Memorandum of the Union of Entrepreneurs and Employers: Ukrainian energy infrastructure in the face of Polish-Ukrainian cooperation

Since October 2022, Russia has systematically and methodically been destroying Ukraine's critical infrastructure. The percentage of heavily damaged energy infrastructure is continuously growing and, according to partners of the Union of Entrepreneurs and Employers, already exceeded 60% before Christmas 2022. Thus, Russia is trying to take the entire Ukrainian nation hostage, including entrepreneurs who are still trying to run their businesses, notwithstanding the ongoing war. In mid-December 2022, as part of the *"Europe-Poland-Ukraine. Rebuild Together"* project headed by our Union, the Union's Energy Forum organised a round table meeting *"Energy in the context of reconstruction of Ukraine"*.

Representatives of energy companies, organisations actively supporting Ukraine, as well as industry experts representing both Ukraine and Poland attended the round table, and among special guests were the following dignitaries:

- Mateusz Domian, acting Director of the Representative Office of PKN ORLEN in Ukraine and Director of ORLEN Lietuva
- Sławomir Gładykowski, Vice-President of the Electric Networks Department at MEGAPOL S.A.
- Oleksandr Kharchenko, Managing Director at Energy Industry Research Center
- Wojciech Tabiś, Director at the Polish Power Transmission and Distribution Association (PTPiREE)
- Tomasz Tomasiak, Head of Energy Transition Department at the Polish Development Fund
- Vadim Utkin, Innovation Manager and Energy Storage Lead at DTEK Group

Dominika Taranko, the Union's Energy Forum Director and the round table's host, at the beginning of the event asked about the current state of affairs in Ukraine. The participants of the meeting were told, among other things, that Russians were methodically damaging the country's energy resources by consciously targeting the power grid with missile strikes so as to prevent its uninterrupted functioning. While the authorities and emergency services were trying to mitigate the effects of the bombings and were conducting repairs round the clock, in many cases, it would become impossible to repair energy facilities and restore power. This situation is a result, among others, of a growing

deficiency of spare parts. Due to the lack of standardisation of network solutions in Ukraine, some components are difficult to obtain, even on a global scale. In cases like these, it is not price that is key, but time. For example, a declaration of delivery of a given transformer several weeks to several months from now is not really an option considering the upcoming cold winter months. And while the weather has thus far been rather mild (average air temperatures higher than in previous years), the situation is nonetheless dramatic.

As a consequence of no steady electricity supply, Ukrainian businesses and production have suffered severely, which constitutes a major blow to national economy. **Oleksandr Kharchenko**, Managing Director at Energy Industry Research Center, assured: *"We keep a register of all damages caused by missile strikes and we will demand full compensation from Russia"*. However, before this may happen, people and their companies must somehow survive. Our guests acknowledged that businesses have been very flexible. The country's capital Kyiv is a perfectly exemplifies the fact that, even in a district where there is no electricity whatsoever, one can find restaurants, shops, and service facilities powered by small generators. This equipment ensures operations of cash registers making it possible to sell goods or of coffee machines making it possible to brew coffee in cafés, while customers get the chance to charge their mobile devices and phones.

"Businesses of all sizes reach out to people, supporting and supplying them with small power generators. We adapted to the situation as much as possible in order to keep jobs and help people earn a living. I am impressed with how well Kyiv is dealing with power outages, how Odesa is doing, how quickly entrepreneurs in Dnipro joined forces and ordered a huge number of generators to supply SMEs with electricity. In the city, there is now no shortage of these devices, which are able to provide a small private house with light," commented **Oleksandr Kharchenko**.

The situation is very dynamic. When Ukrainians are in need of anything that is not readily available at a given moment, sales offers appear within a week or two. When there is considerable demand for certain products and they are relatively easily available abroad, they quickly reach Ukraine. Companies, especially smaller ones, swiftly organise themselves and deliver goods to Ukraine *en masse*.

Nevertheless, when it comes to medium and large enterprises, their situation is undoubtedly extremely difficult, as ensuring production continuity or their normal functioning under current conditions is impossible.

