

The role of RES in the post-war reconstruction of Ukraine

The following is a Memorandum summarising the debate that took place during the 3rd roundtable of the Energy and Climate Forum of Union of Entrepreneurs and Employers, dedicated to the Ukrainian energy sector and implemented as part of the EUROPE-POLAND-UKRAINE REBUILD TOGETHER 2023 project, in cooperation with the Embassy of Ukraine in Poland.

Renewable energy development in Ukraine:

- Over the last five years (prior to the war), Ukraine was able to attract approx. EUR 10 billion in investment in the renewable energy industry.
- According to a 2019 assessment by Bloomberg, Ukraine ranked 8th out of 140 countries in terms of attractiveness for renewable energy investment.
- In terms of the pace of green energy development, Ukraine was among the top 10 economies in the world in 2019 and was in the top 5 European countries in terms of solar energy development in 2020.
- In the structure of electricity production before the war, renewable energy accounted for 8% of the overall energy balance.
- Solar power plants accounted for ca. 58% of renewable energy, wind power plants generated 32%, biomass about 3%, hydropower plants approx. 2%, and biogas close to 5%.
- Currently, over 50% of Ukraine's energy infrastructure is damaged.
- As a result of the war, wind power has suffered losses and damage to 90% of the entire infrastructure.
- The share of renewable energy according to the "National Action Plan for Renewable Energy Development until 2030" and the "National Energy Strategy of Ukraine" should reach 25% by the year 2030.
- Presently, Ukraine has surplus green energy production and is capable of energy exports.
- The renewable energy industry in Ukraine is one of the few sectors that operated in a market-oriented and transparent manner even before the war.
- The Polish Investment and Trade Agency (PAIH) operates programmes to rebuild Ukraine's energy infrastructure, which Polish companies can participate in, and the funds can reach up to EUR 100-200 million.

The following esteemed guests attended the debate:

Prof. Alicja Chybicka – Senator of the Republic of Poland

Ivan Grygoruk – Vice President, Energy Club

Janusz Gajowiecki – President of the Polish Wind Energy Association

Igor Krechkevych – Technical Director of the Energy Efficiency Fund

Karol Kubica – Head of the Foreign Trade Office in Kyiv, Polish Investment and Trade Agency (PAIH)

Konstantin Magaletskyi – Green Recovery Fund Ukraine

Olexander Podprugin – Member of the Board, Ukrainian Wind Energy Association and President of Elementum Energy

Anastasiia Vereshchynska – International Development Manager at Energy Act for Ukraine Foundation

Serhij Zasowienko – First Secretary of the Embassy of Ukraine in Poland

Moderators:

Dominika Taranko – Director of the Energy and Climate Forum, Union of Entrepreneurs and Employers

Hennadii Radchenko – Advisor, Ukraine Business Center, Union of Entrepreneurs and Employers

Current state of affairs of energy generation from renewable sources

The first person to be asked to speak was **Ivan Hryhoruk**, who discussed the current situation and pointed out that as of now more than 50% of Ukraine's entire energy infrastructure has been damaged. Unfortunately, this also applies to renewable energy sources (RES), mainly photovoltaic and wind power. These were mostly located in areas where current or past military operations are taking place, as the largest number of solar and wind power plants were installed in the Zaporizhia, Kharkiv, Dnipropetrovsk, Mykolaiv, Kherson and Odesa regions. Some solar power plants survived and are still operational in certain locations, but most facilities were destroyed during military operations or were vandalised and looted. Wind energy production infrastructure was damaged by 90% compared to its per-war capacity. Power plants in central and western Ukraine are operating normally if the distribution network allows it. However, power sources in southern and eastern parts of Ukraine are severely limited. Overall, out of the installed capacity of 13 GW, only approx. 40% is currently in operation, and are experiencing serious limitations.

Plans regarding renewable energy production

In post-war conditions, the structure of energy production will change. Ukraine has opted for integration with the EU, and the national energy grid is being synchronised with the European one.

The synchronisation processes are ongoing, and Ukraine is fulfilling all the commitments it has made regarding the development of RES in the energy balance structure. This trend will continue to develop. However, it will develop according to a slightly different concept, as significant relocation of production potential from the so-called “grey zone” to the western and central regions of Ukraine is taking place due to the war.

