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The Devastated Ukrainian Power Sector and the Growing Dependence on Electricity Imports from the European Union

Ukraine's power sector is among the most heavily damaged components of the country's infrastructure as a result of the full-scale war launched in February 2022. A system that only a few years earlier possessed substantial export potential to European Union member states has, over the four years of war, undergone profound technical and structural degradation. Large-scale attacks on power plants, transformer substations, and transmission networks have led to the permanent loss of a significant share of its generation capacity and the destabilisation of the entire power system. As a consequence, Ukraine is increasingly compelled to import electricity from the EU in order to maintain the balance of its power system.

Ukraine's Power System. Prior to the outbreak of the full-scale war in 2022, Ukraine's power system ranked among the largest in Central and Eastern Europe. The total installed capacity of conventional generation sources amounted to approximately 41 GW, with the system based on several key pillars: nuclear power, coal- and natural gas-fired thermal power plants, and – to a lesser extent – renewable energy sources (RES), including hydropower. Nuclear energy played the dominant role, accounting for more than half of total electricity generation under normal conditions. Ukraine operated 15 nuclear reactors at four power plants: the Zaporizhzhia Nuclear Power Plant in Zaporizhzhia (Enerhodar), the Rivne Nuclear Power Plant (Varash), the Khmelnytskyi Nuclear Power Plant (Netishyn), and the South Ukraine Nuclear Power Plant (Yuzhnoukrainsk). The combined capacity of nuclear power plants was more than 13–14 GW. The Zaporizhzhia Nuclear Power Plant, with a capacity of 5.7 GW (six units of approximately 1 GW each), was the largest nuclear power facility in Europe. Thermal power plants and combined heat and power plants (CHP), primarily fuelled by coal and natural gas, constituted another crucial pillar of the system. Together with hydropower plants and pumped-storage power stations, they played a key role in the stabilisation of the power system and meeting peak electricity demand. Within the hydropower sector, the cascade of power plants along the Dnipro River was of particular importance, and another critical component of the infrastructure was the transmission system operated by Ukrenergo, comprising thousands of kilometres of high-voltage transmission lines at 750 kV, 330 kV, and 220 kV, as well as hundreds of transformer substations. In March 2022, under emergency conditions, Ukraine's power system was synchronised with the European ENTSO-E network, enabling both the export and import of electricity to and from EU member states. Even before the war, Ukraine possessed electricity export capabilities vis-à-vis the EU, particularly through the so-called Burshtyn Energy Island, which had already been synchronised with the European system. Following the full synchronisation of the entire Ukrainian power system in 2022, the potential for expanding their electricity trade emerged. In practice, however, further development of this cooperation has since been constrained by ongoing military operations and the extensive destruction of energy infrastructure.

Destruction of the Power Sector as a Result of Armed Hostilities. Since the beginning of Russia's full-scale invasion, Ukraine's energy infrastructure has become one of the primary targets of military attacks. According to data from the Kyiv Energy and Climate Lab, approximately 16 GW of generation capacity has been destroyed, while an additional 6.5 GW is currently severely damaged. Furthermore, around 16 GW of installed capacity is located in territories occupied by Russia, which significantly limits its availability to the Ukrainian power system. As a result, Ukraine has lost access to more than 75% of its pre-war conventional electricity generation potential. In practical terms, this means that out of the pre-war installed capacity of 41 GW, only around 13 GW remains operational. At the same time, approximately 9.5 GW has been completely destroyed, while about 6.5 GW is severely damaged and requires extensive repairs. Consequently, the maximum available electricity supply within

