APPLICATION OF SMART GRID TECHNOLOGIES FOR CONTROL AND MANAGEMENT OF POWER SUPPLY

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As it is known from the history, electricity for many years was considered only as an object for experiments and had no practical application. The first attempts to use electricity were made in the second half of the 19th century. These experiments marked the start for this electric energy studying. From that time and up to this day, electric energy research continues to evolve and grow according to the level of the human needs development.

In the modern era, one of the main issues in the development of electric power engineering is increasing energy efficiency.

The problem of integration of renewable energy sources into the existing network lies in the inability to issue a constant value of the flow. To combine energy flows between sustainable sources and new power sources, to fully meet human needs the world's electricity grids need to be made smart.

Smart grid is a smart network, which is based on the concepts of various operational and energy saving measures by using smart meters and renewable energy sources systems. This network is responsible for controlling the electric energy parameters, managing its production and distribution.

The need to develop a new concept of electric energy generation is explained by the economic growth, inextricably linked with the increase of energy consumption, raising requirements for the quality and reliability level of energy supply. On the other hand, this branch of economy faces significant technological, economic and environmental limitations. Therefore, there are only two options for further development of power supply and meeting the challenges:

The first option is an **extensive** approach, which means capacity building and expanding the number of energetic and electrical equipment, as well as increasing the volume of natural resources extraction.

The second option is an **innovative** (breakthrough) approach, which provides an opportunity for economic growth while maintaining the true level of primary energy resources extraction by transforming the structure of resources consumption as well as an active implementation of energy-saving equipment, new advanced technologies, automation and renewable energy sources, etc.

An in-depth analysis conducted in the US and the EU proved that a successful development of a country can not be solved within the framework of the extensive approach of power engineering development, increasing capacity and expanding the number of energetic and electrical equipment units even

having improved characteristics. Thus, the US and EU countries have chosen an innovative (breakthrough) path of power engineering development.

The starting point for the development of the Smart Grid concept in most developed countries marked the formation of a clear strategic vision of the development goals and objectives of power engineering, which will meet the future requirements of the society and all stakeholders: the state, science, economy, economics, consumers and others.

The development of the strategic vision was based on the following main position: “to make a breakthrough in the power supply system through the integration of the XXIst century technologies to achieve a smooth transition to new technologies in electricity generation, transmission and consumption that will benefit the state and the society as a whole.”[1].

From the point of view of the US Department of Energy, Smart Grid is a "fully automated system that provides two-way flow of power and information supply between power consuming devices throughout the world” [2]. Smart Grid allows to increase the efficiency of the industry branch due to the use of the latest technologies, tools and methods.

The US Department of Energy's National Energy Technology Laboratory defines Smart Grid as a means of organizational changes, new process modelling, information technology solutions and innovations in the sphere of the automated systems of technological process control and dispatching control in power engineering.

According to the European Commission, which deals with the development of a technological platform in the field of power engineering, Smart Grid represents electrical networks that meet the requirements of energy efficiency and cost-effective operation of the system through coordinated management and modern two-way communications between the power grid elements, power plants and consumers.

Therefore, the idea that Smart Grid system is the system of the future is fully correct as it will have the following principles of operation:

• The network will adapt to the needs of electricity consumers.

• The network will be available to new users; and new connections to the global network may be user-generated sources with zero or reduced CO_2 emissions.

• The network will guarantee security and quality of power delivery in accordance with the requirements of the digital age.

Innovation technologies should be of the greatest value in the construction of Smart Grid together with effective management and regulation of the network operation.

The structure of Smart Grid will include the following components:

1) smart accounting (the first step towards a smart power system);

2) smart network;

3) energy efficiency;

4) consumer technology.

The main difference in the operation of Smart Grid is as follows: in traditional networks, the current flowing through the wires comes from the generation point to the consumer in accordance with a predetermined level of voltage and resistance, but introduction of Smart Grid will allow to independently regulate power supply depending on decreased or increased mode of consumption. "Smart" counters transferring the information on consumption will be installed at the enterprises and apartment houses. This fact will allow to adjust using of electrical appliances over time and distribute electricity depending on the demand, which significantly reduces energy costs.

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WELFARE OF MARKETS IN POLTAVA

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Modernization of cities is one of the most pressing issues today. This article will consider the problem of modernizing markets on the example of the city of Poltava.

Poltava is the spiritual capital of Ukraine. But along with its historical values and sights, there are many places in it that require reconstruction, transformation and modernization, in other words – changes in urbanism. Urban studies is a science devoted to the development of various urban systems (transport, pedestrian infrastructure, ecology, health care and others), their interaction with each other and with city residents [1]. One of the places that