SERBIAN ENERGY EFFICIENCY PROBLEMS

by

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The aim of this paper is to analyze and explore the most suitable energy policy instruments for energy efficiency improvement in Serbia. The analysis has been carried out with a focus on energy indicators for Serbia and EU27. It encompasses a period of twenty-two years and is directed towards the consideration of amendments that need to be made in the National Energy Efficiency Policy. Despite constant attempts to improve and increase energy efficiency and to expand utilization of renewable energy sources, it seems that accomplished results are still very modest. The comparative analysis of the situation in the area of energy efficiency in Serbia and in the EU takes into consideration deficiencies in the energy policy in Serbia and proposed measures for overcoming them. The Multiple Criteria Decision Analysis method is used for analyzing the extent of key influences on success in the implementation of energy efficiency policy in Serbia and also for the interpretation of results. The analysis shows that identified energy policy instruments are such that the success in their implementation will depend on a reformed institutional approach. This method can be applied in any other country.

Key words: *energy policy, energy efficiency, energy consumption, multiple criteria decision analysis*

Introduction

Since there is no doubt that the efficient use of energy is a matter of general interest, and is in particular relevant to the struggle against climate change, amendments need to be made to energy efficiency policy in order to remove market barriers for the implementation and improvement of energy efficiency [1]. Energy policy instruments for the improvement of energy efficiency need to stimulate the market to higher efficiency but in such a way as to achieve cleaner environment, higher standard of living, more competitive industry and more reliable energy supply. In addition, they should be in line with actual market requirements and adjustable to changing market demands so that objectives are reached in an ideal way [2, 3].

Energy efficiency is determined by a large number of small and mutually independent factors. For that reason, there is no ideal energy indicator on the basis of which it is possible to estimate the energy efficiency of a region or a whole country. For example, energy intensity also depends on the structure of the national economy, which determines the Gross Domestic Product (GDP) and all other economic factors relating to the analyzed activity [4, 5].

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There are excellent energy policies all over the world led by the European Union (EU), which is an undisputed leader in energy efficiency and in the fight against climate change. However, attempts at the global level to reduce energy consumption have yielded no significant and expected results [6-11]. Therefore, the promotion of energy efficiency requires new, innovative approaches, the main characteristic of which is flexibility. This means that energy policy should be adaptable and innovative and it should be created, revised and implemented on an ongoing basis.

Europe has had increasingly more ambitious energy efficiency policies since the 1970s. Particularly since 2000, the pace of change has picked up significantly as energy efficiency gains ground as a priority. The most significant indication of policy direction in the EU has come through the energy efficiency action plans [12] and other documents [13-15].

There are numerous documents in Serbia today which provide detailed analyses of the current situation in the area of energy efficiency and which also propose measures for increasing energy efficiency. This is just one of necessary requirements for increasing energy efficiency; however, it is not sufficient by itself.

Energy efficiency concept

Energy efficiency concerns everything related to the prevention of energy losses within a system. Losses occur in energy transformation, transmission and distribution, as well as with end users. While the decrease of losses in the first three categories mainly depends on available technologies, the decrease of losses with end users needs to be resolved by both technical and non-technical measures. It is quite often possible to avoid unnecessary use of energy by better organization, better energy management and changes in the consumers' behavior and even their lifestyle. The last two are most difficult to achieve. Energy efficiency should be considered as an ongoing process which includes not only the avoidance of excessive use of energy and minimizing of energy losses but also monitoring of energy consumption in order to ensure that it is always at the minimum. To improve energy efficiency, it is necessary to [1]:

- *reduce* excessive and unnecessary use of energy by introducing legislation and energy policy which encourages changes of behavior,
- *reduce* energy losses by implementing energy efficiency improvement measures and by introducing new technologies,
- *monitor* energy consumption in order to get the full picture of energy consumption and consequences thereof, and
- *manage* energy consumption by improving operational and maintenance practice.

Energy efficiency should be understood as a set of organized activities which are implemented within the boundaries of a defined energy system with the aim of reducing the consumption of input energy, harmful gas emissions and energy costs with no change to the level of services performed. The definition itself indicates the complexity of the problem arising from the need to connect people, procedures and technologies in order to achieve consistent and permanent improvements in energy efficiency.

Energy efficiency should be considered as an instrument for achieving overall effectiveness in the use of resources, since the improvement of energy efficiency will enable the fulfillment of economic development objectives and mitigate climate changes. Energy efficiency is an instrument and not an objective [16].

