

Ukraine: Immediate Energy and Utilities Restoration and Repair Needs

1. Energy, heat and water supply sectors

1.1. Power system

Ukraine's power system operates synchronously with the European power system, ENTSO-E. Currently, Ukraine both imports and exports electricity.

However, the war in Ukraine continues, and the power sector remains under constant missile and drone attacks. Since 2022, Ukraine has lost 24.5 GW of installed generation capacity. During the last heating season alone, approximately 9 GW of generation capacity was damaged.

It is important to note that peak electricity demand during the 2025/2026 heating season reached 18.2 GW. Despite domestic electricity generation and electricity imports, the system faced a deficit of up to 6 GW, which necessitated the implementation of scheduled rolling blackouts for extended periods.

Extensive damage has been inflicted on turbine halls, roofs, turbines, generators, transformers, and other critical equipment, much of which requires significant time to repair or replace.

Recovery plans approved for 2026 envisage the restoration of 5.8 GW of generation capacity, of which 3 GW has already been restored.

At the same time, the pace of recovery depends heavily on the timely delivery of critical equipment — including transformers, protection and control systems, excitation systems, and other key components—as well as substantial financial investment.

According to the World Bank's Fifth Rapid Damage and Needs Assessment (RDNA5), direct damage to Ukraine's energy sector amounts to USD 24.8 billion, while total losses are estimated at USD 88.2 billion. Overall recovery and reconstruction needs are estimated at approximately USD 90.6 billion, with the largest share — around USD 71 billion — required for the restoration of electricity generation capacity.

1.2. Natural gas and oil

Following the termination of Russian natural gas transit on 01 January 2025, the Russian Federation deliberately began targeting natural gas production and processing facilities. In 2026, attacks on Ukraine's gas infrastructure have continued, with production facilities in the Kharkiv, Sumy, Poltava, and Dnipropetrovsk regions remaining under sustained attack.

To ensure a stable gas supply and the reliable operation of the gas transmission system, the Government of Ukraine tasked Naftogaz Group with accumulating 14.6 bcm of natural gas in underground gas storage (UGS) facilities by 01 November 2026.

During the first six months of the current year, Naftogaz of Ukraine NJSC imported 1,958.1 mcm of natural gas with a total value of EUR 781.9 million. Of this amount, 436.8 mcm, valued at EUR 186.5 million, was procured using the company's own funds and state budget resources, while 1,521.3 mcm, valued at EUR 595.4 million, was financed through loans and grants provided by international partners.

According to Naftogaz of Ukraine NJSC, contracts have been concluded in 2026 for the supply of 2.0 bcm of natural gas.

Under the baseline scenario, the procurement of natural gas required to ensure the stable passage of the 2026/2027 heating season is expected to be financed through EUR 400 million in international assistance. However, in the event of additional attacks of the Russian Federation on energy infrastructure and prolonged periods of low temperatures (adverse scenarios), the required financing may increase to EUR 1 billion.

With the support of the Ministry of Energy of Ukraine, the Company continues to secure additional credit financing from private banks and banks with foreign capital to ensure the procurement of imported natural gas for the 2026/2027 heating season.

Systematic monitoring of the oil products market situation continues, along with the implementation of necessary measures to ensure its stable functioning. As of today, the market remains under control and generally balanced, while available resources are sufficient to meet the current needs of consumers.

At the same time, given the conditions of martial law, a number of risks remain that require a coordinated response. These primarily include the security of fuel infrastructure facilities, the resilience of supply chain logistics, and the impact of external factors on market conditions.

In this context, the key priorities remain ensuring uninterrupted fuel supplies to all regions of Ukraine, particularly frontline areas, maintaining sufficient reserve levels, and increasing the flexibility and resilience of logistics routes.

Current fuel stocks are sufficient to cover existing consumption needs (gasoline – 12 days, diesel fuel – 9 days, LPG – 13 days). However, the market continues to operate under elevated risks.

As of 07 September 2026, systematic and periodic enemy attacks on fuel distribution and storage infrastructure have resulted in damage to or destruction of 181 fuel stations (including 13 in the current month) and 38 oil depots (including 1 in the current month).

1.3. Heat supply

As a result of the targeted attacks of the Russian Federation against Ukraine, a significant number of critical infrastructure facilities have been destroyed or critically damaged. This has jeopardized the commencement and stability of the 2025/26 heating season which is vital for public health and safety, the stable functioning of settlements, and the maintenance of the national defense capabilities under martial law.

As of today, given the ongoing state of martial law in the country and regular, targeted attacks on critical infrastructure, ensuring the resilience of housing and communal service facilities within local communities for the upcoming autumn-winter period remains a matter of urgent priority.

