SWOT-AHP METHOD APPLICATION TO DETERMINE CURRENT ENERGY SITUATION AND DEFINE STRATEGIES FOR ENERGY SECURITY IMPROVEMENT

by

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The main objective of this paper is to determine the current energy (electricity) situation in municipality of Štrpce and define and assess potential strategies for improving energy security. For that purpose, paper employed hybrid strengths, weaknesses, opportunities, and threats and analytical hierarchy process (AHP) methods. First, current energy situation is observed using strengths, weaknesses, opportunities, and threats analysis. Then, according TOWS matrix potential strengths-opportunities, weaknesses-threats, strengths-threats, and weaknesses-threats strategies were defined. All strategies are rated using EXPERT choice software. Result show that the three best ranked strategies for improvement of energy security are: revitalization of the entire existing distribution network (ST_1), defining the appropriate investment and legal model for the needs of building RES (ST_2), and introducing energy management in the public, commercial and industrial sectors and establishing a municipal energy office (WT_1), respectively.

Key words: *strengths, weaknesses, opportunities, and threats, analytical hierarchy process, energy security, energy*

Introduction

Safe and uninterrupted supply of energy is one of prerequisites for the development of any modern economy. However, numerous problems in the energy sector of Kosovo* are present today. They are summarized by [1] as follows: congestion in building new capacities for electricity generation on lignite and rehabilitation of existing capacities, overloading of the electricity system, especially in the winter season, restrictions in the insurance of electricity imports, lack of effective competition in the electricity market, a small share of thermal energy in final consumption and a lack of natural gas. The main production capacities of electricity in Kosovo* are two thermal power plants, Kosovo A (610 MW) and Kosovo B (680 MW). Lignite is used to produce 97% of total electricity production in Kosovo*[1]. Such a great dependence on only one source of electricity generation sufficiently show energy (in)security of Kosovo* as a whole. According to [2] consumption of electricity in 2015 in Kosovo* is 2.91 MWh per capita, which is less compared to other countries in Southeast Europe except Romania (2.64) and Albania (2.09). Another problem in Kosovo* electricity generation and distribution system are large total losses (both technical and non-technical). Although a down-

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* This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo* declaration of independence.

ward trend can be noticed, fig. 1, the percentage of losses is still very high, which can negatively affect energy security.

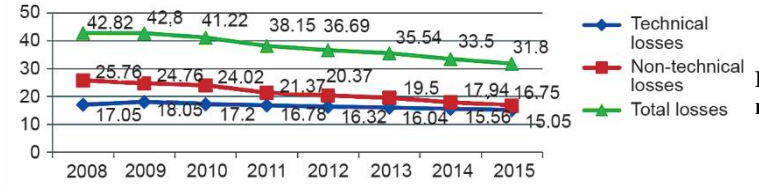

Figure 1. Technical and non-technical losses [1]

According to [3] *energy crises and wars are not behind us, they last and affect both energy and national security through reducing energy efficiency, lower supply, price rises, and deep geopolitical tensions*. Although the term *energy security* is often mentioned, it is not entirely clear and universally defined. In [4] is considered that *there is no general interpretation* of energy security. Chester [5] argue that the concept of energy security is *difficult* to define. Therefore, different definitions of energy security meet in the literature. In [2] energy security is defined as *continuous availability of energy at an affordable price*. The problems of energy security in Serbia are addressed in [6] analysed *availability* as one of the dimensions of energy security in Serbia, [7] analyzes Serbia's energy security from a geo-economic perspective, and [8] explore the possibilities and potential of alternative fuels to increase competition in energy supply, reducing harmful gases in Serbia with a decrease in dependence on imports.

Unfortunately, the problem of energy security of Serbian communities in Kosovo* is not explored. The municipality of Štrpce is located in the south of Kosovo* and covers an area of about 250 km². Štrpce is multiethnic municipality, which includes 16 settlements with a total population of 13.600. All 16 settlements are covered by the distribution network. According to [9], the number of public consumers of electricity is 54 while the number of private consumers is 3.800. The consumption of electricity in Štrpce from 2014. to 2017. is shown in fig. 2.

