

Shkarupa Olena Vasylivna,

*Candidate of Economic Sciences, Associate Professor,
Associate Professor of the Department of Economics and Business Administration,
Sumy State University (Sumy, Ukraine);*

Chasnyk Olena Mykolaivna,

*PhD Student of the Department of Economics and Business Administration,
Sumy State University (Sumy, Ukraine)*

SUSTAINABLE ENERGY MANAGEMENT IN A “GREEN” ECONOMY – THE CASE OF UKRAINE

The article deals with the economic foundations of sustainable energy management in a “green” economy which takes into account the main provisions of ISO 14001. The negative disadvantages of a “green” economy mechanism formation in Ukraine have been outlined. The principal fundamentals and stages of the sustainable energy management in a “green” economy implementation have been considered.

Keywords: energy, management, sustainable energy management, energy resources, “green” economy.

Problem statement. Due to the rapid economy development a large number of countries implement the environmental policy, where using of sustainable energy projects is important. The world community is interested in finding particular ways to solve economic and environmental problems and focuses on ecologization of all spheres of human activity, especially energy sphere.

Worldwide experience of energy production shows that developed countries search for alternative fossil fuels and increased consumption of alternative energy sources (Figure 1). World practice shows change of consumption structure and production of energy with a tendency to increasing share of renewable energy sources (RES) that lead to stable and predictable economic conditions.

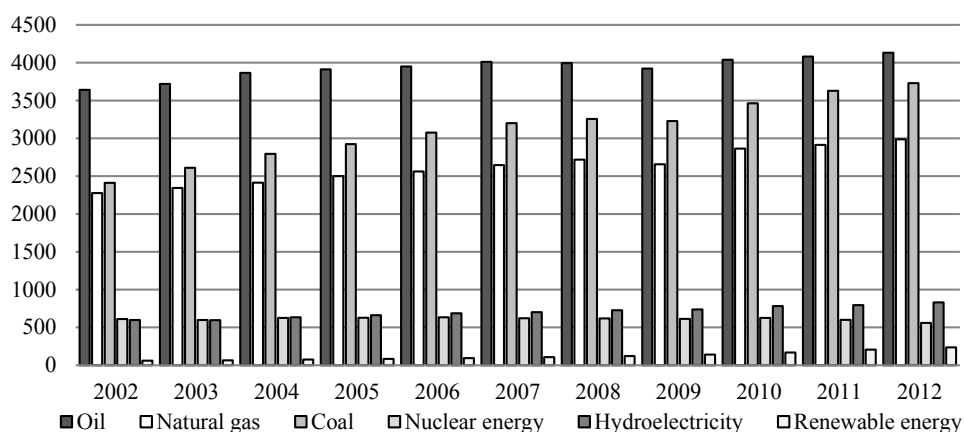


Figure 1 – Total world energy consumption, millions tones oil equivalent [1]

Ukraine has one of the most intensive energy economies in the world but lack of an effective system of forming principles of a “green” economy and non-effective actions of capacity development of resource-saving technologies are urgent problems for the economy of our country today. There is a need for fundamental changes in the principles and methods of management in Ukraine in current economic conditions. The old management system reveals its inability to adapt to new economic conditions. Thus, implementation of the energy sustainable development requires creation of the sustainable energy management system (SEMS).

Analysis of recent researches and publications. It should be noted that the existing of theoretical and methodological proposals for fuel and energy complex (FEC) and its management appears in works of Amosha A.I., Varlamov H.B., Velykyh K.O., Deineka A.H., Derhachova V.V. [2], Nedin I.V. [3], Snizhko S.V. [4], Chukaeva I.K.

Significant attention is paid to the research of sustainable development and “green” economy in works of Balatskyi O.F., Veklych O.O., Zharova L.V. [5], Karaieva N.V., Melnyk L.H. [6], Khlobystov Ye.V [7].

However, despite many researches there is an insufficient scientific development of management issues in FEC based on the concept of a green economy, lack of current economic mechanism for FEC’s enterprises for the implementation of the principles of a “green” economy, that’s why the investigated theme becomes urgent.

The aim of the article is the theoretical foundations concerning “green” economy mechanism of the sustainable energy management implementation, and outlining of the negative trends and main stages in Ukraine’s sustainable energy management.