"What has been said about small businesses is absolutely true. Kyiv and other cities are 'alive'. We shall not surrender. You can still drink fantastic coffee in a café. Yet speaking of big business, here's an

example. We produce transformers in Ukraine, for instance, at the Zaporozhtransformer plant. It's a rather large enterprise and we ordered several transformers from them. They can even repair broken devices, but the problem is that they don't have energy either. Look how it is all interconnected. We cannot get our equipment back up and running quickly despite a local supply chain in Ukraine, because there's no power. A large business cannot function on a small power generator. Big business required megawatts of power. And for now, that is out of the question," added **Vadim Utkin**, Innovation Manager and Energy Storage Lead at DTEK Group.

Our guests, when asked about their vision of the future, that is the reconstruction of Ukraine's energy infrastructure, emphasised it would certainly not be restored one-to-one for a number of reasons. First and foremost, the post-war map of consumption will certainly be different. For example, the city of Mariupol was completely levelled along with all the production facilities that had operated there. All major energy consumers that used to operate there were destroyed. Is it then possible to restore the supply chain as it was before the war? Surely not.

Furthermore, industry experts are convinced that Ukraine's energy infrastructure will be rebuilt coal-free. Reconstruction of power generation units as well as the distribution and transmission networks will be carried out in accordance with the principles of the European Green Deal and in line with European standards of energy network development. Virtually everyone who works in the energy sector in Ukraine shares this conviction.

Another aspect one must take into account while rebuilding Ukraine's critical infrastructure is the constant looming threat from the country's northern neighbour. The risk of a terrorist attack by Moscow will forever remain with Ukrainians. Therefore, the energy network must be rebuilt in a way that guarantees the security of future supply.

Ukrainians are not, however, considering an island mode of operations comprised of local transmission and distribution systems. They are convinced that the system must be cohesive and connected. Still, what is most important is that all links of this system should be as dependable and as resistant to possible future attacks as possible. Discussions on the subject are already being conducted at the country's highest levels. The goal is to rebuild the system so that it is not susceptible to outside interference.

The general vision of infrastructure reconstruction in Ukraine is of dual nature. On the one hand, traditional nuclear energy will be developed. The country has expertise in this field, human capital, and an existing structure ready for further post-war development. Energoatom employs a large number of

qualified, certified specialists and engineers who have everything it takes to take nuclear power generation to another level.

On the other hand, it is clear that renewable energy sources will also be in the centre of attention of the Ukrainian energy system. This applies primarily to energy from wind farms and biomass combustion.

Ukraine has also for some time been working on concepts of systemic electricity storage, including those based on battery systems.

Moreover, experts expect that energy generation from water will gain significance in the form of pumped storage power plants that might be built after the war in Ukraine has ended.

"Ukraine has a vision how to rebuild its energy infrastructure. Of course, we'll know more when the war is over, because right now we have no idea what will outlast the war. To precisely determine what we should rebuild, we first need to see our post-war shape and which infrastructure survived," remarked **Oleksandr Kharchenko**.

According to our guests, both state-owned energy companies and private Ukrainian companies should now strive for the best possible conditions to restore the energy sector on the following principles: independence from carbon, innovation, energy security, full integration with the European energy network, and maximum cooperation with partners in the EU. Efforts are already being made in this direction.

Polish and Ukrainian energy sectors have much in common. Both in Poland and Ukraine, coal-fired power plants have had until this day a rather large share in the energy sector. An extensive energy transformation has already begun in Poland, and over time, coal-fired heat and power plants will be phased out. In this context, Ukrainian specialists focus not only on the domestic, but also on the Polish market for energy storage systems, including battery energy storage systems, which Ukraine is working on.

Vadim Utkin, Innovation Manager and Energy Storage Lead at DTEK Group, stressed: *"Every energy system is characterised by two indices: sufficiency, or how many energy generators we have, and flexibility, whether our generators can address the demand for electricity with no hiccups. In terms of sufficiency, before the war, everything in Ukraine was fine. Our country had numerous nuclear power plants, but flexibility had always been a problem."*

Before the war, Ukraine was of course developing renewable energy, but its share was quite low – approx. 10% of all power. In other countries, problems with flexibility are observed only after reaching a share of at least 30% of RES in the energy mix. Ukraine struggled with grid flexibility with a 10% share of renewable energy in the power grid. As a result, renewable sources were often disconnected from the power grid, what translated directly into inflated costs. This was very disappointing for the green energy supporters, because the efforts and financial resources devoted to increasing the share of RES in the system did not translate into Ukraine actually consuming more clean energy.

