2.2 Digitalisation of the energy sector

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The current energy crisis, the dependence of the Western Balkan countries on energy imports, irresponsible consumption of existing energy resources, as well as insufficient use of the potential of renewable energy sources in the region, are a sign for the activism of highly educated institutions. The digitalization of the energy sector is one such process. The current energy crisis caused by global disruptions poses a serious challenge to the community and requires proactivity from highly educated institutions.

A large number of documents such as the European Green Deal, the Green Agenda for the Western Balkans, and the 2030 Climate and Energy Goals are a good framework for development in this area. What is common to all these documents is the aspiration to create conditions for energy independence through rational use of existing resources, raising the level of energy efficiency of production processes in households, as well as turning towards renewable energy sources, i.e. full orientation towards a competitive low carbon industry, investment stability and security of energy supply. These expectations are set within realistic frameworks because they are based on the application and availability of new technologies such as VR, AI, Blockchain technologies, IOT, Cloud, distributed bases, unmanned aerial vehicles, etc.

On the other hand, the countries of the Western Balkans and the former Yugoslavia carry in their heritage major problems related to process energy efficiency. The potential for renewable energy sources is also enormous, and their utilization is very small. If we add to this the overall state of energy systems, we get a complete picture of the general state of the global energy sector, which can be found to be unsustainable.

What all three countries have in common is that they are extremely dependent on energy imports. Over the last two years, all three countries have adopted new laws on the use of renewable sources and energy efficiency, which include the introduction of stricter standards to increase the energy efficiency of industrial plants and preserve the environment through increasing the use of energy from renewable sources, energy waste, solar energy, biomass energy, geothermal energy. The percentage of energy utilization from renewable sources is not at a satisfactory level, given the existing capacity. On the other hand, the need for decarbonization of the economy is an integral part of all these regulations and is closely related to the processes of creating energy-efficient production processes and products, rational use of resources and the application of energy from renewable sources.

In the Republic of North Macedonia, domestic electricity production is based on coal, oil and hydroelectric power plants, and is complemented by imports of electricity. The total installed capacity in hydropower plants is 33% − including large and small hydropower plants – with a total capacity of 649 MW. The total installed capacity of small hydropower plants is 46MW. Electricity imports are projected to be significantly reduced (from 17% in 2009 to 1% in 2030), which will be achieved by increasing the share of gas and renewable energy sources in the domestic energy mix. In the Republic of Serbia, electricity is mostly produced in thermal power plants. Thermal power plants account for 70.9% of total electricity generated (26.54 TWh) on average for the previous decade. Currently, Serbia has a total installed capacity of 58.5 MW from renewable energy sources in operation, which represents 0.82% of the total installed capacity in the serbian power system – therefore, almost negligible in relation to the target values that the state wants and is obliged to meet in the next five years. Of the total 58.5 MW, 34.86 MW (60%) comes from small hydropower plants, 5.34 MW from solar PV systems on earth, 2.61 MW from solar PV systems on buildings, 4.86 MW from biogas plants, 10.33 MW from cogeneration, and only 500 kW (kilowatts) comes from wind energy. Interestingly, there is no biomass project.

Energy production in Slovenia in 2019 amounted to 148,000 TJ. The largest share was held by nuclear power with almost 43%, followed by renewable energy sources (including hydropower) with almost 32% and coal with 25%. 0.1% of energy was produced from other sources. Slovenia met 51% of its energy needs with domestic energy sources, while the rest was needed from imports. Taking into account energy imports and exports, 283,000 TJ was available for purchase in 2019.

The speed and scope of digital transformation affects almost all industries. The digital agenda today encompasses a combination of technologies, from cloud to analytics platforms to mobile devices. All of these technologies together put research and data at the heart of new business models. Today, industries, companies and business leaders are struggling with increasingly complex challenges that require greater agility, care and digital competitiveness. These trends also affect the energy sector. A large part of the sector's focus goes towards the price of oil related to the dynamics of required quantities and production, as well as the impact on efficiency. The continuously high level of oil production is affected by large reserves of raw materials in different parts of the world, which forces producers to adjust their productivity to these conditions.

Digitalization also affects supply in different ways. There are four trends noticeable in the market: changing consumption patterns, new ways of adapting resources, crossing with other industries through partnerships, and greater use of industrial platforms.

The online world is changing spending patterns. There is less and less ownership, and more and more paying for the use of certain services or resources. Cars are rented by the hour; new models of auto insurance are based on time spent behind the wheel, not on flat payment; Cars are becoming digital platforms for themselves that have only diagnostics, satellite navigation, entertainment systems and are connected to infrastructure and traffic control systems to reduce congestion on the streets. Smarter cars, smarter homes and smarter appliances – all of them will affect energy demand. Much of the change will be possible thanks to connected devices that allow real-time information to flow. It is a combination of real-time data and analysis that will contribute to the use of resources as efficiently as possible.

The digitalisation of the energy sector will enable a higher level of operational quality by adopting technologies with high potential for making changes to conventional approaches. The domain of big data in energy (eng. Energy Big Data as a framework of modern smart energy grids provides an ideal eco-system for the exploitation of knowledge extracted from data. One of the goals of digitalization in the energy domain is to implement distributed technologies for data processing and analysis for optimal management of the energy system in real time. Data management between different stakeholders, coordination and cooperation in the energy value chain will be guaranteed through a data management framework that complies with IDSA (international date spaces) standards. Such exchange environments enable an open and reliable data market that will enable secure exchange and guarantee the sovereignty of data and guarantee data management and secure data transfer from data owners to technology providers.

Digital technologies will also help in the loss of essential skills or personnel in the energy sector. The growth of mobile technologies will help workers more easily get to know and master new, increasingly complex equipment. Digitalization erases industrial boundaries and provides potential solutions that should enable the integration of new technologies. Digitalization can improve workers' incomes and efficiency and increase productivity. All this leads to social benefits such as predictability and greater energy security. But that's where the challenges lie. New skills will be needed, and data security will be even more important.

Finally, digitalization is an integral part of the global transition matrix