Figure 2. Electricity consumption in Štrpce [GWh] (Source: KEDS local unit in Štrpce) (*for color image see journal web site*)

Since 1999 Electric power company of Serbia has no ability to dispose of its assets (production facilities, mines, distribution network) in Kosovo*. Consequently, it cannot supply consumers over Kosovo*. Electricity supply in Kosovo* is currently carried out by the Kosovo Electricity Distribution and Supply Company (KEDS). This means that electricity consumers in Štrpce are forced to purchase electricity from the only available supplier. Also, one of the problems is the only one route of supply of Štrpce, which comes from the direction of Urosevac. The obsolescence of the network, frequent system failures, illegal network connections, intentional exclusion, as well as the difficult terrain for maintenance makes this supply route often unstable. The average annual electricity consumption in the household in Štrpce is 11 MWh and 7 MWh in the apartments [9]. Unfortunately, electricity in Štrpce is often used irrationally and for heating purposes both among citizens and public institutions. There is a

significant potential to improve energy efficiency in health, education and administration in Štrpce of a total of 303 MWh per year [9].

Goal of this paper is to determine current electricity situation in Štrpce and then to define appropriate strategies for improving energy security using the SWOT-AHP method. Also, paper shall alarm the decision-makers at the local and state level in terms of solving the energy security problems of the Serbian communities in Kosovo*.

Methodology

The SWOT-AHP hybrid method

After all, the simple question arises: how to improve energy security of Štrpce? First of all, it is necessary to determine current situation, and then to define strategies for improving energy security. The SWOT analysis is a well-known and widely used strategic planning tool. The SWOT analysis provides insight into the internal (strengths and weaknesses) and external environment (opportunities and threats). Thus allow the adoption of relevant decisions. Also, if used in the right way, SWOT analysis can provide a good basis for defining the strategies [10, 11], such in [12, 13]. However, the use of conventional SWOT analysis do not allows determination of the importance of each SWOT factor [14]. This drawback can be eliminated using the appropriate multicriteria decision making (MCDM) methods (AHP, VIKOR, PROMETHEE, TOPSIS, *etc.*). To that end, [15] introduces a hybrid SWOT-AHP method. The possible advantages of using AHP in SWOT analysis are in the quantitative examination of the SWOT factors and inclusion of preferences of the decision-makers in the planning situation [15]. Some of the advantages of the SWOT AHP method are: scientific and systematic approach to problem solving, well-known and easy-to-use method, software-supported methodology, quantitative evaluation, simple group decision-making and integration of group results, *etc.* The AHP was developed by Saaty [16]. The AHP is a method to select one alternative from a given set of alternatives, where there are multiple decision criteria involved, and to rank available alternatives in a desirability order based on a rational framework of quantitative comparisons [17]. The AHP is a effective decision making method especially when subjectivity exists and it is very suitable to solve problems where the decision criteria can be organized in a hierarchical way into sub-criteria [18]. The SWOT-AHP method is applied for solving different issues in many areas such as environment [15], agriculture [19], sport [20] and energy [21-26]. Also, SWOT-AHP is employed in literature to determine and evaluate strategies: [27] evaluate the management strategies of a forestland estate, [28] determine the business strategy in textile firm, [29] define strategy for Turkish chemicals industry; [30] develop and evaluate innovative strategies to overcome biomass supply problems and increase the competitiveness of wood-based energy production.

Accepted model

In order to achieve the defined goal an integral SWOT-AHP model shown in fig. 3 is applied.

Case: Municipality of Štrpce

In text that follows step by step application of decision making model is shown.

Phase 1: Preparation and data collection.

The first phase of the model includes three main steps: defining the problem, forming the DM team and conducting a stakeholder analysis.

