



Contribution of renewable energy sources to overall national energy security policy



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Abstract

Energy is necessary for the functioning of every society. Although the development implies increasing energy efficiency, due to the increase in the number of inhabitants, introduction of various new technologies and development of automated industry, there is significant increase in energy needs. The lack of energy is therefore a threat to the security of every country. The use of renewable energy sources increases country energy independence. In this paper, the importance of application of renewable energy sources in Serbia in the context of its energy security policy has been considered.

Keywords: renewable energy sources, energy security, energy policy, biofuels, Serbia

Introduction

Energy security of every country is important element of economic and political stability. When energy security is considered, the current position of country is analyzed, to assess dependencies on other countries in the field of energy production, and available energy production capacities and resources that one country has at its disposal [1].

Energy security means energy availability in sufficient quantity, at acceptable prices, with stable delivery, with physically secured energy facilities and critical infrastructure (oil pipelines, gas pipelines, electrical network) [2]. A critical energy infrastructure is of primary importance for delivering energy to final consumers (households, public companies and industry).

The problem of energy security is becoming more and more important, as world energy resources are limited, and their demand is growing with an increase in the number of inhabitants. Although new technologies are mostly energy-efficient, their introduction also increases energy consumption. Another significant problem is geographically uneven distribution of resource reserves and their consumption, as well as political character of relationships in the energy market.

Table I. Different energy risk dimensions

Dimensions	Description
Political	Effects of political, organizational or institutional factors that are local, external or international (institutional and organizational quality, rule of law, international influences and pressures, political instability)
Economical	Level of economic development, economic sustainability, industry characteristics, energy prices, trade properties, energy intensity
Technical-energetic	Available resources and energetic potential, location of available resources, market concentration, competitiveness of local producers, import dependence
Social	Social factors can initiate disturbance (problems in the labor market, inadequate salaries, inequality)

Factors and indicators

There are various aspects of risk considerations from the point of view of energy security. These aspects are usually grouped into four dimensions: political, economic, technical-energetic, and social. The characteristics of these dimensions are shown in Table I.

Table II provides an overview of various representative models for considering energy security [2,3,4]. Most of presented models can be used for comparison of energy security of different countries, except US Energy security risk index.

National energy security policy

National energy security policy defines set of laws, strategic documents, regulatory instruments, rules, and operative activities leading to achieving energy security for all country citizens. It defines organizational structure, roles and obligation schemes of all actors which enable the energy to be available to all final consumers, and to achieve sustainable growth.

In order to increase energy security, it is necessary to make energy system more resistant to external influences (energy independence), increase diversification and decentralization, effectively use available resources and supplies, and to include diversification of energy sources. Therefore, especially significant sources of energy are renewable energy sources.

Experimental

The following table presents the elements of Serbian national energy security policy [5,6,7,8].

Serbian energy security is described by the following models: EAPI, International energy security risk index, and Energy trilemma index. Overall scores and ranks, as well as scores and ranks for individual groups of indicators are presented in the last Table.

According to all presented models, Serbia as developing country is in the middle of all analyzed countries in relation to energy security.

Table II. Representative energy security models [2,3,4]

Model	Description
4 A's	Energy security is described by four aspects: availability (physical-geological), accessibility (technological-political), affordability (societal-environmental), acceptability (financial-organizational)
MOSES	Model of short-term energy security describing domestic and external risks and resilience
US Energy security risk index	37 indicators combined into 4 sub-indexes describing technological, environmental, economic, and geo-political security
EAPI	Global energy architecture performance index is score based on environmental sustainability, energy access/security, and economic growth/development
International energy security risk index	29 metric classified into 7 groups (global fuel, fuel import, energy expenditure, price and market volatility, energy use intensity, electric power sector, transportation, environmental effects) are used for energy security assessment

Results and Discussion

Heavy dependence on imports of oil and gas caused the need to define specific national energy security policy. The main elements of the national energy security policy concerning energy sector development, energy security and use of renewable energy sources are presented in the following table.

The Action Plan of the Republic of Serbia for renewable energy sources in respect to obligations undertaken under the Energy Community Treaty defines activities to reach the target of 27% renewable energy sources in final energy consumption in 2020. According to the Directive 2006/32/EC on the effective use of final energy, until 2020 Serbia has to decrease FE consumption for 10%, and increase the use of RES other than hydropower for 7% and biofuels in the transportation sector for 10%.

Overall EAPI score of 0.59 puts Serbia into 70th place, while as the main problems economic growth and development indicators and sustainability are identified. Energy access and security received much higher grade (0.73).

International energy security risk index for Serbia in 2016 is 1,333. The risk is increased compared to 2015, and average annual difference of risk score compared relatively to OECD average for previous 10 years is just 48%, which means that the energy security risks for Serbia are approximately two times higher than in representative OECD countries.

Overall rank in 2016 for Serbia according to energy trilemma index is 73, with BBC balance. Energy security and equity are at average level, but the main problem, according to this index, is environmental sustainability dimension.

Table III. Elements of Serbian national energy security policy [5-8]

Element	Corresponding document(s)
Strategies	Energy Sector Development Strategy of the Republic of Serbia for the period by 2025 with projections by 2030 (Official Gazette of the Republic of Serbia, 101/2015) Strategic assessment of the impact of the Energy Development Strategy of the Republic of Serbia until 2025 with projections until 2030 on the environment
Laws	Energy Law (Official gazette of Republic of Serbia, 145/2014) Law on Efficient Use of Energy (Official Gazette of the Republic of Serbia, 25/2013)
Action plans	National Action Plan for the use of Renewable Energy Sources (NAPoIE) (Official Gazette of the Republic of Serbia, 53/2013)

Table IV. Serbian energy security according to selected models

Model	Energy security
EAPI	Overall 2017 score: 0.59 (70/127) Economic growth and development: 0.50 Environmental sustainability: 0.54 Energy access and security: 0.73
International energy security risk index	Energy Security Risk Score 2016: 1,333 Risk Scores Relative to OECD Average Average Annual Difference 2006-16 48%
Energy trilemma index	Overall 2016 rank (balance): 73 (BBC) Energy security: 61 (B) Energy equity: 73 (B) Environmental sustainability: 89 (C)

Conclusion

The contribution of renewable energy sources to energy security is reflected in the reduction of import dependence, local character of energy sources, and reduction of pollution and preservation of non-renewable energy sources. Local character leads to diversification and decentralization of energy sources, as well as improvement of life in local communities by increasing the number of available jobs.

Based on applied energy security analysis methods, Serbia is a country with moderate risk. By increasing the use of available renewable energy sources and by increasing energy efficiency, this risk can be significantly reduced.

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Acknowledgements

This research is part of the projects III 44006 and III 42006, under the auspices of the Ministry of Education, Science and Technological Development, Republic of Serbia.

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