Structure of pre-war electricity production

Renewables accounted for 8% of the overall energy balance in electricity generation prior to the war. These were mainly large industrial power plants. Photovoltaic power plants accounted for around 58% of all energy produced from RES, wind power plants – 32%, biomass – approx. 3%, hydroelectric power plants – 2%, and biogas – ca. 5%. Total installed solar capacity amounted to almost 7 GW, while installed wind capacity reached 3.5 GW. Industrial installations required large areas of land. When solar energy began to develop in Ukraine, 2 ha of land corresponded to 1 kW of power. Over time, technologies became more advanced, surfaces decreased, in some cases rotating mechanisms were implemented, and to produce 2 MW, only 1.4 ha of land could be used. Due to the upcoming post-war relocation of many types of economic activity as well as the population’s “change of address” to western and central parts of Ukraine, such significant free land areas where large industrial power plants could be developed will likely no longer be available. The map of solar activity in western Ukraine practically corresponds to the southern part of the country, hence the potential for PV installations is still considerable. As for the wind energy, it is a little trickier, with winds of 6-8 m/s characteristic only of the Zakarpattia and Prykarpattia regions. There, thanks to the mountainous landscape, aerodynamic currents are created. In other regions, according to experts, it will not be possible to construct large wind power plants, since generators with a capacity of 5 MW or more require higher wind speeds. Therefore, large industrial power plants will not be built in western Ukraine. As for distributed generation, these are power plants up to 20 MW, and they should dynamically develop in the post-war structure of electricity production as distributed generation will be necessary for the future stability of the energy system and can provide electricity to both industry and infrastructure.

Ukrainian Energy Transformation

Currently, the Ukrainian energy sector is going through a difficult period of transformation. After the war will have ended, the situation should improve, but Ukraine is currently dependent on fossil fuel imports, whereas many thermal power plants are damaged and non-operational. Thus, it is necessary

to urgently develop RES, such as photovoltaic and wind energy, to replace the consumed fossil fuels and reduce dependence on imports.

Nonetheless, one of the problems that arise from the production of energy from RES is their instability. Therefore, conventional energy and heat generation systems were used to oversee peak loads. Currently, most of them are damaged to a degree exceeding 50% and cannot play the same role in the post-war period. It seems that in spite of all that, they will be rebuilt, assuming that the energy consumption structure will change, and industry will start to develop again. Power plants will gain new importance and will play a crucial role in ensuring the reliability of local infrastructure and industry. Furthermore, actions will be taken to create energy communities and local distribution centres that will ensure the stability of the energy system at the local level. The aim is to create one distribution centre for every 1 to 3 regions, which could connect renewables, heat generation, and hydroelectric power plants. This way, such cooperatives will balance the power in the local energy system and also operate in all market segments: daily operations, next day, balancing, and ancillary services.

Settlements between market participants would take place within a day, so there would be no deficits in settlements for renewable sources, as was the case before the war. For effective use of small distributed power plants, distribution network operators will be appointed. Ukrainians are already switching to a higher voltage level of 20 kV to reduce electric energy losses during transmission. As a result, the quality of electricity supply services to customers will improve.

Legal changes to attract investment

Serhij Zasowienko, the First Secretary of the Ukrainian Embassy in Poland, pointed out that in recent years, thanks to the introduction of the green tariff model in Ukraine, there had been an increase in installed RES capacity. At the beginning of 2022, the installed RES capacity reached 9.5 GW, with investments in the industry exceeding USD 12 billion. Currently, about one quarter of the installed RES capacity is located in occupied territories. The situation is particularly difficult for wind power plants, with about 80% of installed capacity located in the occupied areas of the Kherson and Zaporizhia regions. About 20% of the power plants are completely damaged, many destroyed or looted by the occupying forces. Despite these circumstances, even during the war, Ukraine ensures the fulfilment of its obligations to investors in the field of renewable energy. This is one of the priorities of the Ukrainian Ministry of Energy. Regarding the future of the country, like the rest of Europe, the creation of future energy balances will be based on RES. According to the *“National Action Plan for the Development of Renewable Energy until 2030”* and the *“National Energy Strategy of Ukraine”*, the share of renewable

energy should reach 25% by 2030. Currently, the parliament has submitted a package of laws to the government for consideration, such as *“On Stimulating Local Production of Electricity from Alternative Energy Sources”* and *“On Improving the Conditions for Supporting the Production of Electricity from Alternative Sources”* as well as further legislation related to energy projects. The Ukrainian Ministry of Energy is working on market solutions and facilitation for investors regarding the development of energy. The government is already inviting investors to become active players on the Ukrainian market, because with the end of the war, the physical reconstruction must begin, rather than just the administrative process.

