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ENERGY EFFICIENCY AND GREEN TECHNOLOGIES: THE ENGINE OF A NEW ECONOMIC PARADIGM IN POST-WAR UKRAINE

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Statement of the problem. In the wake of post-war reconstruction, Ukraine will be faced with the urgent need to revive its war-torn economy while addressing important environmental issues. Against this background, the integration of energy efficiency and green technologies becomes a key strategy for advancing Ukraine to a sustainable and prosperous future. However, numerous problems and barriers prevent the effective adoption and implementation of these technologies.

The aim of the article. Energy efficiency is becoming an extremely relevant topic for Ukraine as the main road to post-war recovery and strengthening of the national economy. The introduction of the latest technologies through the reconstruction will not only reduce the energy bills, but will also contribute to saving of expensive energy resources and reduce emissions. In this context, the importance of the innovative component of the country's reconstruction is related to the fact that the main requirement for recovery should not be a simple return to the pre-war state, but a full-fledged innovative development and integration into the European Community on the basis of sustainable development and taking into account the European Green Course, which also is a guarantee of fulfillment of the Copenhagen criteria for accession to the EU. Ukraine seeks accelerated accession to the EU, and therefore post-war reconstruction should be carried out according to European standards, rebuild the economy, reduce its energy intensity and increase the level of energy efficiency in all sectors.

Summary of the main results of the study. As soon as the war ends, the focus will swiftly transition to rebuilding and laying the groundwork for a thriving, tranquil Ukraine. Whereas both wartime and post-war management are needed, the goals are not the same. Reconstruction will mobilise resources not towards a single goal but multiple goals adapted to the various reconstruction needs, both across geographic regions as well as economic and societal spheres.

The conflict instigated by Russia against Ukraine has inflicted a substantial toll on Ukraine's energy infrastructure and has reverberated across global energy markets. Ukraine has endured extensive damage to its energy systems and has relinquished control over certain power generation assets. Nonetheless, crises often unveil new prospects. Yet, securing a prosperous and sustainable future for Ukraine's energy sector necessitates deliberate planning and policy reforms.

According to an audit by the Kyiv School of Economics (KSE), total war-related losses in the energy sector as of June 2022 were estimated at approximately US\$ 12 billion, with direct losses at US\$2 billion [1]. For example, more than twelve (CHP, TPP and HPP) have already been destroyed or damaged. In general, about 50 % of the country's energy infrastructure is damaged. Green energy is no exception, because its share in the structure of production before the full-scale war was more than 13 %.

Solar energy has been actively developing in Ukraine over the past decade and a half. Mostly, due to the peculiarities of the climate, in the south of the country and in the Crimea.

But with the occupation of the peninsula and active hostilities in the southern region, many stations were either occupied or in the front zone. Therefore, it is advisable to shift the focus to wind power generation. In general, about 40 % of territories in Ukraine are suitable for generating energy from the wind.

Key recommendations for energy efficiency in “green” restoration are indicated:

1. Emphasizing international experience and citing EU cases is essential when crafting support schemes and securing financing for energy-efficient projects;

2. Development of “energy storage facilities”. Law “On Amending Certain Laws of Ukraine Regarding the Development of Energy Storage Installations” no. 2046-IX introduced new concepts such as “energy storage system”, “energy storage system operator” and “fully integrated network elements”. Accordingly, this increase in the use of “green” energy will lead to the need for energy storage systems [2].

3. Establishing eligibility criteria for funding streams and other reconstruction initiatives by stakeholders should prioritize energy efficiency.

4. Given the increased European ambition on energy and climate and considerable damage to Ukrainian building stock, respective plans could be revised and amended with more precision and higher ambitions and merged into a single reliable renovation strategy/plan.

5. Crafting the NECP and Long-Term Renovation Strategy as foundational policy documents is crucial, prioritizing the “energy efficiency first” principle to incentivize renovation solutions [3]. Moreover, replicating proven best practices at regional and local levels is equally essential, presenting parallel priority solutions that can significantly advance the thermal modernization of the Ukrainian building stock.

6. Ukraine should consider legally defining the energy efficiency first (EE1st) principle in its legislation, drawing upon the valuable experience of the European Union in this regard [4].

7. To enhance the performance of the Energy Efficiency Fund of Ukraine and expand energy efficiency programs at national, regional, and local levels, it's imperative to learn from the best practices of EU member states. Initiatives like the KfW Energy Efficient Construction and Renovation, RenoWatt, and the EOL project offer valuable insights [5]. These examples can inform strategic improvements in the Energy Efficiency Fund's operations and inspire the development of effective energy efficiency programs tailored to Ukraine's context.

8. Recognizing the significance of wider penetration and exposure of building certification is crucial, including international voluntary certification systems such as LEED, BREEAM, DGNB, and EDGE [6]. These systems play a vital role in identifying buildings with high performance levels, serving as benchmarks for energy efficiency and sustainability standards. Their increased adoption can drive awareness, encourage best practices, and facilitate the transition towards more environmentally friendly and efficient buildings.

Conclusions. The future of “green” energy in Ukraine is promising. Natural conditions, such as a favorable climate and the potential of solar and wind resources, make the country an ideal place for the production of “green” energy. Legislative initiatives and approximation to EU standards contribute to the active development of RES, and the introduction of new technologies in the sector, such as storage systems and the integration of biotechnologies, opens wide opportunities for innovation.

It is important to take into account challenges such as war, the need for financial resources for new technologies and the implementation of European standards. With proper management and effective resolution of these tasks, Ukraine can become a key player in the “green” energy sector, ensuring the stability and independence of the country's energy supply in the future.

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