Ensuring the stability of critical infrastructure is fundamental to both public resource security and the continued operation of national and municipal utilities amidst external threats.

To prevent the interruption of housing and communal services, the Ministry for Recovery, Infrastructure and Transport of Ukraine is actively implementing distributed heat and power generation within the municipal sector. In accordance with the approved Resilience Plans of regions and individual cities, the Ministry is implementing the development of new distributed thermal generation capacity to ensure backup electricity generation and heat supply in case if major generation facilities are destroyed or critically damaged. Although significant financial resources have been allocated for this purpose, the available budget remains insufficient to meet all identified needs. The expected result of these measures is to ensure the continuous life-support of local communities despite the challenges of martial law and severe weather conditions.

1.4 Water supply

As a result of the armed aggression of the Russian Federation and the subsequent systemic damage to energy infrastructure, Ukraine's centralized drinking water supply, sewerage, and heating facilities are currently operating under increased risks associated with prolonged and unpredictable power outages.

The high energy intensity of pumping stations, water intakes, treatment facilities, and heat-generating plants does not allow for prolonged shutdowns without humanitarian and man-made consequences, making them critically dependent on a stable power supply. Despite the extensive humanitarian aid of generators and mobile power stations provided in 2022–2025, water and heating utilities remain among the most vulnerable objects of critical infrastructure.

The Ministry for Development, in collaboration with regional and Kyiv city military administrations, local self-government authorities, and heat, drinking water, and wastewater utilities enterprises, has consolidated and verified the current state of backup power supplies for critical infrastructure facilities. Furthermore, priority facilities requiring autonomous power supply to ensure continuous operation under extreme conditions have been identified. The current level of coverage of the needs of water supply enterprises for generators with small and medium capacity (up to 500 kW)

is satisfactory, but the need for large generators to ensure the stable operation of water intakes and gig stations in large cities in Ukraine remains unmet.

Given the urgent and unpredictable nature of these needs and the inability to fully cover them with available resources, their fulfillment requires the involvement of targeted international technical and financial assistance, as well as coordinating donor efforts for priority aid provision of the most critical facilities.

Context and problem

Since the beginning of the full-scale war, Ukraine's energy infrastructure has suffered systemic damage due to missile and drone attacks. Water and sewage utilities have been among the most vulnerable critical infrastructure facilities, as their operation is completely dependent on uninterrupted power supply.

In 2022–2025, international partners provided thousands of units of backup equipment — diesel generators, mobile power plants, and uninterruptible power supply systems. This support has allowed us to maintain a minimum level of services during times of crisis.

At the same time, humanitarian generation has significant limitations:

- it is mainly designed for small and medium-power facilities;
- does not cover pumping stations, water intakes and treatment plants with a load in the megawatt range;
- does not ensure long-term autonomous operation of water supply systems in large cities.

As a result, the most critical and system-forming facilities are left without an alternative to centralized electricity supply.

Key facts and observations

The analysis of the aggregate needs of water utilities shows common trends:

- the largest cities of Ukraine have facilities with a unit electrical load from hundreds of kW to several MW;
- there are no basic alternative energy sources to support the minimum operating mode;

It is especially critical that the operation of several key facilities depends on the water supply, sewage, heat supply and fire extinguishing of entire agglomerations, and not individual districts.

2. Emergency Repair Needs

2.1. Power sector equipment needs

Despite ongoing large-scale attacks, emergency repair works in the energy sector continue daily. Energy companies are prioritizing the rapid restoration of critical equipment needed to maintain power system stability during the 2025/26 heating season. Because damage is continuous and repair capacity is constrained, emergency equipment needs are evolving.

There remains a significant need for core equipment for the electricity transmission system required to restore damaged facilities, ensure the reliable operation of backbone networks, and establish an emergency reserve. This primarily includes power transformers and autotransformers of high voltage classes, high-voltage switching equipment, switchgear, as well as auxiliary components of primary and secondary equipment and cable products. The existing resources do not fully cover the actual needs for the rapid restoration of damaged capacities and for enhancing the resilience of the power system against repeated attacks.

Despite these efforts, current equipment deliveries do not fully cover the need for emergency reserves, replacement of critically damaged EHV substations (330/750 kV), or the restoration of damaged transmission and distribution capacities.

High-risk and frontline regions where the energy infrastructure has suffered the most damage and is at high risk of repeated strikes include Donetsk, Dnipropetrovsk, Zaporizhzhia, Kharkiv, Sumy, Chernihiv, Odesa, Mykolaiv, and Kherson regions.

2.2. Natural gas sector equipment needs

In 2025, attacks increasingly targeted natural gas infrastructure, including large-scale strikes on gas production facilities.