For this reason, projects involving the creation of energy storage systems were so necessary in Ukraine. The war became, in a sense, a catalyst for these activities. Currently, Ukrainians are developing several scenarios how to expand the Energy Storage System project. A large part of the infrastructure is planned in the west, close to the Polish border. A major challenge in this project is to guarantee its physical security. Looking at the energy storage system, a seaport comes to mind, as there are numerous containers visible on the surface, which are potential targets for missile strikes.

In this context, ideas of cooperation between Poland and Ukraine are quite obvious. As our Ukrainian experts remarked, there are many municipalities on both sides of the border. Poland also experiences periods of energy deficiency, during which it starts looking closely at foreign exports. But it has also identified challenges on its territory related to the flexibility of the system. Therefore, deploying battery systems in Poland seems like a worthwhile idea, while operators on both sides of the border, working under an agreement, could provide system balancing services. This could prove to be a smart and quite unexpected solution to the problem, effective even in wartime. The issue of the physical protection of such facilities becomes irrelevant in this scenario, since Poland is a member of NATO and its situation is far different from the position of Ukraine.

Ukrainian experts believe that ideas of building underground infrastructure are misplaced. On the one hand, the cost of such projects is exorbitant, because issues related to drainage or temperature control are major problems in such systems. This also applies to energy storage systems and substations. On the other hand, all protection systems have their weaknesses, and the first question should be what we are protecting ourselves from. Are we protecting ourselves from X55-class drones and missiles, which are widely used by the Russians? Or are we protecting ourselves from ballistic missiles? These are vastly distinct levels of protection. And this should also be considered.

Energy storage systems are now extremely sought after in Ukraine, because energy reserves are very scarce. Power reserves and energy storage systems help a lot in such demanding situations when the frequency in the grid drops by 50%, as it did happen on 23rd October 2022.

During the meeting in December, **Mateusz Domian** representing the ORLEN Group described the company's pre-war involvement in the Ukrainian market, and concerned, among others, the fuel market. Presently, one of the problems in Ukraine is the lack of continuity of electricity supply, which is why energy from generators that run on fuel has become a natural substitute. Small business, by using low-power devices such as cash registers or company lights, have the ability to cope with power outages. However, in order to maintain the operation of activities with higher power consumption, such as petrol stations, the waiting time for the appropriate generators equals as much as even 2 months.

Currently, there is no fuel production in Ukraine, and all fuels are imported. The availability of engine fuels in Ukraine has become problematic, there is no indication, however, that they would run out. Not everyone can afford it, but it is available. Generally, in previous years, the period between autumn and winter was characterised by lower fuel supply both in Europe and in Ukraine. However, during the war period, in particular in autumn 2022, the demand for fuels in Ukraine increased by 30%. Due to the greater interest in fuels on the part of our south-eastern neighbour, the price of fuels in Poland and Lithuania also increased, which, however, is not a factor limiting supplies, as the most important thing is to ensure the availability of fuels on all these markets.

Mateusz Domian claimed: *"The Ukrainian fuel industry is extremely efficient and there are no serious problems with the availability of fuels"*. In fact, the first quarter of last year in Ukraine was difficult and it was hard to come by fuel, for example in Kyiv. At the outbreak of the war, more than 60% of Ukrainian diesel fuel was imported from Russia or Belarus. However, these import channels were rapidly replaced. Currently, fuel reaches Ukraine from many directions, such as Poland, Romania and Hungary. Nevertheless, it is Ukraine itself that must ensure that the channels remain available. The main logistic connections in fuel transport are operated by rail, which requires improvement, for instance on the Polish-Ukrainian border. As of now, half of fuel transports are carried out by fuel trucks, which are currently lacking on the market. Thinking about substitutes for grid power, which is non-operational during the war due to damages, the most important thing is to develop logistics of liquid fuel supply.

This situation will only improve following the restoration of infrastructure (if the Russian shelling stops) or with the beginning of warmer months in March 2023 and a reduced demand for power.

The representative of the ORLEN Group also did not want to elaborate due to the ongoing conflict on the company's current plans for Ukraine. However, Ukraine has always been of interest to Poland's domestic multi-energy concern, also in terms of acquisitions. As our guests emphasised, all plans would be implementation-ready when the country become stable again – a problem since 2014. It is expected that the challenges related to economic stability in Ukraine will change from month to month, along with the cessation of hostilities. Only then companies will be able to return investment negotiations and to resume their broad involvement activities on the Ukrainian market. The ORLEN Group sees immense potential in Ukraine, if only because of its population size that is comparable to Poland. The Ukrainian side has also asked the Polish market leader to work hand in hand in fuel market development. However, it is currently difficult to discuss restoring fuel production in Ukraine. Any business can see that in the face of active military aggression by Russia, it is difficult to develop an infrastructure that can be destroyed in the blink of an eye.

