**Sustainability in Local Power Supply Systems of Production Facilities Where There Is the Compensatory Use of Renewable Energy Sources**

**Georgi N. Todorov 1\*, Andrey I. Vlasov 2, Elena E. Volkova 3, Marina A. Osintseva 3**

1 Varna Scientific Institute of the Eastern European Commonwealth – VSIEEC, Bulgaria

2 Bauman Moscow State Technical University, Russian Federation

3 Tyumen Industrial University, Russian Federation

\*Email: todorov.g@protonmail.com

**ABSTRACT**

Renewable energy has become a promising way to meet growing energy needs in the society. However, operation of power supply systems based on renewable energy sources (RES) depends on a number of uncontrolled factors. This imposes certain restrictions on applications and causes application-related challenges. At this point, the search for the best combination of applied energy sources has been still a key issue. Methodological approaches to the solution to this problem are diverse. The idea of our research is the application of tools from economics and mathematics to measure the best mutual substitution of energy resources in the production facility local power supply system. Authors have considered the possible application of RES through the example of the Russian-based production facility typical in terms of average power consumption and size. Authors chose a solar power plant as a renewable energy source. From the simulation results, authors conclude that when using RES, in terms of gross figures, there is about 20-25% less consumption. This makes it possible to achieve the balanced energy consumption from traditional sources throughout a production cycle. Our calculations have showed that, depending on the seasonal prevalence, it is possible to reduce average daily costs for power (in case of compensation from RES) by about 15.75% in the first season, 37.04% in the second season, and 25.44% in the third season. As for time period, in the second season, in the half-peak period (43.68%), we achieve the highest saving, while the lowest saving in the half-peak period of the first season (1.22%). Thus, the application of the solar power plant as a part of the local power supply system of the production facility makes it possible on average to achieve the 13% less energy consumed from centralized sources. It is safe to say that the application of combined sources of power in local power supply systems of production facilities is economically feasible to compensate for peak and half-peak loads. Authors have concluded that the potential of RES at the enterprise might be only developed as that of an additional energy resource and full substitution is impossible.

**Keywords:** Renewable energy sources, Production facilities, Centralized and decentralized power supply systems, Balance of energy resources, Resource sustainability

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