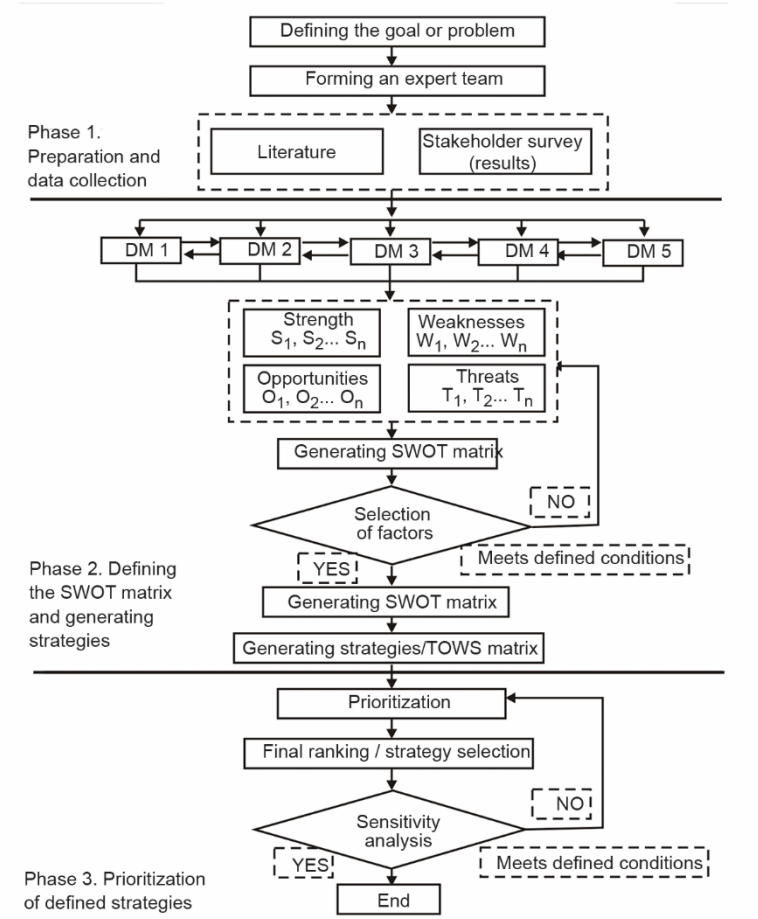

Figure 3. Decision making model; DM – decision making, SWOT – strengths, weaknesses, opportunities, threats, TOWS – threats, opportunities, weaknesses, strengths

Step 1. Defining the problem. One of the main problem of Štrpce is unstable electricity supply from 1999. until today. Unfortunately, such a trend can be expected and in the coming period for a number of reasons (old and insufficient production capacity, poor distribution network…). Therefore, it is necessary to take appropriate measures to improve energy security of Štrpce. The problem of energy infrastructure is also recognized in [31] which defines strategic priorities related to: demography and social issues, economic development, environment, and land use and infrastructure. Among the numerous 10 strategic priorities there are and priorities related to infrastructure:

– building an alternative energy infrastructure and
– improvement of existing energy infrastructure.

However, strategic priorities are only exhaustively listed and there are no strategies/action plans, *etc.* for their implementation. Based on the identified needs, the objective of this paper is to assess the current energy situation and define strategies for improving the energy security of the municipality of Štrpce.

Step 2. Forming an expert team. In order to make relevant decisions, it is necessary to engage experts in the field of research subjects as well as relevant stakeholders. In this regard, five decision makers are involved in this research, two of which are experts in the field of energy, while the remaining three participants will be stakeholders selected after a stakeholder analysis.

Step 3. Stakeholder analysis. According to [32] stakeholder can be an individual, group or organization that can influence, which may be the subject of an impact, or who believes that it can be influenced by the decision, activity or result of the project. In this paper to identify the stakeholders, the Brainstorming method was used. Two expert participated. Stakeholder analysis has identified a total of 30 stakeholders. Then, all stakeholders are classified into influence/impact matrix in one of the 4 groups (group A: *keep satisfied*; group B: *manage closely*; group C: *monitor*; group D: *keep informed*). As most important stakeholders for current energy situation determination in Štrpce group B is chosen: municipality of Štrpce (both Serbian and Kosovo*), Office for Kosovo and Metohija, Serbian government, non-governmental organizations (NGO), KEDS, land owners in Štrpce, business sector in Štrpce, residents of Štrpce, Ministry for community and return. All stakeholders from group B participated in survey (45 questionnaires). Then, the following stakeholders were selected from group B to participate in the decision-making team: representative of local government (vice president), KEDS representative (local unit stuff) and representative of local NGO (president of informal group of local NGO).

Phase 2. Defining the SWOT matrix and generating strategies

Step 4: Defining a list of SWOT factors. In the second phase, the decision making team (DMT) is provided with the collected literature: [1, 9, 31] as well as relevant scientific papers. Also, the results of the stakeholder survey are also submitted. Then, DMT based on the obtained data and their knowledge perceive the current energy situation in Štrpce and define an initial SWOT matrix. The defined SWOT matrix contains a total of 43 factors.