Main material. FEC is recognized as priority sector of the Ukrainian national economy. The energy balance characterized directly proportional processes, decrease and increase in the share of natural gas and coal for 2%, accordingly, while the share of renewable energy sources remains unchanged from the previous year (2%).

Coal continues to be the weightiest in-house production of energy materials. It should be noted that the share of renewable energy sources (including hydro, geothermal, solar, wind energy and biofuels) remained about 2% compare to the 2011 [8]. The largest final consumers of energy resources in Ukraine in 2012 were industry (about 34%), residential sector (32%) and transport (about 16%). Such resource of intensive economic model demonstrates overtime consumption of energy resources, which leads to the formation of millions tons of waste slagheaps, thus the need of integrating of principles of ecologically sustainable development should be activated, new ways of generating and obtaining of the energy and ecologization of fuel and energy complex in Ukraine should be found [7].

Analyzing the data from the Table 1 it should be noted that Ukraine’s level of industrial development demonstrates the lowest rate of industrial production thus, it proves the need to develop a mechanism to implement the rapid development on the FEC’s enterprises. The most significant problems of the concrete implementation of a green economy in Ukraine are needs of huge investments and effective capacity development for resource-saving technologies. That why an actual problem is the implantation of the principles of a green economy and their financing. Unfortunately, the existing law in a green economy has been holding back the development of energy in Ukraine and contained some essential disadvantages (Figure 2), such as complicated procedure for green tariff obtaining and incorrect definition of terms that are introduced in the law.

Implantation of sustainable energy management in a green economy must be based on the principles of ISO 14000. As known the ISO 14000 provides an effective environmental management system in action. It is a standard established for industrial facilities for managing including all aspects of energy use.

Table 1 – Comparative characteristics of energy balance in 2012, (according to [1; 8])

	Country	Production		Consumption	
			% of world total		% of world total
Coal (million tones)	World	7790	100	7356	100
	Ukraine	64	0,82	77	1,05
Oil (million tones)	World	4015	100	3944	100
	Ukraine	5	0,12	12	0,30
Natural gas (billion cubic meters)	World	3455	100	3466	100
	Ukraine	20	0,58	53	1,53
Nuclear power (Twh)	World	2195	100	560,4	100
	Ukraine	85	3,87	20,4	3,64
Hydroelectricity (million tones)	World	–	–	831	100
	Ukraine	–	–	2,4	0,29
Renewable energy (million tones)	World	–	–	237,4	100
	Ukraine	–	–	0,1	0,04

Sustainable energy management establishes the structure and implementation of technical and management strategies that cut energy costs and greenhouse gas emissions [9]. So, in our opinion depending on a specific management model predicts the FEC adequate motivation to achieve effective environmental and economic result that balances two components: economic (cost of production, production volume, which usually increase) and environmental (indicators of the environmental impact that should be reduced).

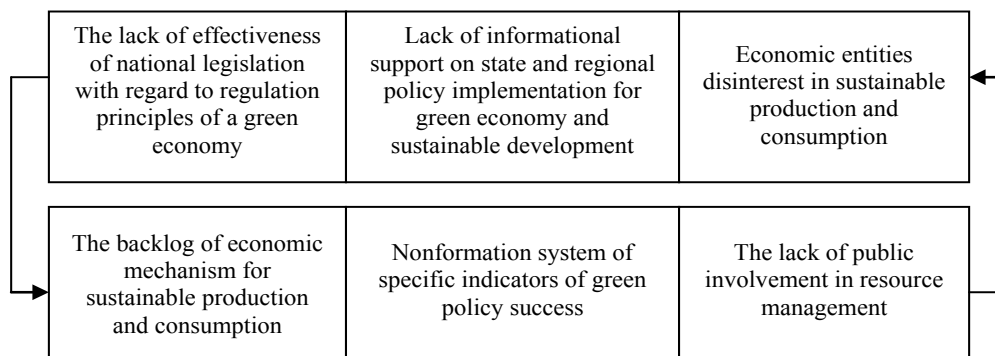


Figure 2 – Negative trends of formation mechanism of a “green” economy in Ukraine

ISO 14000 provides enterprises with implementation of sustainable energy management and addresses the following:

1) *develop an environmental policy* for FEC's enterprises – a document of principles for organization and definition of environmental objectives and targets for FEC. Environmental policy should reflect the scale, nature and environmental impact. Environmental policy, among others, must contain a statement of desire for compliance, as well as to the “continuous improvement”;

2) *develop of environmental objectives and targets* should be based on environmental policy and are defined for each function and level of the FEC's organization;

3) *develop of a program of sustainable energy management*, which should define the responsibilities, the means and time frames for achieving of objectives and targets.