The importance of energy efficiency in the economic sense is obvious if we consider the fact that energy costs typically account for 15-20% of the gross domestic product [17].

Considering the role that energy efficiency has in achieving the global goals of combating climate change, it is obvious that action needs to be coordinated at all levels – the international, regional and national – in order to secure appropriate surroundings for improving energy efficiency. The real force for change is at the local level. Energy policies should be developed in a manner that they can be easily implemented locally – in households, public services and companies.

An energy efficiency policy is in its essence a *program of market transformation*, consisting of strategic interventions that give rise to permanent change in the structure or function of markets for all energy efficient products/services/practices. Therefore, before we start with the preparation of a draft energy efficiency program, market assessment needs to be performed. The assessment of a market will reveal its maturity, which is extremely important since different measures have different effects and are appropriate for different markets, that is, for markets with differing maturity levels. This means that some measures can stimulate market development, while other measures can accelerate commercialization or increase the overall demand for energy efficient products and services. Market analysis is required in order to identify market forces that have to be strengthened through incentives or weakened by penalties. The measures should be carefully devised in order to overcome identified market barriers.

Evaluation of energy efficiency in Serbia

We are going to analyze here general energy situation and observe it on the basis of four energy indicators by comparing these values in Serbia and in EU 27 (iea.com database is used). Energy indicators used are [18]:

– total primary energy supply (TPES) per population [toe/capita],
– electricity consumption per population [kWh/capita],
– CO_2 emission per population [tCO_2/capita], and
– GDP (ppp) per population, (2005 US$/capita), (Purchasing Power Parity (ppp) calculations).

Figure 1 shows total primary energy consumption in the period from 1990 to 2011. By comparing the same indicators for Serbia and EU 27, the following can be concluded:

– TPES per population in Serbia is growing while the same consumption in EU 27 is in stagnation,
– TPES per population is significantly lower in comparison to EU 27, and
– the growth of TPES per population in Serbia causes particular concern since economic activities are significantly slowed down.

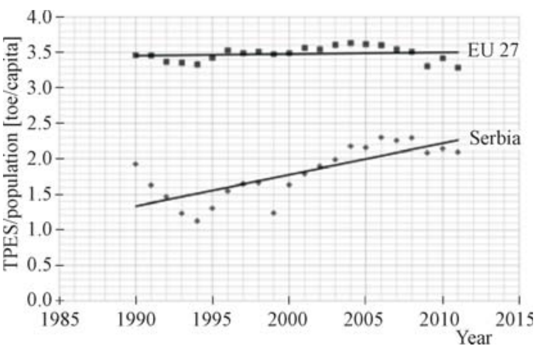

Figure 1. TPES per capita in the period 1990-2011

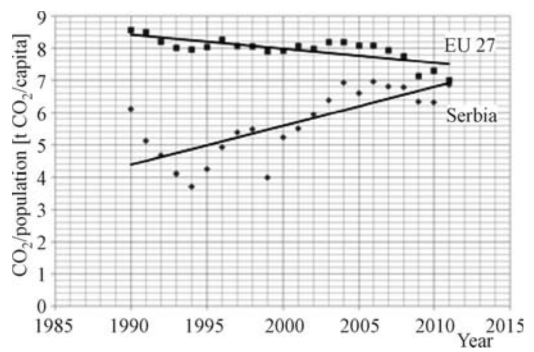

Figure 2. Electricity consumption per capita in the period 1990-2011

Figure 2 shows electricity consumption per capita in the same period. It can be said that:
- electricity consumption growth trend in Serbia and in EU 27 is almost identical, and
- the value of this energy indicator is around 1.7 times higher than in EU 27 in relation to Serbia.

