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THE EU COHESION POLICY AND HEALTHY NATIONAL DEVELOPMENT: MANAGEMENT AND PROMOTION IN UKRAINE

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The monograph focused on the specifics of the principles of the EU Cohesion Policy implementation. The authors conducted an analysis of the economic, ecological and social aspects of the integration of the EU experience into the state policy of Ukraine. The monograph summarizes approaches to the restoration of the country and healthy development. Particular attention is paid to the issues of health care system management, the trends and prospects of achieving the state of resilience of the medical and social provision system of the population in the context of the impact of COVID-19 on the national economy. The experience of using marketing and innovative technologies in the context of healthy national development is summarized.

The monograph is generally intended for government officials, entrepreneurs, researchers, graduate students, students of economic, medical, and other specialties.

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Today the opportunities associated with the use of innovative financing mechanisms, not fully implemented. One major problem is that these mechanisms lead to an increase in administrative costs. However, in case political conditions for a substantial expansion of international social investment recipient countries must be prepared to ensure proper management of resources, including on the basis of distribution in the mechanisms of countercyclical macroeconomic management and medium-term programs of public expenditure.

In this regard, it is important to also international cooperation in the field of taxation, providing reduction of tax evasion and non-payment. In political terms, bringing global resources and revenues from tax increases on the international level to address global problems seem much more difficult than taxing for purely domestic purposes. But like all political decisions made for future generations, not just to win the next election, this issue should be carefully analyzed in view of possible scenarios, including a dangerous scenario of events in which stored social polarization, social isolation, political confrontation and lack of security. Social expenditures should be seen as state social investments in human development.

2.8. Smart grid in Ukrainian energy system

The need for electricity and the energy system's capacity is growing every year. According to the forecast of the International Energy Agency (IEA), by 2030, the growth rate of demand for electricity will be 1.5-2 times faster than the growth rate of demand for primary energy carriers (Oliinyk, 2021).

According to the Paris Agreement of 2015, it is up to all countries to balance anthropogenic emissions from sources and the absorption of greenhouse gases in the second half of the 21st century to limit the increase in the global average temperature to 1.5 °C. Ukraine's achievement of this goal depends significantly on the energy industry development (Khomenko et al., 2022).

At the same time, the energy system of Ukraine has some problems, in particular (New Voice, 2020; Oliinyk, 2021; Makogon, 2023):

– high level of wear and tear of the main and additional equipment and lack of funds for their modernization (wear and tear more than 70%);

– uneven network load distribution;

– a large proportion of power plants use fossil fuel resources (coal, gas, etc.);

– accidents and low reliability due to uncoordinated operation of emergency automation systems;

– technological losses of electricity during transmission and distribution in networks (11.6% in 2019 or up to 15 billion kWh of electricity);

– commercial electricity losses (due to old meters, unsatisfactory level of reliability of power supply systems);

– significant losses of wind (90%) and solar (50%) generation due to the full-scale invasion of the Russian Federation;

– accumulated significant debts to investors regarding green energy.

Smart grid technologies can solve most of the energy companies' problems.

Smart grid involves the use of communication technologies, the collection of information on the production, transmission, and consumption of electricity in real-time, and effective control and management of the network without human intervention.

The critical role of smart grid technology in energy development is evidenced by the current market volumes and its projected growth (Fig. 2.11).

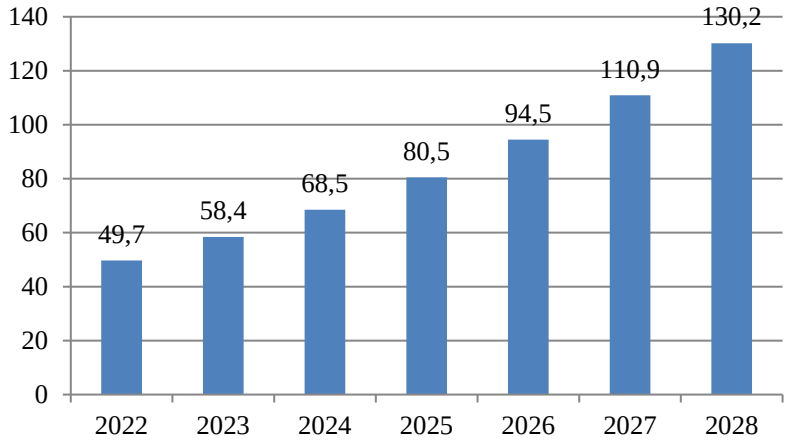

Figure 2.11 – Forecasted volumes of the smart grid technology market in the world during 2022–2028, in billions of dollars. USA (Statista, 2022)

According to a report (IEA, 2022), despite the economic crisis caused by Covid-19, investment in smart grids is expected to double by 2030 to reach 100% zero emissions by 2050, especially in emerging market countries and in developing countries.

