

PROBLEMS OF SYSTEMS WITH DISTRIBUTED GENERATION

TSYPLENKOV Dmytro & SUVORKIN Olexsandr
Dnipro University of Technology, Dnipro, Ukraine

The problems of the development of modern production are related to the demand for electricity, which is ahead of the increase in generating capacity. Electric power industry in the 20 th century developed mainly by increasing the level of centralization of electricity supply in the creation of ever more powerful electric power facilities. The consequence of this was the formation of geographically distributed extended electric power systems, which allowed to achieve a significant economic effect, improve the reliability of electricity supply and the quality of electricity.

Last century of technology of traditional steam-turbine units of thermal and nuclear power plants developed on the way of use of more and more high parameters of steam, it demanded use of more perfect materials of coppers and turbines, at the same time the tendency of increase in per unit of power of installations took place. All this allowed to improve the technical and economic parameters of the facilities - unit investment and constant current costs per unit of capacity and specific fuel costs per unit of generated electricity. This tendency of consolidation of aggregates was also observed in hydropower, although to a lesser extent.

In this regard, as an important means of solving energy supply in world practice, consider distributed generation. Distributed generation refers to a set of modular low-power generating units that produce electricity in close proximity to the place of consumption. In this case, the parameter of "proximity" to the place of consumption is estimated by the distribution network voltage class, to which the generating object is connected.

In addition to low-capacity power plants, renewable energy sources (RES) play an important role in the DG concept: they are sources of conversion of solar energy, wind energy and water flows, as well as organic waste associated with human activities-industrial, agricultural, domestic waste [2].

Recently, the issue of energy security is acute, in which the consumer has reliable access to the necessary energy, and the supplier - to its consumers at stable and affordable prices [3].

Currently, the development of technologies for the use of renewable energy sources leads to the fact that in matters of ensuring a stable electricity supply, sources of low-power will play a significant role. Ukraine in this process takes an active position. Given the climatic factors of our country, its geographical location, the potential for renewable energy in the country is quite high [4]. According to the data of the Institute of Renewable Energy of the NAS of Ukraine, the technically achievable potential is at least 548 billion kWh / year, of which in electric power

generation - up to 270 billion kWh / year (wind power up to 60 billion kWh / year, solar electricity - 5.7 billion kWh / year, large hydropower - 20.1 billion kWh / year, small hydropower - 8.6 billion kWh / year, bioenergy - 27 billion kWh / year, energy of the environment - up to 146 billion kWh / year).

Putting into operation in the last 5 years in the field of wind power and a solar power engineering, and to a lesser extent small hydropower [4, 5, 6], more and more larger leads quantity of objects of a renewable power engineering to problem definition of creation of networks with the distributed generation and regulation of streams of power in such networks. The power output of renewables also has to cope irrespective of local loading. In that case systems with distributed generation can influence negatively functions of management of tension of network, increasing fluctuations between the maximal and minimum levels of tension in comparison with necessary value.

Due to the introduction of distributed generation systems based on renewable energy sources, there are problems with monitoring and ensuring the stability of the power grid and the quality of the voltage. Hence the need to automate such systems.

Consequently, with the increase in the number and power of sources of distributed generation systems, various technical, operational and economic problems arise in integrating distributed systems into existing energy systems.

Keywords: distributed generation renewable energy sources, power quality

References

1. Энергетика XXI века: Условия развития, технологии, прогнозы / Л.С.Беляев, А.В. Лагереv, В.В. Посекалин; Отв. ред. Н.И.Воропай. Новосибирск: Наука, 2004, 386 с.
2. Каргиев М.В. Распределенная генерация энергии с использованием возобновляемых источников энергии // Energy Fresh. - 2010 - № 1. - С. 42-45.
3. Атлас енергетичного потенціалу нетрадиційних та відновлюваних джерел енергії в Україні. – К., 2005. – 36 с
4. Альтернативная энергетика в Украине: монография / Г.Г. Пивняк, Ф. П. Шкрабец: Д.: НГУ, 2013. – 109 с.
5. Основи вітроенергетики: підручник / Г. Півняк, Ф. Шкрабець, Н. Нойбергер, Д. Ципленков ; М-во освіти і науки України, Нац. гірн. ун-т. – Д.: НГУ, 2015. – 335 с.
6. Ветроэнергетика. Информационно-аналитический обзор по альтернативной энергетике: монография / С.В. Тарасов, Ф.П. Шкрабец, В.А. Задонцев, С.В. Отчич; под общ. ред. В.А. Дзензерского и Г.Г. Пивняка; М-во образования и науки Украины, Нац. горн. ун-т. – Д.: НГУ, 2014. – 156 с.
7. Pivnyak, G., Dychkovskiy, R., Smirnov, A., & Cherednichenko, Y. (2013). Some aspects on the software simulation implementation in thin coal seams mining. Energy Efficiency Improvement of Geotechnical Systems, 1-10.