royela, V., 2007. Quality of Life in the Economic and Urban Economic Literature. *Social Indicator Research*. 84 (1), 1-25.
- [28]. Valentine, S.V., 2011. Emerging symbiosis: Renewable energy and energy security. *Renewable and Sustainable Energy Reviews*. 15 (8), 4572-4578.
- [29]. Asif, M., Muneer, T., 2007. Energy supply, its demand and security issues for developed and emerging economies. *Renewable and Sustainable Energy Reviews*. 11 (7), 1388-1413.

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