Step 5: Evaluation and selection of SWOT factors. After defining the initial list of SWOT factors, the DMT is then required to evaluate all factors using the scale 0-1 (0-unimportant; 1-most important) with an incremental increase of 0.1. Only the factors whose average score is greater than ≥0.80 will be selected to generate the final SWOT matrix. From initial 43 factors defined condition (≥0.80) satisfies 22 factors and they will be included in the final SWOT matrix, tab.1.

Step 6: Defining the SWOT/TOWS matrix and generating strategies. In order to improve the current energy situation in Štrpce, a total of 9 strategies, tab. 1, have been defined by DMT. In the following text they are briefly described.

The SO_1 Exploitation of locally available RES to improve energy security of Štrpce (O_2 S1 S_3 S_2 S_4). The Štrpce hydropower potential is estimated at 20 MW [31]. The total Štrpce forests area is around 10.500 ha, with an annual accrual of about 32000 m^3, while the area of agricultural land is about 13.600 ha which can be a significant sources of biomass [31]. According to the annual sum of global radiation for optimally inclined photovoltaic modules for the territory of Štrpce is about 1400 kWh/m^2 [33]. Average monthly wind speed is between 4.4 m/s in lower areas to 7.8 m/s in higher areas [34]. Unfortunately, there are no available data for thermal energy sources. Exploitation of the RES potential that is available energy security could significantly be improved. The SO_1 strategy is based on the O_2 opportunity that can be utilized using S_1 and S_3 strengths. According to the laws of Serbia, but also

Kosovo*, the use of RES for energy purposes is permitted (O_1), and that opportunity should be used to improve energy security. Also, the exploitation of locally available RES could maximize the S_4. Implementation of the SO_1 strategy will contribute to a certain extent to the more successful implementation of the Municipal Energy Efficiency Plan 2016-2021 (S_2).

The SO_2 Defining incentive measures at the local level for investors and locals to use RES (O_3 O_2 O_1 S_3 S_1 S_2 S_4). By defining incentive measures, it would be additionally attracted O_3 and use of O_2 and O_1 which would lead to more efficient use of S_3 and S_1, and could also lead to maximizing S_4.

The SO_3 Establishment of working group for cooperation with international institutions in order to provide political support and funding for renewable energy projects (O_5 O_2 O_1 S_1 S_2 S_3 S_4). Currently, the construction and exploitation of RES should be carried out according to the applicable laws of Kosovo*. It means that there is a potential danger that in addition to bureaucratic obstacles and problems with the issuing of necessary permits, the authorities of Kosovo* may apply even repressive measures to stop the realization of legal and legitimate projects aimed at improving the energy security of Štrpce. Therefore, it is necessary to provide political support of international organizations present in Kosovo*, but also outside of Kosovo*. It shall neutralize potential obstacles in the realization of future projects. It is also necessary to use the various funds of international organizations (O_5) as well as the capital of interested investors (O_3).

The WO_1 Raising awareness of the population on energy efficiency improvement and rational use of energy (O_5 W_3 W_1). For the purpose of implementing this strategy, a number of EU funds (O_5) and funds of other *green* foundations can be used. Application of O_5 can contribute to the reduction of irrational use of energy for heating W_3. Also, by raising awareness and reducing consumption, restrictions may be reduced which occur and as a result of a poor and old distribution network (W_1), or because of frequent *dropouts* of the system.

The WO_2 Construction of a new transmission line from the direction of Prizren (O_5 W_2 W_7). The municipality of Štrpce is currently supplied with electricity only through one route, and it is a transmission line of 35 kV from the direction of Urosevac. By constructing a new transmission line from the direction of Prizren, as mentioned in [9], another electricity supply route would be provided, which would contribute to increasing energy security. In that sense, O_6 should be used, as well as the funds of other international organizations (O_5) present in Kosovo* for the construction of an alternative transmission line, which would affect the reduction of W_2 and W_7.

The ST_1 Revitalization of the entire existing distribution network in the territory of Štrpce (S_2 S_3 T_2 T_4). The distribution network in Štrpce, as well as throughout Kosovo*, is obsolete, poorly maintained and with great losses. Revitalizing the local network with the help of experienced labor (S_3) can significantly prevent further decline in the efficiency of distribution and reliability of equipment (T_2). Improving the efficiency of the network as a result of revitalization would also contribute to the implementation of (S_2). Also, the revitalization of the network will also contribute to preventing a further decline in the quality of life of the population through the reduction of restrictions (T_4).

