

Poggi-Varaldo, H.M.; Bretón-Deval, L.M.; Camacho-Pérez, B.;  
Escamilla-Alvarado, C.; Escobedo-Acuña, G.;  
Hernández-Flores, G.; Hernández-Vera, R.; Muñoz-Páez, K.M.;  
Romero-Cedillo, L.; Sotelo-Navarro, P.X.;  
Ortega-Clemente, A.; Sastre-Conde, I.; Macarie, H.;  
Solorza-Feria, O.; Ríos-Leal, E.; Esparza-García, F.;  
Camarillo-Ravelo, D.; Romero-Ramírez, Y.; Balagurusamy, N.

## ***Book of Abstracts***

# ***“Environmental Biotechnology and Engineering – 2014”***

ISBN 978-607-9023-24-9



Institut de recherche  
pour le développement



México D.F., México, 2014



**STOCHASTIC APPROACH TO ECONOMICAL ANALYSIS OF  
BIOMASS POWER PLANTS**

***Renata Varfolomejeva***\* (1); Marija Zima-Bočkarjova (2); Antans Sauhats (1);  
Evgenijs Kucajevs (1); Nauris Jankovskis (1,3)

- (1) RTU, Institute of Power Engineering, Riga, Latvia;  
(2) ABB Corporate Research, Switzerland.  
(3) JSC Latvenergo, Riga, Latvia;

The global community is motivated to move towards renewable energy supply and market based operation in power systems. In the core of this change is an aspiration of the reduced the influence of power generation on the environment and the increased power supply efficiency, which is achieved through market conditions and free competition within generation and sales of energy. These new conditions define significant changes in the design and planning of the operation of the biomass power plants (this kind of renewable generation is developing rapidly in the northern Europe).

First step in the power plant development project is pre-feasibility study. As a result of such study, a developer would choose a place of construction, type of fuel, the connection scheme to the power grid, would estimate the necessary capital expenses, the energy to be produced, production costs and profits from the energy sales. Economic analysis is an important part of the pre-feasibility study of the power plant. Usually, power plant design is evaluated in terms of the profit maximization and the following economic criteria, e.g. NPV, IRR, payback time.

The introduction of the markets in power systems substantially changes the approach to economic analysis of the power plant profitability. Free market and competition implies uncertainty. Consequently, the energy prices and revenues of power producers are subject to significant fluctuations. The criteria for profit maximization for the stakeholders shall be reformulated. The uncertain and random parameters, such as the ambient temperature, thermal energy consumption, price of energy has to be taken into account. The task assumes a stochastic form. Additional input information is needed in a large volume. As a result, the problem becomes much more complicated and requires new algorithms and software tools to solve it.

This paper proposes a procedure to estimate the average value of these criteria taking into account random nature of the variables and using the historic values of parameters. Besides, we use neural network based algorithm to predict processes in future from the historical data. We capture information on various input parameters, such as temperatures prices etc from the internet. A case study is conducted on a realistic project of the cogeneration biomass power plant (4 MW) and demonstrates the advantages of the stochastic approach. It is concluded that the proposed approach to profitability analysis, developed algorithms, the data capture from Internet, enhanced user friendly interface shall support and enable improved decision making.

-----  
\*Author for all correspondence