The situation in wind energy

Olexander Podprugin pointed out that there are currently about 35 wind farms connected to the transmission grid in Ukraine with a total capacity of 1.7 GW. Energy is one of the most aggressive military frontlines. An energy war is being waged, with atomic blackmail and attacks on nuclear power plants. It is difficult to estimate the losses in infrastructure in a credible way, as many installations, including wind turbines, are located in hostile territory and are thus inaccessible. Only 20% of the turbines are located in the unoccupied territories of Ukraine. Ukrainian wind energy, which was operational last winter, made a significant contribution to the survival of Ukrainians, providing them with the basic minimum of energy and often being the only available source.

Despite the ongoing war, the construction and installation processes of wind power plants continue in a few locations. There are currently two projects in the pipeline, in Mykolaiv and in Odesa regions, with a total capacity of ca. 150 MW, expected to be launched in the spring. Unfortunately, for most projects, work is not being carried out due to occupied ports and blocked logistics.

The reconstruction of the Ukrainian energy system should be based on clean energy sources, primarily wind generation. The Ukrainian government’s recovery and development plan provides for a significant increase in wind and solar plants to at least 10 GW. As for green energy generation, over 30 GW of RES are planned for hydrogen production. Research conducted in various regions of Ukraine shows that many large power plants and fairly large wind farms using the best and most powerful turbines currently available can be built in Ukraine. We are talking here about both onshore and offshore wind farms. The potential for Ukrainian offshore wind power is immense and could theoretically be as high as 250 GW in installations located in the Black and Azov Seas, of course, after de-occupation and opening up investment opportunities. However, much still needs to be done to give this momentum, including regulatory changes such as reducing barriers to connecting new power

plants, simplifying permit systems, and simplifying procedures for obtaining both environmental and construction decisions. Separately, many changes need to be developed in legislation concerning land and sea use, including connecting new wind power plants to the grid. From a technical standpoint, efforts should be made to increase the flexibility of Ukraine's energy system so that it can accommodate more renewable energy.

Existing barriers that can be eliminated

According to our interviewees, administrative deadlines are also barriers to RES development, as power plants whose construction has been halted due to the war have missed their deadlines for commissioning. They will not be built on time and could be connected to the grid in the near future. Investors in Ukraine should be able to rely on promises being fulfilled, and capital and assets being protected. Therefore, a law should be adopted to extend the deadline for commissioning the planned power plants (on the same terms as in 2022). This may enable the execution of planned projects. Ambitious goals and a strategy according to which RES development will be based should be documented. Administrative decisions should have a validity period of 5-10 years and provide for conditional extension of the investment execution deadline. At the same time, the issuance of environmental documentation and construction permits should be expedited. It would also be worthwhile to implement regulations that allow investors to receive additional benefits for green energy.

Energy efficiency in the reconstruction of Ukraine

Igor Krechkevich, the technical director of the Ukrainian Energy Efficiency Fund, discussed the Fund, which is the only state organisation established by the Ukrainian government to stimulate energy efficiency and energy savings, mainly in the multi-family sector. Before the war, the fund successfully implemented the "Energodom" programme, which aimed to introduce energy-saving measures in the private and communal housing sectors. The organisation worked and is still working with residents' self-government organisations, even during the war. Innovative programmes were implemented both from the state budget and with support from the EU, in particular Germany. After 24th February 2022, the war forced changes in the fund's activities, and thus began the search for possible ways to provide additional support to the people of Ukraine. The "Rebuild Your Home" programme was developed, which to some extent can also be called energy efficiency activities, as many apartments and multi-family residential buildings were damaged and continue to suffer from air strikes, missile fire, explosions, leading to broken windows, roof and façade damage etc. "Rebuild Your Home" is also co-



funded by the European Union. The programme helps residents' self-government organisations rebuild damaged homes, repair windows, façades and roofs. Fortunately, it is now spring, and the enemy's plans to prevent Ukraine from surviving the winter failed to succeed. The energy network survived, and the process of stabilising it continues. Therefore, there is a developed programme that allows families without a roof over their heads to return to their homes. The energy modernisation programme, which also operated during the previous year of the war, did not stop and paid out over UAH 1 billion (Ukrainian hryvnias) for modernisation purposes. An example is the city of Mykolaiv, which continued modernisation efforts even during shelling.