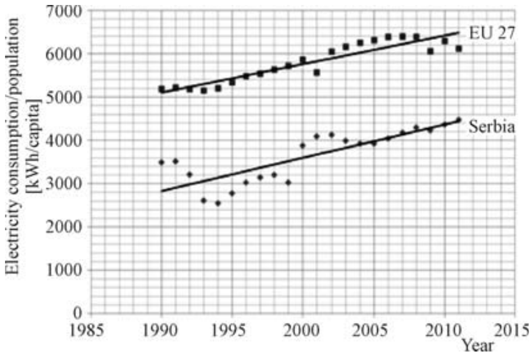

Figure 3. CO_2 emission per capita in the period 1990-2011

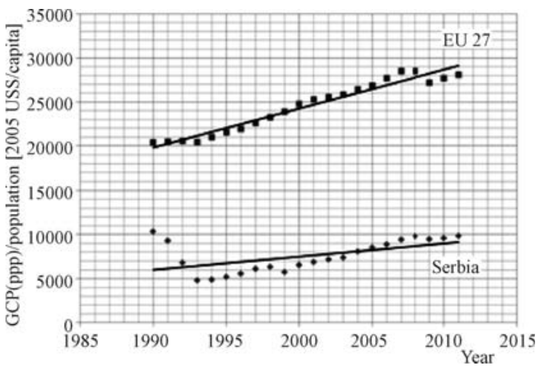

Figure 4. GDP (ppp) per capita in the period 1990-2011

Figure 3 shows CO_2 emission again per capita. It can be observed that there is:
- considerable growth of CO_2 emission in Serbia and at the same time this emission falls in EU 27, and
- although CO_2 emission per capita in Serbia is lower than in EU 27, the growth of this emission is not the consequence of economic growth but of the decline in energy efficiency and insufficient or almost no use of renewable energy sources.

Everything that has been said so far becomes very clear when Gross Domestic Product (GDP) per capita is included in the analysis. Figure 4 shows the values of this indicator for Serbia and EU 27. Realistic values were calculated in US$ for 2005. This diagram shows the following:
- economic activities in Serbia are at a very low level in comparison to EU 27,
- the growth of TPES, kWh, and CO_2 per population in Serbia is the result of increased energy consumption in non-productive activities instead of in industrial sectors. In addition, it is necessary to point out to the fact that in Serbia, there is a population decrease.

Table 1. Basic social and economic characteristics for Serbia and EU 27

SERBIA	EU 27
Slight decline of population	Very slight growth of population
Slowdown of economic growth	Stable economic development
Considerable growth in primary energy consumption per capita	Stagnation in the consumption of primary energy per capita
Growth in electrical energy consumption per capita	Growth in electrical energy consumption per capita
Considerable growth in carbon dioxide emissions per capita	Considerable fall in carbon dioxide emissions per capita
GDP (ppp)/per capita = 9,832 US$ (2005) in 2011	GDP (ppp)/per capita = 28,086 US$ (2005) in 2011

The energy indicators for Serbia, which is the subject matter of this paper, but also of EU 27 as the basis for comparison, will be considered in particular. EU 27 has been selected as one of the most advanced regions in the world when it comes to energy efficiency and the exploitation and development of renewable energy technologies. Its GDP per capita is one of the highest in the world (tab. 1).

Energy efficiency multi-criteria decision analysis for Serbia

Numerous documents have been enacted in EU to respond to three main concerns. They are: energy security, economic development, and environmental sustainability. In Serbia, although the majority of these numerous documents are accepted in principle, they have never been applied, or their application is still in an early stage. Even in regulated systems such as EU, application has not been possible without adequate political and financial support, and in Serbia both supports have failed.

Various factors that are involved in a political decision-making process on energy efficiency options are elaborated in [2]. In practice, the political picture is either more complex and involves a much larger set of detailed criteria or it is a multi-criteria problem. Each of these has its own weight in the overall decision-making process depending on both objective and subjective judgments. It is very important to emphasize that each of listed activities [2] must be implemented simultaneously. For example, it is not sufficient to enact rules on energy certification of buildings but fail to ensure sustainable financial schemes. In Serbia, such rules came into force in October 2012, but without adequate financial scheme, results cannot be expected.

The EU directives which have been mentioned several times in this paper focus national energy policies in great detail on the achievement of mutual sustainable energy development. It should be especially emphasized that these directives are subject to permanent coordination by means of amendments and supplements which satisfy the need for flexibility in energy efficiency policy. A characteristic of regulatory documents in Serbia is their very poor adaptability and flexibility.

In this paper, a multi-criteria energy efficiency analysis is performed by matching different criteria and objectives with a finite number of energy policy alternatives. The Multi-Criteria Decision Analysis (MCDA) is adopted as a method that has the ability to take into consideration all implications of energy policy with reference to the environment, economy and development. Relevant authors recognize MCDA techniques as an adequate approach for supporting energy policy because of multi-dimensionality of sustainability goals and complexity of socioeconomic and environmental issues [19]. Valuable conclusions can be derived from MCDA approaches in the form of general analytical framework incorporating multiple aspects for the assessment of EU energy efficiency (EE) and renewable energy (RES) targets and supporting policies [20].

