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The Prospects of Smart Grid in Belarus

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The Belarusian economy, national security and even the health and safety of our citizens depend on the reliable delivery of electricity. The electric grid is more than just generation and transmission infrastructure. It is an ecosystem of asset owners, manufacturers, service providers, and government officials at state and local levels, all working together to run electrical grids. Our electric infrastructure is aging and it is being pushed to do more than it was originally designed to do [1].

Modernizing the grid to make it *smarter* and more resilient through the use of cutting-edge technologies, equipment, and controls that communicate and work together to deliver electricity more reliably and efficiently can greatly reduce the frequency and duration of power outages, reduce storm impacts, and restore service faster when outages occur. Consumers can better manage their own energy consumption and costs because they have easier access to their own data. Utilities also benefit from a modernized grid, including improved security, reduced peak loads, increased integration of renewables, and lower operational costs.

Smart Grid technologies are made possible by two-way communication technologies, control systems, and computer processing. These advanced technologies include advanced sensors that allow operators to assess grid stability, advanced digital meters that give consumers better information and automatically report outages, relays that sense and recover from faults in the substation automatically, automated feeder

switches that re-route power around problems, and batteries that store excess energy and make it available later to the grid to meet customer demand.

A smart grid is an electricity network based on digital technology that is used to supply electricity to consumers via two-way digital communication. This system allows for monitoring, analysis, control and communication within the supply chain to help improve efficiency, reduce energy consumption and cost, and maximize the transparency and reliability of the energy supply chain. The smart grid needs to be introduced in Belarus with the aim of overcoming the weaknesses of conventional electrical grids by using smart net meters [2].

Smart grid is equally advantageous for enterprises, retail stores, hospitals, universities and multinational corporations. The entire smart grid system is automated for tracking the electricity consumption at all the locations. Grid architecture is also combined with energy management software for estimating the energy consumption and its associated cost for a specific enterprise. Generally, electricity prices increase along with demand. By providing consumers with information about current consumption and energy prices, smart grid energy management services help to minimize the consumption during high-cost, peak-demand times.

A modern smart grid system has the following capabilities. It can repair itself. It encourages consumer participation in grid operations. It ensures a consistent and premium-quality power supply that resists power leakages. It allows the electricity markets to grow and make business. It can be operated more efficiently [2].

The basic concept of smart grid is to add monitoring, analysis, control, and communication capabilities to the national electrical delivery system to maximize the throughput of the system while reducing the energy consumption. Smart

grid initiatives seek to improve operations, maintenance and planning by making sure that each component of the electric grid can both *talk* and *listen*. Another major component of smart grid technology is automation.

In many places, a power company will only know that service is out if a customer calls. In a smart grid scenario, if service is interrupted the company will know right away because certain components of the grid (smart meters in the affected area, for instance) stop sending sensor data. By ensuring that all the components of the grid – from transformers to power lines to home electric meters – have IP addresses and are capable of two-way communication, the company can manage distribution more efficiently, be proactive about maintenance and respond to outages faster [1].

One of the radically new concepts of smart grid to be introduced in Belarus is micro grids, which are generally defined as low voltage grids with distributed generation sources, power storage devices and controlled loads (heaters and air conditioners). An important property of micro grids is that, despite functioning within the distribution system, they can automatically be transferred to an isolated state in the event of network failures and restore synchronization with the network after eliminating the accident while maintaining the required quality of electrical energy.

Smart-micro grids can effectively cover the growing consumer demand due to the growth of electricity revenues from renewable energy sources. In a micro grid, energy resources can't be completely *planned*, intellectual systems are combined with the communication infrastructure to provide control on the demand side, and through it – the balance between supply and demand.

Governments and power companies across the world have recognized that the traditional grid, which has not significantly changed in 100 years, must be replaced by more

efficient, flexible and intelligent energy-distribution networks, called smart grids. These are digitally monitored, self-healing energy systems that deliver electricity or gas from generation sources, including distributed renewable sources, to points of consumption. They optimize power delivery and facilitate two-way communication across the grid, enabling end-user energy management, minimizing power disruptions and transporting only the required amount of power. The result is a lower cost to the utility and the customer, more reliable power, and reduced carbon emissions [3].

References:

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