The development potential of Ukraine

According to Bloomberg, Ukraine ranked 8th out of 140 countries in 2019 in terms of attractiveness for investing in renewable energy. Investments lead to business development, influx of money, and profits. In this model, investment opportunities and an attractive rate of return are crucial. The Ukrainian government has already developed certain mechanisms and steps, while projects and laws are being created, and there is an understanding that RES represent a vast space for development and huge investment opportunities. Earlier in the text, offshore perspectives for wind energy were mentioned, which can only be developed with access to the Black Sea. Nevertheless, its potential is indeed enormous and has great significance in the European energy strategy, where Ukraine is a possible electricity supplier (especially to Germany, from which 75% of equipment imports originate).

The private residential sector is also active in the field of distributed energy, where small solar power plants are installed – not so much for business purposes as for powering homes. The war has shown that distributed generation and the development of energy cooperatives are necessary. They can develop basing on both multi-family residential buildings and private estates. There are already opportunities to work with the private sector in Ukraine, and after Ukraine's victory over Russia, there will be an opportunity to enter a completely new market with new, investor-friendly rules. It seems that the scale of the planned investments will be sufficient to support Ukraine's economy and help it transition to green energy. In western Ukraine, where there is less enemy shelling, preparations for the implementation of residential renewable energy are already underway. Ukraine has already been systemically integrated with the European market and had supplied energy to the EU market before the war broke out.

RES as a source of primary energy



Anastasia Vereshchynska, the Development Manager of the Energy Act for Ukraine Foundation, emphasised that the projects of the Energy Act for Ukraine Foundation are gaining attention not only in Ukraine, but also abroad. The foundation was established in response to the full-scale war in Ukraine and focuses on providing energy assistance primarily to Ukrainian civilian facilities, schools, and hospitals. The Energy Act for Ukraine Foundation focuses on a long-term, large, and very ambitious project to equip 100 schools and 50 hospitals in the country with hybrid solar power plants. The foundation is constantly looking for sponsors. The latest completed project was in a school in Irpin, where the installation had a capacity of 25 kW, satisfying a third of the school's energy needs. The energy generated by the installed power plant also provides power for street lighting, so that children can safely return home from school, which is particularly important during winter.

On the other hand, the Energy Act for Ukraine Foundation installs hybrid power plants in hospitals to ensure the functioning of surgical theatres, maternity wards, and ICUs. Schools and hospitals participating in the programme are selected in cooperation with the Ministry of Education and Ministry of Health, which recommend institutions covered by the programme. These are chosen at a safe distance from the frontline and the Belarusian border. Investors do not want newly installed PV panels to attract the attention of the enemy, which could further endanger these facilities. One of the criteria for allocating investments is also having a bomb shelter at the school. Children and patients must be provided with safety.

The Energy Act for Ukraine Foundation's programme also includes lessons on renewable energy and green solutions installed in schools. The organisation also informs why the development of renewables and conscious energy consumption is critical.

The third direction of the Foundation's activities is the delivery of energy equipment to the civilian population. This is mobile equipment, mainly energy storage systems with PV panels that can be easily moved. It is important for hospitals located in strategic locations. Some of them have been delivered to field hospitals in the Donetsk and Zaporizhzhia regions. Polish and German donors were involved in the project. The Foundation also tries to draw attention to the fact that renewables can not only be a part of post-war reconstruction, but also an exceptionally effective way to provide immediate help. This need for help is urgent and desperate, and not as harmful to the environment as diesel generators. The organisation is not opposed to diesel generators, which it also buys when there is no alternative, but it draws attention to the existing proposals for energy storage systems that are a more forward-looking solution. The goal is to make energy consumers in Ukraine independent of fuels, so that people do not have to die due to a lack of access to electricity.