Energy planning intends to determine the optimal mix of energy sources to satisfy given energy demand. In the past, energy planning was guided only by technical and economic criteria. Today, the major difficulty is the multi-faceted nature of the problem. We need to take into account not only quantitative (economic, technical) but also qualitative (environmental, social) criteria. Using the MCDA methodology, we can argue an answer to questions:

- would it be possible to cover energy demands of a region by developing EE and RES, and
- if yes, determine adequate EE and RES that can be exploited in the region by assessing suitability of alternatives with reference to environmental and socio-economic criteria and legislative constraints and facilities placed at national and local levels.

The factors given in [2] are used to define tasks that should be carried out. But, only after multi-criteria analysis, it is possible to establish the list of priority tasks. The tasks are taken into consideration on the basis of adopted and presented indicators.

Defining criteria

The practical implementation of energy efficiency policy is a very complex activity as it requires the fulfillment of a large number of criteria which differ by nature. The consideration and evaluation of the effects of these activities represent, then, a multi-dimensional problem. Multi-criteria analysis enables the consideration and evaluation of all aspects of energy efficiency policy in relation to defined criteria in an organized and systematic way and takes into account and assesses each individual criterion.

Each criterion is defined in the form of integrated objective which is of essential interest for individual holders of energy activities or energy users as an indicator of success in the implementation of the energy efficiency policy. The following criteria are involved.

K1 Achievement of the government's goals and objectives: long term development of the energy sector; energy transition; lower import dependency; geographical dispersion of sources; compatibility of energy systems.

K2 Accomplishment of economic interests: cheap and accessible energy for the economy; Possibilities for PPP (Public - Private Partnership), ESCO (Energy Service Company), *etc*.

K3 Achievement of tasks and goals of public companies and plants: efficiency of energy production and distribution; introduction of renewables; acceptable quality, price and diversity of energy; technical viability; cost effectiveness.

K4 Meeting social interests: reducing risks of energy system's breakdown, lack of energy and pollution; advancement of health, safety and environmental standards.

Determination of weighting factors for each criteria

Each of mentioned criteria has different significance in relation to other criteria in the group, regarding to desired effects on energy efficiency improvement. These effects are identified and quantified through comparing analysis of 4 indicators for Serbia and the EU27. The relative importance of certain criterion is then weighted or ranked by its adequacy and potential capability to improve concrete indicator. For example, for reducing energy intensity, accomplishment of K1 and K2 is dominantly effective and bring increasing concrete indicator in more extent than K3 and K4, respectively. This approach is applied for all criterion and all indicators and relative significances of criteria are summarized, assessed and then weighted in pair wise comparison matrix (tab. 2), which is typical for the AHP concept (Analytic Hierarchy Process). The estimation of relative importance of each criterion is done by Saaty scale [21] in accordance to previously determined adequacy and potential possibility to improve concrete indicators.

Energy indicators used for determining relative significances and accordingly weight factors are as follows.

I1 Energy intensity, expressed as TPES/GDP (ppp), (toe/2005 US$). In Serbia, this indicator is 0.25 and almost 2 times higher than in EU27 (0.14). This figure indicates that in Serbia, energy is not sufficiently used for creating new values. The criteria K1 and K2 have a dominant influence on improvement and change of the indicator's trend. K3 and K4 follow the first two criteria with lower importance.

I2 Consumption structure, expressed as TPES per population [toe/capita]. In Serbia, this indicator is 1.97 and lower by some 1.7 times in relation to EU27 (3.31). The other indicator is electricity consumption per population [kWh/capita]. In Serbia, this indicator is 4.23 and around 1.5 times lower in relation to the EU27 (6.07). This figure indicates poor structure of consumption and low economic activities and criteria K2 and K3 have a dominant influence on improvement and changing the indicator's trend. K1 and K4 follow the first two criteria respectively.

I3 National economy, expressed as GDP per population (US$ 2005/capita). In Serbia, this indicator is 9,832 and some 2.9 times lower than in EU27 (year 2011). This figure points out to low economic activities and to energy activity as a potential business opportunity and stimulation. Here, criteria K3 and K2 are dominant. Criteria K1 and K4 are less important.