In our opinion, perfection of sustainable energy management is targeting at solving of the following issues [2; 4-6]:

- production efficiency (stimulation of rational using energy resources);
- promoting a positive environmental image of FEC's enterprises;
- increasing investment opportunities in the development of sustainable energy management;
- adaptation of national energy system to the terms of a green economy;
- establishment of appropriate environmental policy for FEC's enterprises;
- ensure responsibility for violations of set mode for energy management.

Effective sustainable energy management is possible only when it is based on the use of a complex set of actions. The main stages of the sustainable energy management implementation are showed on Figure 3.

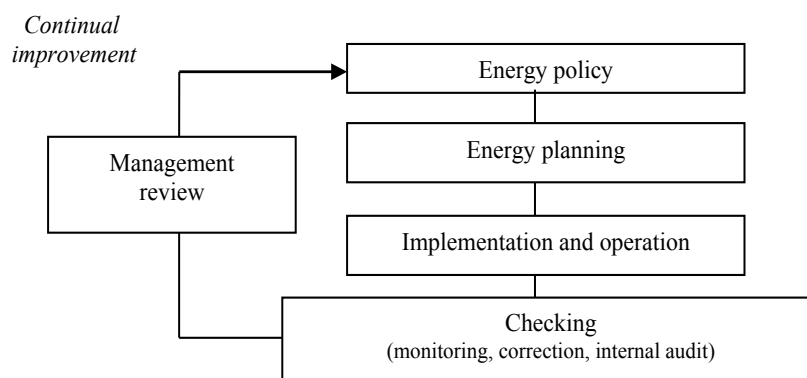


Figure 3 – Sustainable energy management model, (based on [10])

The main stages are:

- **planning** (assessment of enterprise's capabilities; energy strategy formulation; energy strategy execution; evaluation or sustainment);
- **implementation and operation** (financing support; establishing an implementation of the team to get the best results; adapt the management system; motivate staff involvement with training and incentives; regularly review system for being sure you are continually improving it);

– **checking:**

1) *monitoring* (FEC’s enterprises shall monitor or measure the main parameters of the activities that can have a significant impact on the environment. Procedures shall be established for periodic inspection of compliance with applicable legal and other requirements);

2) *correction* (correct deficiencies in FEC’s activity associated with using outdated techniques that do not satisfy norms and standards namely amendments, changes in plans and projects);

3) *internal audit* (should conduct periodic energy management system audits to ascertain whether it meets the criteria set by the enterprises, as well as the requirements of ISO 14001, implemented and whether if it is working properly. An audit may be conducted by both the company and outside. The audit results are reported to the enterprises in the form of reporting documents and statistical data);

– **management review** (management shall periodically review the work of the sustainable energy management system in terms of its adequacy and effectiveness. We must be sure when consider the question of the necessary changes in energy policy, objectives and other elements of the SEMS.

The results of the audit, the changed circumstances and the desire for “continuous improvement” should be taken into consideration. Implementation of sustainable energy management elements requires the creation of the management center, which should operate with monitoring and improving ecological and economic parameters of energy enterprises. Management center should provide gradual reduction and also the neutralization of the negative aspects of FEC’s enterprise, and should ensure accounting measures for short and long term of activity (Table 2).

Table 2 – Actions toward sustainable energy management for Ukraine

Short term	Long term
National and regional energy plan. Provide national policies for investments. Financing instruments supports of national initiatives. Technical support for policy creation. Regulatory support for sustainable business. Develop standards for efficiency, safety, and emission reduction, based on monitoring and certification. Knowledge management, ecological education	Provide policies, regulatory frameworks, and standards implemented at all levels to achieve nationally objectives. Growing investment potential. Create sustainable energy management model and technology innovation. Provide regulatory support for sustainable business and financial models for renewable energy (including, sustainable electricity solutions)