Polish perspective on RES in Ukraine in the context of health and safety

Senator Alicja Chybicka, Vice-Chair of the Health Committee, member of the Senate Committee on Climate and Vice-Chair of the Environmental Committee, noted that several laws related to RES are currently being processed in Poland, a national milestone. The entire world is striving to use renewable energy, which is currently the cheapest source of energy. We can use wind, water and sun. As we need wider access to the transmission grid today, we also need to learn how to store energy better. In the opinion of Senator Chybicka, it is important that children in Ukraine are taught about clean environment. Most diseases, not only cancer, have their origin in negative factors related to the climate and environment, not only universally understood, but also in what we eat and breathe. Cancer, which we now have a genetic accumulation of, needs an initiator to activate the gene – these can be found in the air, water or food.

The war in Ukraine has caused numerous countries to focus on RES development. Nowadays, we provide Ukraine with many generators, because we need to provide electricity to residents right now, but assistance must be planned in such a way that these green solutions remain in Ukraine after the war.

How does Polish business currently fare in Ukraine?

Karol Kubica, Manager of the Foreign Trade Office in Kyiv at the Polish Investment and Trade Agency (PAIH), assures that the economic cooperation between Poland and Ukraine is constantly developing. Poland is one of Ukraine's most important trading partners, and Ukraine is also climbing higher in the national trade balance. The PAIH office has been operating in Kyiv since 2018. For the last 5 years, interest in Polish products and services has been steadily increasing. Polish businesses are also increasingly interested in investing in Ukraine and seek cooperation with local entities. Over the past 20-30 years, Poland has undergone a transformation and has been one big construction site. Now, our experiences can be useful to Ukrainian companies.

The issue of alternative energy sources is a topic that the entire world is currently facing, not just Ukraine. In Poland, there is quite a long investment process in RES, both due to legislation and investment schedules. For Polish businesses to enter into these investments in Ukraine, they must have guarantees, security, and prospects for adapting legislation for foreign investors provided by the government. The inquiries from the renewable energy industry received by PAIH represented a few percent per year, usually totalling about 700 inquiries. Despite the ongoing war, these trends are similar. PAIH educates and presents investment prospects, but representatives of the agency believe

that education alone is not enough. So far, about 1,800 entities interested in rebuilding Ukraine have registered, of which 33% represent the construction and energy sectors. The renewables sector, which includes not only energy companies but also energy-efficient buildings, is a part of this sector.

Developing business in Ukraine

Polish companies may not be visible in the renewable energy sector on a daily basis in Ukraine, but they participate in the broadly understood RES supply chain. These are suppliers of equipment and technologies who offer their solutions. Both Polish state-owned companies such as Orlen, PGNiG or Unimot Energy, as well as other private sector companies operate in Ukraine. However, businesses also like stability and not always report to government agencies, implementing investment assumptions independently. PAIH often intervenes when there is a problem with the administration, such as when Polish factories operating in Ukraine face difficulties connecting additional power demand. An example of support from PAIH may be ensuring an increase in the capacity of power lines when, after investing, additional production lines are launched. Ukraine's accession to the EU structures is still quite distant and will require, among other things, adapting legislation, which should in turn improve investment conditions. However, Polish sectors such as construction, food and energy are already present in Ukraine.

Money for investments in Ukraine for Polish companies

Tenders related to the reconstruction of critical infrastructure in which Polish companies can participate are announced on the website <https://odbudowaukrainy.paih.gov.pl/> and on the website of the Ministry of Development and Technology. These are funds allocated for various purposes. The pool of funds can amount to EUR 100-200 million for a single grant.

Currently, Ukraine is declaring what it needs and what needs to be rebuilt in order for it to function properly. Without energy, there is no business, without business there are no taxes or jobs, and then economic emigration increases. On 1st December 2022, PAIH held industry consultations for entrepreneurs, including those representing the energy industry. During such meetings, PAIH presents the scale of destruction and the possibilities of entering the market, but mainly emphasises that Polish businesses should cooperate with Ukrainian entrepreneurs, share their technology, use preferential loans offered by, among others, Bank Gospodarstwa Krajowego, and insure transactions with KUKE. We should not only be competitors on the Ukrainian market, but the best solution is to find a long-term partnership on the Ukrainian side. Poland and Ukraine together would be unbeatable in Europe. PAIH is already preparing domestic businesses for this.

