OUTLOOK ON THE FACTORS INFLUENCING SELECTION OF ELECTRICITY PRODUCTION SOURCES WITHIN ENERGY INDUSTRY

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Annotation. *This paper aims at the identification of the factors influencing creation of an optimal electricity generation mix for the energy generating companies. The article focuses on: 1) classification of the major factors influencing selection of electricity production sources, and 2) insight into the forecasts of an optimal energy mix for Europe.*

Key words: *security of energy supply, type variety principle, energy mix.*

Latest developments in the world's politics and economy contribute to the re-focusing of the energy policy from competitiveness and sustainability towards security of energy supply. The latter is dependent on technological advancements and creation of efficient energy production structure.

It is vital to combine the characteristics of the energy industry as critical infrastructure with high value of failure and decision making principles when analyzing the structure of electricity generation, diversification and optimization of the energy portfolio.

The model of the research is aimed at defining key modules to collect necessary data to mix different electricity generation technologies in the energy portfolio in order to ensure energy security thus maximizing the value of the portfolio. Type variety principle (TVP) lies at the basis of a developed algorithm

TVP is a combination of different components e.g. systems, technologies, models, methods, software components into one system. These components perform similar functions, but are based on different principles and each of them can solve the task separately. If combined to a system they will improve resilience and exclude possibility of common cause failure and deliver reliable, long-term performance of complex systems.

The model of the study is based on the following four modules. First, given the necessity of choosing the most appropriate energy technology, which is determined by a set of certain factors and conditions, the approach of multi-criteria decision-making is applied. Given the need to balance the advantages and disadvantages of using a particular set / configuration of energy technologies the modern portfolio theory (MPT) is considered. Since MPT takes into account mainly financial risks and in practice there is a need to re-evaluate the composition of the energy portfolio in terms of other possible dangers, an assessment of the strategic alignment of the energy portfolio is carried out. Additionally, the analysis of the risks inherent in various sources of electricity generation and their possible impact is studied. Finally, the study applies LEAP within the strategic planning of an optimal diversified electricity generation mix.

To improve openness of the whole information technology, the research discusses that the consideration of as many factors as possible allows a sufficiently complete description of the object of evaluation and its comprehensive assessment.

A comparative analysis of the results of the application of the developed information technology for different countries points to the existing differences in the adoption and implementation of effective managerial decisions on energy mix management. The most effective and optimal scenario for the development of energy mix in accordance with the proposed modeling does not always coincide with the policy of the governments of the countries and strategic plans of the energy companies.

References.

1. Joachim Lang, Reinhard Madlener, “Portfolio Optimization for Power Plants: The Impact of Credit Risk Mitigation and Margining,” Institute for Future Energy Consumer Needs and Behavior (FCN), E.ON ERC, RWTH Aachen University, Aachen, 2010.
2. Awerbuch, S. and M. Berger (2003). “Applying Portfolio Theory to EU Electricity Planning and Policy Making”. IAEA/EET Working Paper No. 03, EET.
3. Chatzimouratidis, A. and A. Pilavachi (2008). “Multicriteria evaluation of power plants impact on the living standard using the analytic hierarchy process.” Energy Policy 36 (3): 1074–1089.
4. Reinhard, Madlener, Barbara Glensk, and Günther Westner, “Applying Mean-Variance Portfolio Analysis to E.ON’s Power Generation Portfolio in the UK and Sweden,” E.ON Energy Research Center, RWTH Aachen University, 2009.
5. Volodymyr Zaslavskyi, Maya Pasichna, “Optimization Techniques for Modelling Energy Generation Portfolios in Ukraine and the EU: Comparative Analysis,” Advances in Intelligent Systems and Computing, 761(2018): 545-555.