I4 Environmental background, expressed as CO_2 per population [tCO_2/capita]. In Serbia, this indicator is 6.32 while in EU27 it is 12% higher (7.15). The other indicator is CO_2/TPES [tCO_2/toe]. In Serbia, this indicator is 3.20 while in EU27 it is 32% less (2.16). These figures show inadequate application of the health and safety standards, which is particularly important in the conditions of low economic activities. The other important conclusion concerns unfavorable consumption structure which primarily refers to inadequate use of electricity generated mostly from low-calorific coal. Here, the criteria K3 and K4 play a dominant role and K1 and K2 follow.

The method used for the analysis, valuation and weighting of criteria is pairwise comparison matrix (tab. 2), which is typical for the AHP concept (analytic hierarchy process). The estimation of relative importance of each criterion is done in accordance with previously determined adequacy and potential possibility to improve concrete indicators. The Saaty scale [21] is used for pairwise comparison, which numerically valuates intensity of relative importance in the following way: (1) – Equal importance (two criteria contribute equally to the objective), (2) – Weak or slight, (3) – Moderate importance (assessment slightly favors one criterion over another), (4) – Moderate plus, (5) – Strong importance, *etc*. Vectors of relative weights "Wc" are determined by normalizing geometric means of rows of the comparison matrix.

Table 2. The values of pairwise comparison

	K1	K2	K3	K4	Wc
K1	1.0	1/2	1/3	2.0	0.160
K2	2.0	1.0	1/2	3.0	0.277
K3	3.0	2.0	1.0	4.0	0.467
K4	1/2	1/3	1/4	1.0	0.095

The higher value of the criterion's weighting coefficient indicates that in Serbia there is a more pronounced need to apply efficiency policy measures to this specific criterion. In other words, it is more important to fulfill this criterion than another one with a lower weighting coefficient. In the case of Serbia, criterion K3 (Public companies and plants, goals and tasks achievement) has the most dominant influence.

Defining the importance of each criterion can be checked using the sensitivity analysis by changing the way the evaluation of criteria or alternatively changing the gaps in indicator analysis. The first option considers taking into account other parameters such as the potential to rationalize by application of a particular policy instrument, reducing consumption of imported fuel, stimulating the economy, *etc*. Such an approach will be the targeted use of presented energy indicators and comprehensiveness of analysis will be reduced. The second approach can explore future trends of key indicators and suggests correction of policy implementation.

Valuation of energy policy options in relation to criteria

The weighting of the influence of certain energy policy options against criteria is done by means of numerical values that represent the intensity of influence on defined criteria, that is, the achievement of objectives interpreted by criteria. Numerical values are defined in the following way: 0 – no influence; 0.2 – minor influence; 0.4 – general influence; 0.6 – strong influence; 0.8 – essential influence and 1 – crucial influence. The total score of any given energy policy option (*S*) is performed by the simple arithmetic operation Σ (weight of each criterion × score of energy policy option)$_i$. In this way, the amount of the total score (*S*) interprets the intensity of the concrete task's influence on the fulfillment of criteria and on ultimate achievement of EU indicators. Table 3 (on pages 692 and 693) shows scores for all tasks under consideration and shaded and bolded fields are those tasks with the highest total scores, that is, tasks which have the greatest influence on the fulfillment of defined criteria. Thus, these are tasks that are most lacking if satisfactory level for indicators is to be achieved. Tasks (energy policy options) are based on generally known attitudes and on [2].

Interpretation of results

Taking into account dominant energy policy options recognized in the intensity of influence analysis, it is possible to ascertain that the highest total scores are obtained for tasks which do not have exclusively technical character and that these relevant tasks can produce results in the mid-to long-term. The other observation is that responsibility for the majority of options (tasks) lies with competent institutions and bodies in Serbia. Based on these interpretations, it is possible to conclude that there is an absence of institutional commitment regarding energy issues. This implies the conclusion that the following is present in Serbia.

- Poor reception of energy efficiency policy by all stakeholders in energy activities in Serbia (inadequate recognition of energy as a resource).
- Slow and ineffective energy transition (the structure of sources and consumers is not changing).
- Insufficient use of available financial mechanisms (expensive capital, low IRR of energy efficiency projects, high discount rate, *etc*.).
- Undeveloped market in energy services.
- Inert local authorities (absence of energy planning, absence of consistent implementation of development strategies, lack of project ideas and developed projects, *etc*.).

Value of approach

The MCDA methodology consistently takes into consideration the multi-objective character of energy efficiency policy and opens up possibilities to determine how adequately particular policy option is to be implemented in the regional context, assessing the appropriateness of each policy option in relation to environmental, social and economic criteria and to legislative constraints. This can serve as an essential support to the policy.