The ST_2 Defining the appropriate investment and legal model to build RES capacities (T_1 S_2 S_4 S_3). Under the Kosovo* law [35], the application of a public-private partnership model for the production of electricity is not allowed. Investments by private companies are not forbidden, but they can also be subject to bureaucratic and political pressures. However, the main goal of private companies is profit rather than increasing energy security. Therefore, it is necessary to define the appropriate legal and investment model that could include

the local government, local companies and interested population in the process of production and distribution of electricity. Otherwise, the exclusion of local actors (stakeholders) from the management of production capacities would probably not contribute to improving energy security. Possible solution for overcoming the problems T_1 and T_3 could be the establishment of a stock company for the production and distribution of electricity by interested local companies and the population. The new model could partly rely on S_2 that promotes and using of RES. Also, defining the appropriate model, and later its application, would lead to the maximization of S_4 but also and other RES potentials using S_3.

The WT_1 Introducing energy management in the public, commercial and industrial sectors and establishing a municipal energy office (W_3 W_5, W_6 **).** Non-rational use of energy in both private and public sectors is a characteristic of the energy sector of Štrpce, which is determined by [9]. Also, it has been established that there are significant opportunities for energy savings in all sectors and facilities (private and public). However, no one institution is currently dealing with energy management, while its introduction into all sectors would contribute to the improvement of W_5, W_6 and W_3. The local energy office could work on the definition and implementation of local plans for the development of the energy sector and energy security W_4 and to work on raising the awareness of the population W_3.

The WT_2 Construction of a new local network for the RES island operation (T_2 T_4 T_5 W_1 W_2**).** If local RES are sufficient for electricity supply, then the local network will enable the complete energy independence of Štrpce and the impact of T_5 and W_1 in that case would be minimized or even completely eliminated. Also, there would be a significant increasing in the efficiency of distribution T_2. In addition, abolishing or reducing restrictions would also contribute to improving the quality of life of the population T_4 and W_2.

Phase 3: Prioritization of defined strategies

As already mentioned, one of the shortcomings of conventional SWOT analysis is the inability to evaluate and rank SWOT groups, factors, and strategies defined by the TOWS matrix. In order to overcome this shortcoming the third phase of the model that refers to the prioritization of strategies should be carried out.

Step 7: Prioritization. To prioritize strategies AHP method was applied, and the process is carried out using the EXPERT choice software. The AHP generates a weight for each evaluation criterion according to the decision maker's pairwise comparisons of the criteria according Saaty's 9 point scale. Five decision makers are involved in prioritizing process. Two experts from the field of energy and representatives of the three most important stakeholders (representative of local government, Kosovo* electricity distribution and supply company and non-governmental sector from Štrpce). The importance of decision-makers in the model is equal. Local and global priorities is shown in tab. 2 and the rank of alternatives as result of group decision making is presented in fig. 4.

Step 8: Sensitivity analysis. After the results of group decision making is obtained the sensitivity analysis shall be conducted. Sensitivity analysis should determine how changes of the weight coefficient of SWOT groups and factors affect the change in rank of strategies which is done by 8 scenarios defined in tab. 3. The benchmark values are group decision making results, whereby minimal changes (increase or decrease) of weight coefficients that lead to changes in the ranking strategies were considered, tab. 3.

The SWOT group Opportunities is the most sensitive in weight coefficient changes in relation to all other groups. The smallest change that leads to a change in the ranking strategy

is –0.022 which represents a value at the very boundary defined by ≥10% compared to the reference value of the Opportunities group (0.220). The sensitivity analysis of the SWOT factors included factors with the highest weighting coefficients in each group (S_1, W_1, O_2, P_4). The smallest change in the weight coefficient leading to change a rank of strategies was observed at factor S_1 (0.104). Nevertheless, it is significantly higher than the defined ≥ 10% relative to the reference value of factor S_1 (0.486).