Components of smart grid technologies in the energy industry (Volta, 2023; New Voice, 2020; Denisyuk & Stsheletsky, 2019; Krushtymki, 2023; Matviychuk et al., 2019):

– smart metering – an intelligent meter transmits data on electricity consumption in real-time, thanks to which it is possible to maintain the set rules of behavior during peak hours and other times;

– dynamic grid management – connection of all equipment to an intelligent network, making it possible to monitor power outages at the consumer in real-time and timely. Thanks to this, the energy company can quickly detect an emergency and prevent it;

– demand response – provides regulation of demand by shifting it in time, for example, by turning on energy-intensive equipment only at times of the lowest load;

– increased security – network video surveillance and limited access technologies allow to monitor of remote smart grid resources at all times, avoiding interception and distortion of information, as well as system shutdown;

– integration of renewable energy into the power grid – provides for the possibility of effective integration of power plants based on renewable energy sources, which strongly depends on weather conditions to a centralized system;

– work with large amounts of information when a person cannot cope – the production of electricity by stations based on renewable sources can change over time, and the use of smart grid data and automation allows for an uninterrupted supply of electricity to consumers;

– digitalization of the energy sector – the use of digital technologies to change the business process and improve efficiency. It allows comprehensive management of electric power systems and ensures the optimization of all business processes for the stability of the industry;

– power electronics (FACTS / HVDC) – allows transmitting high-voltage direct current and flexible alternating current over much longer distances;

– energy management system (EMS) – helps to ensure the reliability of supply, efficient use of production resources, and reduction of energy transmission costs;

– intelligent automation and protection of substations – allow to ensure a high level of protection of people and power facilities, remotely monitor errors, enable predictive maintenance, support engineering and testing, reduce manual interactions and speed up individual operations, and reduce installation and maintenance costs;

– comprehensive monitoring of the state of substations – ensures tracking of all components of the substation;

– communication solutions – combine centralized and decentralized electricity production into a single system;

– distribution management systems (DMS) – allow a reduction in the duration of power outages, minimize losses due to improved monitoring, balance demand and distributed generation, reduce maintenance costs due to online monitoring;

– distributed energy resources (DER) – requires the creation of a virtual power plant that connects several small plants, the participants in the energy market. Thanks to it, new sales channels are used that are not available to operators of individual plants;

– decentralized energy management system (DEMS) – uses real-time forecasting, operational planning, and optimization. Thus, it is possible to predict electrical and thermal loads, forecast electricity production from renewable energy sources depending on the weather forecast;

– intelligent solutions for measurement – record energy consumption by each consumer over time and provide information about their consumption. It allows for saving electricity consumption significantly.

Some factors contribute to smart grid technologies gaining popularity and are increasingly used in the energy sector.

The drivers of smart grid implementation in the energy sector are (Denysyuk & Stsheletsky, 2019):

– Internet of energy (IoE) – the use of the Internet of Things with various energy systems; provides "mobility" of energy, such it is as easy to connect to the energy system as to the Internet;

– decentralized energy – involves the development of projects for electricity generation with small capacities; includes distributed generation, demand management and energy efficiency, microgrids, electric vehicles, and distributed electricity storage systems;

– industrial Internet of things (IIot) – a system of computer networks and industrial objects to which various sensors, counters, and other devices are connected, allowing collection, transmission, visualization, processing, and remote management of data without human intervention;

– a single information platform – the formation of a single digital platform that will provide data analysis at energy facilities and management decision-making;

– risk orientation – forecasting the technical condition of equipment and identifying dangerous trends at the initial stages (based on mathematical algorithms) for timely response and prevention of breakdowns and accidents;

– customer services – intelligent contracts, interactive service, various electricity tariff packages;

– supply and demand aggregators – companies that simultaneously manage the power-consuming equipment of several consumers and are participants in the wholesale electricity market.

The state, operators (energy companies), businesses, and end consumers will benefit from the introduction of smart grid technologies in the energy sector of Ukraine.