Finally, the conclusions of MCDA can also assist in selecting strategic development paths, taking into account all specificities of the local society and economy.

Other applicable approaches are Multi-Attribute Decision Making (MADM) and Multi-Attribute Utility Theory (MAUT). These are methods and procedures that handle multiple attributes of alternatives (policy instruments) and can be a choice in the analysis of energy systems. This paper uses MCDA because of several reasons:

- national analysis is combined method (due to the different nature of information, different sources, different detail and reliability of data) and MCDA is more convenient because identifying applicable attributes (needed for MADM/MAUT) is a very challenging process with high uncertainty in case of energy policy analysis,

– MCDA ranks wide numbers of alternatives; MADM/MAUT is more suitable for identifying single most preferred alternative in a limited number of alternatives in subsequent detailed appraisal. This paper intends to involve numerous alternatives,
– MADM/MAUT ignores interactions among attributes that is unacceptable for the paper's objective. Tracing the path to successful implementation of energy policy attributes of policy instruments is interrelated and often very dependent, and
– MADM/MAUT brings better results when objectives are conflicting (need for decision making compromises) and has incomparable attributes. This is not a case in the process of energy policy's implementation.

Conclusions

Based on the analysis of several energy indicators and their comparison with EU 27 countries' indicators, it can be concluded that the results achieved in increasing energy efficiency are very modest in Serbia. Total primary energy supply, electricity consumption and CO_2 emission per population show growth even though there is stagnation in economic activities in the period covered by the analysis from 1990 to 2011.

It is determined that Serbia lags behind in the process of improving energy efficiency and probable reasons for this are indicated. The most important reason is inadequate and slow institutional organization and application of state instruments in order to implement strategies.

It is obvious that the preparation and drafting of one energy efficiency program is not one-off task. It is a continuous process that needs to create conditions for energy efficiency market to take appropriate decisions. Therefore, approaches to markets as complex systems of supply and demand interactions should be changed and this change should be directed towards efficiency, environmental benefits and social wellbeing. However, there are some barriers which prevent ideal functioning of energy efficiency market and based on these barriers a choice of energy efficiency policy instruments needs to be made. These instruments should be flexible so that they can respond to market requirements and enable the accomplishment of objectives in the best possible way, *i. e*., with the lowest possible cost to the society. Because of fast-changing market conditions, energy efficiency programs can no longer be in the form of documents which remain unchanged for years at a time. Evaluation of energy efficiency policy should become a frequent task. Future research work to support energy efficiency policy-making should, precisely for that reason, be directed towards the elaboration of methodologies that will be able to qualitatively and quantitatively evaluate the efficiency and cost-effectiveness of energy efficiency policy instruments and allow the selection of the best program of energy efficiency measures, depending on the current stage of development of the energy efficiency market.

Analysis of the current situation in Serbia shows that energy efficiency policies fail in accomplishing desired objectives in terms of reductions in energy consumption. The main reason lies in a lack of understanding and in a focus on capacities for the implementation of energy efficiency policy which are undeveloped, insufficient and inappropriate for the ambitious objectives that have been set. It must be understood that energy efficiency policy will not get implemented by itself and that capacities and capabilities are required in all social structures. Monitoring of the implementation of energy efficiency policy measures must be the top priority and the driving force for ongoing change and adjustment to energy efficiency policy.

The method used in this paper could be applied in analyzing the energy efficiency situation in any country.