Polish Power Transmission and Distribution Association Director Wojciech Tabiś highlighted the fact that cooperation in the field of power engineering with the Ukrainian side had taken place for many years. He pointed out that Poland changed its power system in 1995 to a UCTE standardised one, while Ukraine looked into this process for its own needs before the war broke out. The hitherto long-term cooperation between the two parties resulted in the creation of the so-called Khmelnytskyi Island, which operated in Ukraine within the UCTE system. The current cooperation with Ukraine consists of, among other things, analyses of operations on a voltage of 230V. Before the war, activities were carried out over a long period of time aimed at Ukraine joining the standards of the European Union. The war certainly accelerated these changes.

Currently, the Polish side is receiving lists materials required to reconstruct the power grid in Ukraine on an ongoing basis. The power grid is highly fragmented. The cooperation of Polskie Sieci Elektroenergetyczne (Polish Power Grids) with UKRENERGO and DETEK requires coordinated efforts based on an agreement between the ministries of both countries – the Polish Ministry of Climate and Environment and the Ukrainian Ministry of Energy. What constitutes a challenge is the structure of the Ukrainian energy sector, which is technologically different from the Polish energy sector. In Poland, we have other voltage levels than the Ukrainian power industry and we are therefore unable to provide either equipment or spare parts. The Polish side has already transferred almost all the equipment of the Widełka 750 kW substation (autotransformers, circuit breakers, disconnectors), because it could

be applied in Ukraine due to the right voltage levels. We do not have, however, the right equipment of grids of 800 kW, 500 kW, 300 kW that are used in Ukraine. They are non-standard power levels. We are unable to assist our neighbours in this case. **Wojciech Tabiś** stated: *"We hit a brick wall, so to speak, which means that in this case we have already used all the reserves that Polish energy companies had at their disposal. By sending those reserves to Ukraine, we are only left with the bare minimum, a necessary level to, among others, undertake current repairs domestically."*

Therefore, there are no more reserves in Poland that the Ukrainian transmission system could make use of. Consequently, it would be appropriate to approach the problem now from a different angle, namely, to begin cooperation in Poland in terms of production of materials and equipment that would meet Ukrainian standards. The Ukrainian side even asked their Polish counterparts to send them broken switches or disconnectors, but the applicable regulations prohibit the imports of such devices to Ukraine, because according to the law they are waste. This requires an urgent liberalisation of Ukrainian import regulations.

In principle, all energy companies in Poland are open to cooperation with Ukraine. This also concerns, perhaps above all, distributed energy. This branch of energy production, based on renewable sources, has already grown in Poland. It is very difficult to import and produce high-power generation sources, and these are long-term processes, requiring time that Ukraine does not have. However, it is easy to install photovoltaic sources, locate low-power transformers, and build such energy facilities from scratch. It also seems natural that the destruction of the Ukrainian energy system should constitute an impulse to rebuild the network in accordance with the UCTE standard enforced in Europe. Primarily where this infrastructure was completely destroyed.

What also characterises the crisis is the fact that certain processes have accelerated and Ukraine may use this opportunity to rebuild its infrastructure basing on European standards.

As far as the transfers of electricity between Poland and Ukraine are concerned, it was possible to separate the already mentioned Khmelnytskyi Island from the Ukrainian energy system, powered by a local nuclear power plant, which produced energy that was later sent to Poland. Operational tests of this system had already been carried out. However, due to the ongoing Russian aggression, there is currently no exchange of energy between the two countries. The idea of supplying energy from Poland to Ukraine is also unfeasible at the moment, as both high-voltage connections are currently non-operational. At the same time, debates and works are underway to create connections at a lower

voltage, for which devices transforming the different Polish and Ukrainian voltages would be necessary. In order to implement this, initiative is required on both sides of the border.