Benefits for the state from the use of smart grid (New Voice, 2020; Oliinyk, 2023; Matviychuk et al., 2019):

– development of an energy industry based on renewable energy sources (solar, wind, hydropower);

– reducing the duration of emergency power outages;

– ensuring a stable supply of electricity to the population;

– increasing the reliability and quality of electricity supply;

– reduction of the environmental load (because during peak periods, coal-fired thermal power plants, which pollute the environment, are used to avoid accidents);

– reduction of dependence on external supplies (or imports) of organic fuel or electricity;

– improvement of conditions for economic integration and competition;

– the innovative impulse for the economy.

Benefits for the energy company (Oliinyk, 2021; Matviychuk et al., 2019):

– better accounting of electricity consumption;

– electricity demand management;

– increase in energy efficiency;

– more effective management of electricity production, supply, and consumption processes;

– reduction of operational costs and improvement of reliability of electricity supply;

– increasing productivity and labor safety of energy company employees.

Benefits for the population (New Voice, 2020):

– minimization of negative consequences for consumers thanks to automatic management of all processes of the energy company;

– eduction of time of lack of electricity and provision of stable supply;

– the possibility of earning electricity thanks to installing solar panels on the roofs of buildings.

Benefits for business (New Voice, 2020):

– ease of connection to power grids;

– increase in network reliability;

– quick elimination of emergencies.

– For smart grid technologies to work effectively, they must have certain features.

The main features of smart grid (Wikipedia, 2023):

– reliability – thanks to state assessment technologies, the smart energy system detects malfunctions and self-restores without the intervention of specialists;

– flexibility – adapted to bidirectional energy flows, which allows connecting solar batteries, charging batteries of electric cars, and wind turbines;

– efficiency – achieved through demand management, voltage reduction on distribution lines when possible, complete use of generators, reduction of redundancy in transmission and distribution lines;

– stability – neutralizes the effects of weather conditions and ensures stable operation of the system;

– market opportunities – balancing demand and supply due to introducing a double tariff for energy during peak hours.

Thus, considering the components and features of the smart grid, several directions of development and implementation of smart energy systems are distinguished.

Directions of technologies of smart energy systems (Matviychuk et al., 2019):

– integrated communications – provide management and data exchange in real-time,

– sensors and meters - allow monitoring and measuring data from meters; include smart meters and phase meters;

– high-tech components – provide for distributed management of energy flows and intelligent energy generation;

– intelligent control – involves the presence of a control system, software, and high-speed computers, automation of substations, and response to demand;

– improved interfaces and decision support – include visualization technologies for ease of perception; software systems that provide huge opportunities for operators when intervention is needed; employee training simulators and scenario analysis systems.

The following steps must be taken to implement smart grids at the state level (Oliynyk, 2021).

1. Implement automated monitoring, intelligent control, and protection systems - this will reduce the impact of the human factor and, as a result, reduce the time of power supply interruptions in the system.

2. With the help of information and communication technologies, modernize the tools that support the balance between the production and consumption of electricity - for example, switching to LED lamps instead of incandescent lamps, which ensures the same lighting level, but with lower electricity consumption.

3. Implement the tools of controlled electricity conversion – this will allow using electricity only when and in the amount needed and not using it at other times.

4. Integrating renewable sources of power plants (sun, wind, water) will reduce the production and use of fuel resources.

5. Develop a microgrid (microgrid) is a group of consumers and sources connected to a common network, but they can function autonomously. It can reduce regional energy dependence.

6. Implement means of energy storage – they allow to "store" electricity in periods of minimal load, and give it out in peak hours, thus balancing generation and consumption.

7. Implement high-speed regulators of power and voltage flows – they allow for leveling out voltage changes and ensure system stability.

8. Implementing smart electricity accounting will allow one to receive meter readings remotely. Thanks to this, the system of mutual settlements between the consumer and the energy company is improved, electricity theft is avoided, and the quality of the electricity supply is controlled.

9. Carry out large-scale digitalization – thanks to which it will be possible to optimize all business processes and ensure the stability of the energy system of Ukraine.

10.Move to the concept of uninterrupted power supply (or minimal interruptions).

Several companies in Ukraine are actively implementing Smart Grid technologies in the Ukrainian energy industry. These include (New Voice, 2020):

Tractebel is a Belgian company engaged in developing and implementing Smart Grid technologies together with NEC Ukrenergo.

DTEK – implements the installation of "smart meters" and automates the electricity supply system using modern software. It allows seeing emergencies and fixing them quickly.