Table 1. The SWOT/TOWS matrix

Strengths (S)	Weaknessess (W)	
S_1 Coverage of the whole municipality with the distribution network S_2 Implementation of the Municipal Energy Efficiency Plan 2016-2021 S_3 Experienced workforce in the energy sector S_4 Exploitation of Hydropower for Energy Purposes (partial)	W_1 Poor and old distribution network W_2 Very frequent power cuts W_3 Non-rational use of electricity for heating purposes W_4 Lack of local plans for energy sector development and energy security W_5 Energy Inefficiency in Public Buildings and Enterprises W_6 Inefficient public lighting W_7 Only one direction of supply (from the direction of Uroševac) of supply	
Opportunities (O)	SO strategies	WO strategies
O_1 Permitted use of RES for energy purposes under the laws of Serbia and Kosovo* O_2 Significant RES potentials (biomass, hydro, solar and wind energy) O_3 The interest of investors in the energy sector, especially the RES O_4 Financial Incentives for Citizens and Companies Using RES O_5 EU funds	SO_1 (O_2 O_1 S_1 S_3 S_2 S_4) SO_2 (O_3 O_2 O_1 S_3 S_1 S_2 S_4) SO_3 (O_5 O_2 O_1 S_1 S_3 S_2 S_4)	WO_1 (O_5 W_3 W_1) WO_2 (O_5 W_2 W_7)
Treaths (T)	ST strategies	WT strategies
T_1 Inability to use public private partnership model for energy purposes under the Kosovo* law; T_2 Further decline in the efficiency of distribution and reliability of equipment; T_3 Possible obstruction of Kosovo* authorities to the development of energy sector at the local level T_4 Further decline in the quality of life of the population due to frequent restrictions; T_5 Political instability in Kosovo* T_6 Non-functioning of an open and competitive electricity market in Kosovo* and in the region	ST_1 (S_2 S_3 P_2 P_4) ST_2 (P_1 P_3 S_2 S_4 S_3)	WT_1 (P_6 W_4 W_3 W_5 i W_6) WT_2 (P_5 W_1 P_4 W_2)

Results and disscussion

By group decision-making, the following ranking list of the considered strategies was obtained, respectively:

$$ST_1 – ST_2 – WT_1 – SO_1 – SO_3 – WO_2 – WO_1 – SO_2 – WT_2$$

Table 2. Priorities of SWOT groups and factors

SWOT group (priority)	Incons-istency (group)	SWOT factors	Incons-istency (factors)	Priority	
				Local	Global
Strengths (0.377)	0.00	S_1 Coverage of the whole municipality with the distribution network	0.02	0.486	0.183
		S_2 Implementation of the Municipal Energy Efficiency Plan 2016-2021	0.04	0.112	0.042
		S_3 Experienced workforce in the energy sector	0.02	0.191	0.072
		S_4 Exploitation of Hydropower for Energy Purposes (partial)	0.02	0.212	0.080
Weak-nessess (0.234)	0.04	W_1 Poor and old distribution network	0.01	0.284	0.066
		W_2 Very often power cuts	0.02	0.138	0.032
		W_3 Non-rational use of electricity for heating purposes	0.05	0.154	0.036
		W_4 Lack of local plans for energy sector development and energy security	0.03	0.062	0.015
		W_5 Energy Inefficiency in Public Buildings and Enterprises	0.05	0.132	0.031
		W_6 Inefficient public lighting	0.03	0.040	0.009
		W_7 Only one direction of supply (from Uroševac)	0.02	0.190	0.044
Opportuni-ties (0.220)	0.02	O_1 Permitted use of RES for energy purposes under the laws of Serbia and Kosovo*	0.03	0.170	0.037
		O_2 Significant RES potentials (biomass, hydro, solar and wind energy)	0.03	0.333	0.073
		O_3 Interest of investors in the energy sector, especially the RES	0.04	0.138	0.030
		O_4 Financial incentives for citizens and companies using RES	0.02	0.144	0.032
		O_5 EU funds	0.02	0.215	0.047
Threaths (0.170)	0.01	T_1 Inability to use public private partnership model for energy purposes under the so-called Kosovo* law	0.04	0.096	0.016
		T_2 Further decline in the efficiency of distribution and reliability of equipment	0.03	0.241	0.041
		T_3 Possible obstruction of Kosovo* authorities to the development of energy sector at the local level	0.02	0.145	0.025
		T_4 Further decline in the quality of life of the popu-lation due to frequent restrictions	0.02	0.247	0.042
		T_5 Political instability in Kosovo*	0.03	0.170	0.029
		T_6 Non-functioning of an open and competitive electricity market in Kosovo* and in the region	0.02	0.102	0.017

