

## **RESTORATION OF THE ENERGY SYSTEM OF UKRAINE**

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### ***Анотація***

*В статті виконано розгляд майбутніх напрямків відновлення енергосистеми України.*

**Ключові слова:** електрична мережа, модернізація, сонячні панелі, автоматизація.

### ***Abstract***

*Consideration of future directions of restoration of the power system of Ukraine is done in the article.*

**Keywords:** electrical network, modernization, solar panels, automation.

### **Introduction**

As a result of Russia's aggression against Ukraine, part of the energy system has already been destroyed. Hundreds of towns and villages were left without electricity, a large amount of equipment was destroyed and our country will have to gradually restore it all.

The post-war reconstruction of the Ukrainian energy system may give impetus to the development of Ukrainian energy, in particular electricity networks, which were very worn out even in peacetime and needed significant modernization.

### **Ways of further development**

Until February 24, 2022, Ukraine had one of the largest energy systems in Europe. After February 24, the Ukrainian power system operated in isolation for 21 days. Zaporizhzhya nuclear power plant and Kakhovka hydroelectric power plant are now under terrorist control. Special damage to substations at 330-750 kilovolts: buildings, circuit breakers, transformers.

New technologies and distribution systems need to be adopted for future recovery and energy transition.

- Technological trends affect all energy sectors and lead us to an all-electric society;
- Automation is recommended for both distribution networks and telecontrol systems;
- The key technologies of an all-electric society are divided between electrification, network control and automation;
- Additional use of automation: measurement and monitoring (network security, network infrastructure, modular and controlled network switches, etc.).

We cannot develop only renewable sources, we need to maintain cheap nuclear energy and high-maneuverability (thermal) capacity as well. It is also necessary to build new wind and solar power plants, reconstruct nuclear power plants, and renew thermal power plants (more than three gigawatts) so that they can operate reliably for the next 15 years. With regard to networks, the issue of: as soon as possible to provide electricity to households where the networks are completely destroyed, and to restore supply to all customers; replace old networks, even repaired ones, with new ones using technology and innovation (smart grids, etc.)

### **The concept of a smart grid in Ukraine.**

On May 18, the initiative "Return Energy to Ukraine" was adopted. We are already seeing the beginning of the introduction of some of its elements: the beginning of the installation of solar panels on roofs, and so on. Such an action plan can be the basis for the development of energy supply networks in Ukraine, similar to European models.

However, we need to keep in mind the significant differences between the EU and Ukraine. Massive installation of solar panels with a voltage of 250 volts on the roofs can be a significant problem for distribution companies.

**Energy is a weapon.** Energy independence has become a security factor for us. This should always be kept in mind when reconfiguring and restoring our power distribution.

We need to change the way we think: reducing energy consumption is a security issue for us. Energy efficiency, reduction of energy consumption and decentralization of energy systems are urgent.

We need to create small closed distribution systems with self-consumption and self-generation.

**Financing.** GDP will fall, we cannot increase tariffs. We will have to ask for support from European partners. Large investments will be needed to overcome the long path of building networks in the long run.

## Conclusions

Our country will have to rebuild our entire energy system after the conflict. This process is time consuming, costly and troublesome. Despite this, a large number of conferences are already being held to discuss further actions in terms of implementing new and improving existing electrical equipment.

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