A list of the proposed action (for short and long terms) should be changed depending on time and economic conditions. It should be noted that this list can be developed individually for each energy enterprise and be reflected on specifics of its activities. The implementation of sustainable energy management in a “green” economy requires motivational factors that will encourage the principles of a green economy and should provide constant improvement of FEC’s enterprises and it is necessary to take into account the following fundamentals for fuel and energy development [3; 9]:

- develop of a predictive model of technical equipment operation for the FEC's enterprises, which increase the level of innovative system;
- ensure adaptation of environmental and economic performance indicators in FEC (energy saving indicators, energy intensity, etc.) to the terms of ecologically sustainable development, through the functions of monitoring and reviewing;
- predict changes in production, consumption and supplying the fuel and energy resources, predict related cost and damages from the activities of FEC's enterprises;
- implement of a number of stimulus measures in the sphere of activation investment process (for example, creation of the state environmental fund for the FEC's development, attracting effective schemes of financing, etc.);
- ecological responsibility and introduction of penalties for environmental violations. For example, in some countries such as the UK, Sweden, Spain, Denmark, there is a system in which the state requires proof of financial ability to cover possible damage to the environment;
- application of saving resource and of wasteless technologies;
- ensure of a stable price setting for energy resources;
- decrease in high level of energy consumption through their rational use and energy efficiency improvements of the economy;
- improve environmental standards, regulations, norms, for influence on economic interests and behavior of economic entities;
- create a single environmental fund, on which environmental payments will be delivered (use of such money is only possible for environmental purposes with obligatory reflection in the enterprise reporting).

National government must focus on sustainable energy management, including renewables with supporting of all actions toward it. They can provide native renewable energy consumption, improve energy efficiency, they can also provide a technical, regulatory, investments support of energy projects or demonstrations, so it reduces environmental risk in future. All SEMS strategies can be used to predict adequate motivation of achievement an effective environmental and economic performance.

Conclusions and directions for further researches. The process of sustainable energy management in a “green” economy implementation must take into account specific characteristics and principles of the energy enterprises activity by combination environment and economic technologies of management. In our opinion, implantation of the principles of a green economy has to be accompanied by revision of each and all current national target programs, branch and regional strategies. System of energy management should be aimed at ecologization FEC through measures for improving of the whole structure of energy enterprise management. Ukraine's legislation requires changes, eliminating the problematic aspects of FEC's function and further improvements. Providing of a sustainable energy management in a “green” economy in the fuel and energy complex today is an important issue to ensure environmental safety and preconditions for the transition to a sustainable development of society.

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О.В. Шкарупа, канд. екон. наук, доцент, доцент кафедри економіки та бізнес-адміністрування, Сумський державний університет (м. Суми, Україна);

О.М. Часник, аспірант кафедри економіки та бізнес-адміністрування, Сумський державний університет (м. Суми, Україна)

Стале управління енергетикою в умовах “зеленої” економіки на прикладі України

У статті розглядаються економічні основи сталого енергетичного менеджменту в умовах “зеленої” економіки, що враховують основні положення міжнародного стандарту ISO 14001. Викладено основні недоліки механізму формування “зеленої” економіки в паливно-енергетичному комплексі України. Досліджено фундаментальні основи та етапи сталого енергетичного менеджменту для реалізації концепції “зеленої” економіки.

Ключові слова: енергія, управління, стале управління енергетикою, енергетичні ресурси, “зелена” економіка.

Е.В. Шкарупа, канд. екон. наук, доцент, доцент кафедри економіки і бізнес-адміністрування, Сумский государственный университет (г. Сумы, Украина);

Е.Н. Часник, аспирант кафедры экономики и бизнес-администрирования, Сумский государственный университет (г. Сумы, Украина)

Устойчивое управление энергетикой в условиях “зеленой” экономики на примере Украины

В статье рассматриваются экономические основы устойчивого энергетического менеджмента в условиях “зеленой” экономики, учитывающие основные положения международного стандарта ISO 14001. Изложены основные недостатки механизма формирования “зеленой” экономики в топливно-энергетическом комплексе Украины. Проанализированы фундаментальные основы и этапы устойчивого энергетического менеджмента для реализации концепции “зеленой” экономики.

Ключевые слова: энергия, управление, устойчивое управление энергетикой, энергетические ресурсы, “зеленая” экономика.

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