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INNOVATIVE TECHNOLOGIES FOR PROTECTING THE ENVIRONMENT FROM EMISSIONS INTO THE ATMOSPHERE OF ENERGY FACILITIES

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Annotation: *Most atmospheric processes are directly or indirectly caused by the presence of suspended particles in the air - aerosols. Aerosol pollution is a serious problem as aerosol particles travel long distances and cause global climate change and human health. For this reason, in recent years, the attention of the world scientific community to the study of atmospheric aerosols has been steadily increasing.*

Widespread environmental pollution with various substances, sometimes completely alien to the normal existence of the human body, poses a serious danger to our health and the well-being of future generations. Therefore, environmental problems require immediate solutions. It is necessary to reduce the harmful impact of economic activities on the environment and achieve a minimum of emissions of harmful substances into the atmosphere.

The study of snow cover pollution is a convenient and fairly cheap way to obtain data on the flow of pollutants from the atmosphere onto the underlying surface [1]. Snow cover is of particular interest when studying long-term pollution processes (month, season), since, being a natural reserve tablet, it provides the actual amount of dry and wet precipitation during the cold season.

Reliable, safe and economical operation of power units and power systems requires solving complex problems of planning, forecasting, monitoring, analysis and control. The combination of rising energy consumption and delayed expansion of existing transmission networks, as well as the physical and obsolete deterioration of thermal power equipment and networks, means that energy systems are currently being operated at the limit of their capacity. This requires a more careful approach to choosing the optimal operating mode of power units and effective management of the power system, which is only possible with more detailed than usual monitoring of the system and a more informed choice of management and operational decisions, especially in transient modes and extreme (emergency) situations.

The behavior of power systems under operating conditions is highly nonlinear, and power system monitoring and control involves several hundred variables. This results in energy consumption and dynamic loads that cannot be reliably analyzed and modeled using traditional methods and technologies. Traditional technologies are successfully used if it is possible to build mathematical models of the problem or create a reliable expert system based on expert solutions. However, in most cases, the problems encountered in the energy sector do not satisfy these two conditions above. This leads to the need to introduce new advanced technologies in energy system management. The most rapidly developing and very promising systems are those using artificial intelligence technologies. Such new technologies have become quite widespread in industrialized countries and have shown their high efficiency.

The artificial intelligence system automates the procedures for generating images (models, descriptions) of changing objects in the external environment, creates conditions for clarification and making final decisions by the human operator, without placing increased demands on him, but only supplementing him. private intellectual functions to the functions of a generalized system in the changed conditions of this environment.

An intelligent system can consist of many components that have elements of artificial intelligence [2]. In the limit, each technical or software tool of an intelligent system can be considered as an intelligent tool that has its own reacting and closing parts. The goal of the latter is to ensure sustainable development not only of

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this individual product, but also of the system as a whole in relation to changes in the external and internal environment.

One of the central problems in the development of complex artificial intelligence systems is the problem of harmonization (coordination) of the reacting parts of its individual intellectual components with the help of their closing parts (nested artificial and actually functioning natural intelligence). Solving this problem is complicated by the fact that the closing parts of the system components can be created by different artificial intelligence methods, and in order to coordinate the reacting parts of these components it is necessary to combine solutions obtained by different methods. on a single basis. Neural network methods and tools can be chosen as such a basis, since with their help it is possible to simulate learning the rules of fuzzy logic, as well as to include genetic algorithms in their composition.

One of the important tasks facing software developers of artificial intelligence systems is the automation of the process of accumulating and processing extensive information. In this regard, the question is currently being raised about transferring some of the functions of processing this information to intelligent systems. At the same time, such systems must independently receive information, process it, make decisions about its further promotion and ensure such promotion.

In some cases, it is necessary that an intelligent system can independently influence the outside world [3].

Artificial intelligence technologies are widely used in monitoring and regulating frequency and voltage stability in power systems, as well as in assessing and improving their safety, which includes solving the following problems:

– analysis of unforeseen events and assessment of dangerous consequences (overload, voltage drop, uncontrolled state of the power system, etc.);

– static assessment of safety when the power system operates in a steady state, when the time frame for actions to localize the consequences is 10–30 minutes.

To monitor, control and reduce gaseous emissions in thermal power plants, it is necessary to install very complex and labor-intensive equipment (for example, the need to externally calibrate sensors every 24 hours). This significantly increases the cost of equipment and operation of thermal power plants. Therefore, the development of low-cost and efficient methods for modeling and monitoring emissions is of great economic and environmental importance.

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