Table 3. Results of analysis

Tech and Non-Tech	TASK (Energy policy options) / Criteria:	K1	K2	K3	K4	S
	Weight of each criterion:	0.16	0.28	0.47	0.09	
Building construction	Upgrading building construction	0.4	0.2	0.4	0.2	0.33
	Implementation of energy services in buildings	0.8	0.4	0.6	0.6	0.58
	Implementation of administrative buildings project	0.6	0.2	0.4	0.4	0.38
	Promotion of highly efficient technologies	0.8	0.4	0.4	0.4	0.46
	Education and training	0.8	0.2	0.2	0.8	0.35
	Improvement of performances in existing private buildings	0.6	0	0.2	0.6	0.25
	Financial schemes	0.6	0.8	0.8	0.6	0.75
	Assessment of needs for human resources development	0.4	0.2	0.4	0.2	0.33
Industry	Energy management	0.4	0.2	0	0.6	0.18
	Upgrading services in the area of RES and energy efficiency	1	0.6	0.2	0.8	0.50
	Production of electricity from RES	1	0.4	0.2	1	0.46
	Establishment of minimum standards for energy efficiency	0.8	0.4	0	0.6	0.30
	Acquiring new technologies and assessment of service life	0	0.6	0	0.2	0.19
	Intensified market transformation	0.8	0.8	0.2	0.2	0.46
	Monitoring market transformation and new incentives	0.6	0.4	0.2	0	0.30
	Assessment of needs for human resources development	0.4	0.2	0	0.2	0.14
Electric power plants, thermal power plants and utilities	Development of incentive schemes in RES and energy efficiency	1	0.6	0.8	0.4	0.74
	Distributed heat and power production	0.8	0.4	0.6	0.8	0.60
	Connection to the public distribution grid	0.4	0.4	0.6	0.6	0.51
	"Green" certificate	0.4	0	0.2	0.6	0.21
	"White" certificate	0.4	0	0.2	0.4	0.20
	Carbon trading and certification issues	0.2	0.4	0.4	0.2	0.35
	Legislation, standards and norms for fuels	0.8	0.6	0.8	0.4	0.71
	Assessment of needs for human resources development	0.4	0.2	0.4	0.2	0.33
Transport	Restructuring the whole national transport system	1	0.4	0.6	0.6	0.61
	Legislation, fiscal regime, fuel standards	0.6	0.4	0.2	0.6	0.36
	Supply chains for fuels and bio-fuels, and other fuels markets	0.6	0.4	0.4	0.8	0.47
	Reduction of demand for transportation	0.2	0	0.2	0.4	0.16

	Economic instruments and incentives	0.6	0.2	0.6	0.4	0.47
	Information, stimulation and education	0.6	0.4	0.4	0.6	0.45
	Alternative vehicle fuel market	0.6	0.2	0.4	0.8	0.41
	Assessment of needs for human resources development	0.4	0.2	0.4	0.4	0.34
Energy policy, legislation and market transformation	Relevance chain for energy policy	0.8	0.4	0.4	0.2	0.44
	Energy laws and regulations with respect to sustainability	1	0.6	0.6	0.4	0.64
	Energy planning in urban and rural areas	0.8	0.2	0.6	0.6	0.52
	Promotion of successfully implemented projects	0.6	0.2	0.2	0.4	0.28
	Training and establishment of a network for policy creators	0.8	0.2	0.4	0.2	0.39
Sustainable energy development	Promotion of sustainable development and mobilization	0.8	0.2	0.4	0.6	0.43
	Planning utilization of RES and efficiency measures at the local level	1	0.4	0.6	0.6	0.61
	Establishment of conditions for development of local market	0.8	0.6	0.2	0.4	0.43
	Support for establishing local and regional agencies	0.8	0.4	0.6	0.6	0.58
	Training and establishment of a network for policy creators	0.8	0.4	0.6	0.8	0.60
Financial mechanism and incentives	Investment schemes for supporting programs and projects	0.8	0.6	0.8	0.4	0.71
	Conditions for fair competition	0.4	0.6	0.4	0.2	0.44
	Micro-finance schemes	0.6	0.6	0.6	0.4	0.58
	Financial mechanism for stimulating innovative projects	0.6	0.4	0.6	0.6	0.54
	Training and establishment of a network for policy creators	0.8	0.4	0.4	0.2	0.44
Monitoring and assessment	Monitoring and assessment of programs and measures	0.4	0.2	0.4	0.6	0.36
	Methods, indicators and modeling of future development	0.6	0.2	0.4	0.6	0.40
	Elaboration of mechanism for the exchange of experience	0.6	0.2	0.6	0.4	0.47
	Energy management based on advanced monitoring process	0.6	0.4	0.6	0.6	0.54
	Training and establishment of a network for policy creators	0.6	0.4	0.4	0.4	0.43
Advertising and promoting	Dissemination of results, development and demonstration	0.4	0.2	0.2	0.4	0.25
	Exchange of knowledge regarding best projects	0.4	0.4	0.6	0.6	0.51
	Dissemination of programs and their results	0.4	0.2	0.4	0.6	0.36
	Campaigns promoting an energy sustainable society	0.4	0.2	0.6	0.6	0.46
	Training and establishment of a network for policy creators	0.6	0.4	0.6	0.6	0.54

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