Sławomir Gładykowski, Vice-President of the Electric Networks Department at MEGAPOL S.A., predicts that the reconstruction of Ukraine will take place in two stages. First, power must be restored to industrial production. Second, a national post-war concept must be drafted. However, as it is impossible to foresee the end of the conflict, the network should now be rebuilt with cable lines instead of overhead lines. Building power stations underground is also worth considering. This process is more costly, but it provides greater security.

As far as the post-war reconstruction is concerned, it is a matter of legislation, so the legal foundations must first be laid. It is necessary to define priorities that will allow for faster reconstruction in the Ukrainian reality than it would take place in Poland, in our local legal system.

Tomasz Tomasiak, Head of Energy Transition Department at the Polish Development Fund, is also of the opinion that Ukraine will be rebuilt in two stages. The first stage is winning the war, because there can unfortunately be no question of new investments due to the ongoing military operations and the risk of their immediate destruction. At this stage, Ukraine can count on support and financial aid from EU countries. As for the post-war situation, talks are already in place on the reconstruction of Ukraine, both by the EU countries along with the United States and business communities. Ukraine's potential as a neighbouring country of the EU is noticeable. And the prospect of it becoming a member of the Community in the near future is real. Other countries and the world of business have already realised this truth. After Ukraine wins the war, funding will surely not be an issue. The Polish Development Fund has two types of instruments at its disposal: aimed at supporting and investments (commercial ones). If the PDF received funds to support Ukraine, it would distribute them. The Fund already now possesses funds that can be invested, but it is difficult to make use of them in rebuilding Ukrainian infrastructure while an active armed conflict is still ongoing. This does not mean, however, that these funds cannot be invested in Poland for such purposes as for instance the production of parts or components for Ukraine's present needs.

Tomasz Tomasiak also addressed the issue of rebuilding the power system. In his opinion, the example of Ukraine shows that distributed, local, cluster systems, or the so-called energy islands, will be a principal element in Ukraine's power industry of the future. It seems that these systems are the future, they guarantee energy security for local communities, and at the same time unburden the transmission system. The energy from large power plants can be then transferred to production plants.

Certainly, the goal itself is to standardise the Ukrainian power industry in accordance with European standards. In the power industry, the production of certain devices or equipment that are uncommon required sometimes up to 2-3 years. Meanwhile, standard devices can be purchased directly on the market. Moreover, cheaper, used ones are also readily available.

An essential issue from the point of view of power supply is the availability of power sources, that is fuels or renewable energy. At the same time, greater independence, which works well during a conflict, can apparently be achieved from such sources as water, wind or sun, which do not need to be imported. The use of renewable energy is also related to thinking about energy efficiency, and it often turns out that in winter months considerably less energy is needed to heat a house after thermal modernisation.

Europe's pursuit of electric solutions, for example switching to electric transport or the everyday use of heat pumps, may also be vital in the reconstruction of Ukraine. The Green Hub project implemented by the Polish Development Fund, which aims to implement Poland's energy transformation, has already been recognised in the European Union, according to the Fund's representative. Green Hub could function as a role model for Ukrainian energy transformation. The more so that renewable sources will play a rather key role in its future development.

Gennadiy Radchenko, Director of the Ukraine Business Center at the Union of Entrepreneurs and Employers, was asked to summarise the round table discussion. He pointed out that not only Ukrainians suffer from power outages, but so does the industry. However, the industry was able to adapt to the new reality astoundingly quickly. Entrepreneurs do their best to meet their needs by importing large power generators, for which there is currently a huge global demand, disproportionate to the available supply. It is worth mentioning that the production of energy from power generators costs 10 times more than grid energy, which translates into significantly higher production costs. According to Radchenko, considering the current state of affairs in Ukraine, far-reaching international cooperation should be established between industries in Poland and Ukraine. Business ought to be included in creation of solutions needed on the Ukrainian market. A good answer to present challenges would be to establish production facilities for Ukraine in Poland, which would carry out the most necessary orders for reconstruction. It would be beneficial for both countries. It should be noted that after the war, the entire Ukrainian energy system will turn away from Russian solutions and switch to European standards. At the same time, it is necessary to deal with legal solutions and start executing projects that, while they take time, may materialise soon. Therefore, red tape and bureaucratic

barriers to post-war reconstruction should be eliminated as early as now. Because it certainly is much easier nowadays to solve engineering problems than bureaucratic ones.

Radchenko also expressed his gratitude for the support that Poland has given to the Ukrainian nation, stating that we are now in the best time for cooperation between the two nations ever in history.