the Ukrainian power system currently amounts to approximately 12.5 GW. Of this total, less than 8 GW is generated by currently operating nuclear reactors, around 3 GW by thermal and hydropower plants, with the remainder coming from renewable energy sources. The scale of destruction necessitates massive financial outlay for infrastructure reconstruction; according to a joint assessment by the Government of Ukraine, the World Bank, and the European Commission, the energy sector will require approximately 90.6 billion USD in investments over the next decade. Of this amount, around 71 billion USD will be needed for the reconstruction and modernisation of the power system, including generation facilities and transmission networks. An additional 6.4 billion USD will be allocated to the district heating sector, 5.2 billion USD to natural gas infrastructure, and 4.6 billion USD to the oil sector. As early as 2026, approximately 4.9 billion USD will be required for urgent repairs to energy infrastructure. The total cost of Ukraine's reconstruction over the next decade is estimated by the World Bank at around 588 billion USD, with transport, energy, and housing accounting for nearly half of this amount. One of the most serious outstanding challenges that remains is the situation of the Zaporizhzhia Nuclear Power Plant, which, with a capacity of 5.7 GW, has been under Russian occupation since March 2022. All six reactors have been shut down and are currently in a so-called cold shutdown. Nevertheless, the Russian state-owned company Rosatom has obtained a license from the Russian regulator Rostechnadzor to restart some of the units and integrate them into the Russian power system, despite the International Atomic Energy Agency's assessment that restarting the reactors under current conditions is unsafe. Ukraine's state-owned company Energoatom additionally points to the deteriorating technical condition of the facility and the potential threat it poses to nuclear safety across Europe.

Growing Electricity Imports from the European Union. As a result of the loss of a substantial share of its domestic generation capacity, Ukraine has been compelled to significantly increase electricity imports from European Union member states. This trend has been particularly pronounced during winter periods, when electricity demand rises sharply; in 2026, electricity imports from the EU nearly doubled compared with the previous winter season. The maximum cross-border transmission capacity between Ukraine and the EU was increased to approximately 2.45 GW, up from 2.1 GW a year earlier and, in practice, cross-border flows reach the maximum permissible level during certain hours. In January 2026, daily electricity imports reached a record level of 42 GWh, corresponding to an average capacity of around 1.75 GW. In February 2026, daily imports rose further to as much as 52 GWh, equivalent to an average capacity of approximately 2.2 GW. Over the entire first quarter of 2026, Ukraine imported around 2 TWh of electricity from the EU, representing the highest level recorded to date, primarily from Poland, Slovakia, Hungary, and Romania. At the same time, the direction of electricity flows has undergone a significant reversal. Only a few years earlier, Ukraine had been an electricity exporter to several countries in the region, including Hungary, Poland, Moldova, Romania, and Slovakia; however, it has now become a net importer. Electricity imports have also contributed to rising power prices in Ukraine. In the industrial sector, electricity prices increased from approximately 120 USD /MWh in the second quarter of 2024 to around 230 USD /MWh in February 2026, reaching as high as 370 USD /MWh during peak periods. High energy costs have forced many industrial facilities, including those in the metallurgical sector, to scale back production. At the same time, Ukraine continues to receive financial and technical assistance from its Western partners. In 2026, international partners provided approximately 600 EUR million in energy-related support.

Conclusions

- The scale of destruction of Ukraine's electricity infrastructure is unprecedented in contemporary Europe. The loss of more than half of its generation capacity – both as a result of physical destruction and territorial occupation – has led to a lasting destabilisation of the power system. Rebuilding the sector will require investments exceeding 90 billion USD over the next decade, alongside comprehensive modernisation of the transmission infrastructure and generation assets.
- Ukraine's growing dependence on electricity imports from the European Union currently plays a dual role: on the one hand, it helps stabilise the functioning of the power system; however, on the other, it generates new economic challenges. Imports of approximately 2 GW during peak periods reduce the risk of severe electricity shortages, but at the same time translate into higher costs for industry and

households. Over the longer term, maintaining such a model may negatively affect the competitiveness of the Ukrainian economy.

- The future of Ukraine's power system will depend on the state's ability to rebuild infrastructure in a manner that is more resilient to military and cyber threats. This implies the need to diversify generation sources, expand renewable energy, decentralise electricity production, and deepen integration with the European Union's energy market. In this context, resolving the issue of the Zaporizhzhia Nuclear Power Plant while ensuring stable financing frameworks for the modernisation of the energy sector will be of particular importance.