At the same time, the leading developers and suppliers of intelligent network systems at the global level are (Maynard & Sat, 2022):

ABB is a Swedish-Swiss company, one of the world's leading electrical equipment manufacturers. The goods of this brand are characterized by high quality. Innovative technologies, high-tech equipment, and modern materials are used in their production. ABB's main areas of activity: are electrical equipment, robotics, electric drive, automation for industrial purposes, and power grids.

CISCO Systems Inc. – a world leader in information technologies and networks, helps companies of all sizes to use new communication opportunities. Cisco purposefully develops new products and technologies, and holistic architectures, such as Cisco DNA, aimed at effective business support.

Eaton – develops solutions in energy supply management, has a staff of 96 thousand employees, and is represented in 175 countries. The company strives to improve people's lives and the environment through energy management technologies that are more reliable, efficient, safe, and environmentally friendly. Energy-efficient products and services help customers effectively manage electrical, hydraulic, and mechanical energy more reliably, productively, safely, and environmentally. The company provides people with the means to use energy more efficiently.

Siemens is the world's leading technological concern, which for more than 175 years, represented the highest level of engineering, innovation, and quality. The company operates in more than 200 countries around the world and specializes in areas such as electrification, automation, and digitalization.

Fujitsu is a large Japanese electronics manufacturer and IT company. It specializes in the manufacture of semiconductors, air conditioners, computers (supercomputers, servers, personal computers), telecommunications, and services.

General Electric produces state-of-the-art, high-tech, intelligent uninterruptible power supply systems for reliable protection of computers, means of communication and telecommunications, automated process control systems, medical, scientific, and other electronic equipment from instability and loss of supply voltage. Safe and managed energy is General Electric's business. The company offers a technical solution that meets all customer requirements with a full spectrum of hardware and software products, including products and software for protecting information systems from failures and managing the power supply process.

Honeywell is an American company producing electronic control and automation systems. The main directions of the corporation's work are the areas of production and maintenance of aerospace devices and auto equipment, equipment for the operation of residential and industrial premises, and production of turbocompressors and specialized equipment and devices. Honeywell Corporation is one of the first hundred most famous manufacturers of industrial automation devices, consumer goods, as well as physical security and property protection devices.

IBM Corporation (International Business Machines Corporation) is an American corporation, the world's largest manufacturer of all types of computers and software, and one of the largest providers of global information networks. The corporation ranks sixth on the list of the largest companies in the world. IBM manufactures and sells hardware and software services (hosting, consulting) in areas from mainframes to nanotechnology. With 330,000 employees worldwide and revenues of $91 billion in 2005, IBM is the world's most significant information technology company. IBM owns more patents than any other technology company. IBM has engineers and consultants in more than 170 countries, and IBM Research has eight laboratories worldwide. IBM employees have won five Nobel Prizes, four Turing Awards, five National Medals for the

Advancement of Technology, and five National Medals for the Advancement of Science.

Itron is an American technology company that offers energy and water management products and services. The company's products and services include smart grid, smart gas, and smart water technology solutions that measure and analyze electricity, gas, and water consumption. Its products include devices for measuring electricity (electricity meters), gas, water, thermal energy and control technology, communication systems, and software. Itron has more than eight thousand corporate clients in more than 100 countries.

Johnson Controls delivers products, services, and solutions that improve energy efficiency and lower operating costs in buildings for more than one million customers. Operating in more than 150 countries, it is a leading supplier of equipment, controls, and services for heating, ventilation, air conditioning, refrigeration, building control, and security systems. The company also offers the expertise, services, and strategic vision to make the client work within their current system, optimizing their building's performance and reducing overall costs.

Landis+Gyr AG – in 2011 Landis+Gyr was acquired by Toshiba Corporation. It allowed focusing efforts on the up-and-coming field of energy management solutions, with an emphasis on SMART measurement technology. By joining forces, Toshiba and Landis+Gyr quickly became a world leaders in management solutions contributing to more efficient and economical use of the world's energy resources.

Oracle Corporation is an American corporation, the world's largest software developer for organizations, a significant supplier of server equipment, and a developer of database management systems, database development tools, and ERP systems.

Also, important players in this market are Panasonic Corporation, Robert Bosch GmbH, Schneider Electric, Tantalum, and Wipro.

Thus, the experience of using smart grid technology in different countries of the world shows that it allows for overcoming several technological, environmental, and economic problems in energy; is beneficial for the state, the energy sector, business, and the population and meets the demands of the innovative economy of the 21st century and the requirements of sustainable development.