Cooperation with private and state-owned companies in Ukraine

Konstantin Magaletskyi who represented the Green Recovery Fund Ukraine explained how a fund focused on investments in green energy in Ukraine operates. Its task is to rebuild damaged renewable energy installations and build new ones. From the perspective of Ukraine's future, this is not only beneficial, because of the use of green energy, but also because of the possibilities of decentralising energy production. Ukraine has experience in this area from previous years, when it exported its green energy to European countries. According to Konstantin, it is best to invest in the private sector, because most of the funding currently goes through the public sector, which is more formalised. A good example may be the operation of a private port: while investment in a state-owned port is greater, the ROI is higher in a private port. The reconstruction of Ukraine will progress much faster with the involvement of the private sector than if only central administration were involved.

Ukraine is already producing surplus green energy and is able to export it. The prospect of damage to a RES farm is now negligible. Furthermore, presently, energy production in Ukraine is stable and it does not need to be imported from abroad. The green energy market is developing steadily. Due to the fact that Ukraine is a large country, there is a need for collateral from large financial institutions for investments planned in this country.

Polish experience in the RES industry vs. knowledge of the Ukrainian market

Janusz Gajowiecki, President of the Polish Wind Energy Association, stressed that the industry is counting primarily on the development of RES in Poland, for instance through appropriate legal regulations. Onshore wind energy will develop all over Europe, and Poland should be a powerhouse in this respect. At the same time, companies from the Polish renewables industry have relations with investors from Ukraine. This sector is well developed in terms of substantive and project-related issues. Industry-specific knowhow is already available in Ukraine, which is why bilateral talks are incredibly detailed and at a high level.

The issue of wind energy in the context of RES is critical. Its impact on the national energy system is enormous. The installed capacity of 10 GW often provides 30% or more energy to the system. Poland has become a kind of hub for foreign companies employing experts from Poland and abroad. The potential of wind power installations in Poland is the largest in the CEE region. Ukraine, Romania or Croatia have all a relatively smaller development potential than Poland, even though Ukraine to a certain degree also has this potential. All companies, private and state-owned alike, are looking at a package of laws that are to change the regulations and simplify investments on the Ukrainian market.



They already have projects ready for implementation, the entire permitting is in place, including grid connection, along with analyses of the latest available technologies, which are both ground-breaking and can reach up to 50% of the achievable power. This means that a 6 MW turbine can produce 3 MW over a year.

The UN will also support the development of wind energy. A model of cooperation is currently in the works, with such issues as who is to own farms that are going to be built with European funds among relevant topics. Nowadays, the RES industry is aware of the mission to create something extraordinary, to revolutionise the Ukrainian energy sector. PWEA, hand in hand with the Ukrainian association, are implementing the project “Work service for Ukraine” which helps find a job in the industry.

Unless the 700-metres-rule for wind energy is liberalised, wind energy development will not reach its peak dynamics over the next 8 years. Then the solution for investors will be to engage their remaining capabilities in Ukraine. Possibilities of transmitting green energy from Ukraine to Polish companies are already being analysed. Soon, no foreign investment will stand a chance in Europe without green energy. Without 100% green energy, no Western company will think about opening a new factory in Poland or Ukraine.

Procedures for obtaining permits for RES construction in Ukraine

The issue of permitting in Ukraine is currently similar to how it functions in Europe. There are some good practices that have already been implemented. In Europe, there are presently efforts to simplify and shorten the entire process, as stated in the adopted Re-Power EU package published last year. The regulations indicate that processes related to, among others, spatial planning, duration, and the amount of documentation require to issue environmental decisions should be shortened. Time is of the essence here, because we will need green energy in the short term. This technology is already proven and environmentally safe, so certain procedures can be abandoned or proceeded in a template manner.

Ukraine is prepared when it comes to environmental conditioning specialists and other requirements. The RES industry is one of the few sectors in the country that is corruption-free and transparent. The number of companies operating on the market is large enough to avoid centralisation or monopolising activity in the hands of the state or oligarchs. Therefore, it is a safe part of the market and economy.

Poland has many companies that are not well-known, but produce equipment for wind farm construction. Practically every element of wind turbines in Poland involves Polish companies. They



manage logistics, materials, and construction to a full extent. Despite the war, entities associated in PWEA receive many inquiries from Ukraine regarding the implementation of wind projects. These investments are carried out all the time, also with the help of Polish companies.

The energy structure in Ukraine is very outdated and looks similar to the Polish one in the 1990s. By rebuilding the infrastructure, which has been destroyed by 40-50%, Ukraine can create the most modern energy system in Europe, adapted to the EU system. At the moment, however, there are no funds for this purpose and unless the world and foreign institutions help, Ukraine will not recover.