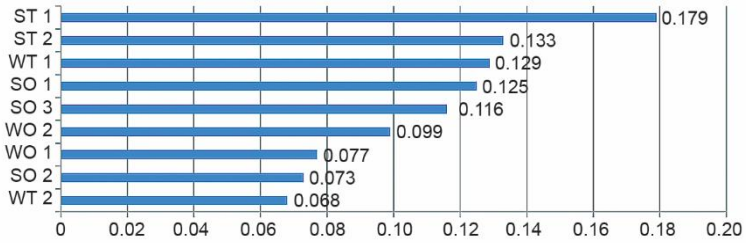

Figure 4. Final rank of alternative/group decision result (inconsistency 0.02)

Table 3. Sensitivity analysis of SWOT groups and factors

	SWOT groups (benchmark values)	Minimal change	
		+	–
Scenario 1	Strengths (0.377)	0.044	0.073
Scenario 2	Weaknessess (0.234)	0.036	0.051
Scenario 3	Opportunities (0.220)	0.027	0.022
Scenario 4	Treaths (0.170)	0.195	0.088
	SWOT factors (benchmark values)		
Scenario 5	S_1 (0.486)	0.104	0.107
Scenario 6	W_1 (0.284)	0.205	0.187
Scenario 7	O_2 (0.333)	0.667	0.199
Scenario 8	T_4 (0.247)	0.170	No changes at all

Solving energy security issues can be considered in the short and long term. In this sense, it is possible to group defined strategies according to their contribution (short or long term) to energy security.

Realizing strategies ST_1 and WO_2 in the short term can improve energy security to some extent. It has already been stated that the local network is old, inefficient and very often there are breakdowns and restrictions. Revitalization of the local network would greatly improve its reliability and efficiency. Also, the construction of a new transmission line from the direction of Prizren would provide an alternative direction of supply. In the event of a break in the current single line of supply from the direction of Urosevac, this could provide the solution of the problem of short-term interruptions. However, in spite of that, the production and distribution of electricity would be re-carried out by the company that is currently doing it. This means that, in the event of political pressures, the supply of electricity from this direction also could be interrupted.

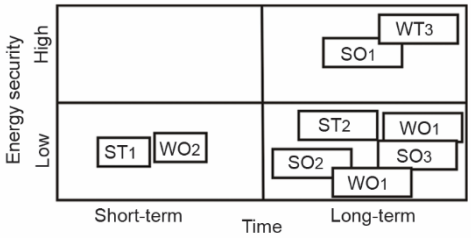

Figure 5. Short and long term improving of energy security of Štrpce

Therefore, it is necessary to fully and in the long term to solve the problem of energy security. This requires the implementation of a number of strategies (ST_2, WT_1, SO_1, SO_3, WO_1, SO_2, WT_2) to round up the process from production to the distribution of electricity with awareness and energy efficiency raising. In this sense, in fig. 5 the matrix shows contribution of each strategy to energy security in short and the long run.

Sensitivity analysis is conducted to check proposed model stability. Minimal changes that lead to changes in strategies rank in each of the 8 analyzed scenarios are ≥10% compared to the reference values which indicates that the model is stable.

Conclusion

In this paper SWOT-AHP method is used to determine current state and propose strategies to energy security improvement in municipality of Štrpce.

According to the results of the research for the purpose of short-term and partial improvement of energy security, it is necessary to revitalize the existing network and to build a new transmission line from the direction of Prizren. In this regard, local and central authorities should provide financial resources for the implementation of the aforementioned strategies. However, the long-term and complete solution of energy security issues requires a strategic approach which includes a set of strategies whose main backbone should be the use of locally available RES. Because of the specific political and legal position of the municipality of Štrpce, it would be necessary first of all to define appropriate investment and legal model for the needs of building RES (ST_2). Also, the international community should be included as a guarantor of the implementation of the defined model.

The authors believe that the obtained results can present good basis for local and national authorities to take appropriate actions to improve energy security of Štrpce. Also, proposed model consists of three phases have a universal character, thus it can be applied in other regions/countries to determine the current state of their energy situation and then to determine the strategies for improvement.

Future research should address the definition of locally available RES alternatives and their use in order to improve energy security.

Acronyms

PROMETHEE – Preference Ranking Organization METHod for Enrichment of Evaluations
TOPSIS – Technique for Order of Preference by Similarity to Ideal Solution
VIKOR – Multicriteria Optimization and Compromise Solution

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