In October and November 2025, combined missile and drone attacks again focused on the gas production sector. As a result, gas producers reported the loss of approximately 40% of national gas production capacity. Surface infrastructure of underground gas storage facilities (UGS) was also significantly damaged, with part of the equipment destroyed or requiring complete replacement.

A detailed list of equipment for energy companies is provided below in the document.

2.3. Ukrainian Railways equipment needs

Ukrainian Railways have increasingly been targeted by attacks intended to disrupt national logistics. Since the start of the full-scale invasion, **more than 100 traction substations** have been damaged, several of them repeatedly. These facilities are part of Ukraine's critical infrastructure.

The frequency of air strikes exceeds manufacturing and delivery timelines for replacement transformers, many of which require custom production due to traction voltage standards.

To restore damaged infrastructure, Ukrainian Railways reports an immediate need for **around 120 transformers** across all voltage classes.

2.4. Water and heat supply equipment needs

Based on the results of the consolidation and verification of information provided by Regional Military Administrations (RMA), the Ministry for Development has determined that the key requirement to maintain the continuous operation for heating, centralized drinking water, and wastewater enterprises is the provision of mid-to-high capacity backup power sources, that are essential to maintain the continuous operation of critical infrastructure facilities during prolonged power outages.

Structure of needs for drinking water supply, centralized wastewater, and heat supply enterprises indicates a substantial deficit of medium- and high-capacity generator sets. These units are critically necessary for water intakes, wastewater treatment plants, main pumping stations, large boiler houses, central heating points, and heat-generating facilities in major cities. Such installations cannot be replaced by usual small-capacity humanitarian supplies and require targeted international technical and financial assistance, as well as the coordination of donor efforts to prioritize the protection of the most system-critical and vulnerable infrastructure objects.

Currently, according to the information provided in the Annex, the estimated additional need for diesel generator sets for drinking water supply and centralized wastewater disposal enterprises is approximately 463 units with a total capacity of about 185,1 MW, and for heat supply enterprises — approximately 261 units with a total capacity of about 82,7 MW.

A detailed list of equipment for water and heat supply disposal companies is provided below in the document.

3. Funding from the Energy Support Fund of Ukraine (UESF)

3.1. UESF: Emergency Restoration

Energy companies continue to submit procurement needs to be financed through the UESF. Requests with a total estimated value of **EUR 342.0 million** remain unfunded.

It should be noted that smaller requests (in the range of up to EUR 5 million) are allocated relatively quickly, while large and complex requests tend to wait for financing for a considerably longer period.

The table below summarizes the submitted needs by company and sector:

Ukrainian company	Total Estimated Amount SR, EUR
Natural gas sector	
JSC "Ukrtransgaz"	156 221 519
JSC "Ukrnafta"	47 574 000
JSC "Ukrgezvydobuvannya"	24 180 000

TOTAL Gas sector	227 975 519,0
Electricity sector	
PJSC "NPC Ukrenergo"	84 654 545,5
PJSC "Centrenergo" Trypilska TPP	12 000 000,0
JSC "Chernihivoblenergo"	3 331 750,7
JSC "Cherkasyoblenergo"	2 735 000,0
PJSC "Centrenergo" Zmiivska TPP	2 498 640,0
JSC "Kharkivoblenergo"	2 332 810,0
LLC "DTEK Nikopol Solar Power Plant"	2 234 000,0
JSC "Khersonoblenergo"	1 082 000,0
LLC "DTEK Pokrovska Solar Power Plant"	950 000,0
JSC "DTEK Westenergy"	929 700,0
JSC "DTEK Dnipro Grids"	745 000,0
PrJSC "Kharkiv CHPP-5"	300 829,0
JSC "KRYVORIZKA TEPLOTSENTRAL"	238 950,0
LLC "BROKENENERGY"	24 000,0
TOTAL Electricity sector	114 057 225,4
TOTAL	342 032 744,4

3.2 UESF: Emergency Reserve

The establishment of an emergency equipment reserve remains one of the key elements of preparing the energy sector for possible damage, in accordance with the **Ukraine Resilience Plan** and preparations for the 2026–2027 **winterization period**. Particular attention is given to the accumulation of critically needed equipment that has long manufacturing lead times or limited market availability.

Such needs are defined by energy companies based on the existing equipment nomenclature, selecting approximately **up to 20% of the most critical items** to create a reserve required for rapid response in the event of damage to energy infrastructure.

At present, the funding gap for covering the emergency reserve amounts to **EUR 83.7 million**.

Given the high cost of core high-voltage and power equipment, requests aimed at establishing an emergency reserve are financially substantial and, as a rule, require significant grant contributions or dedicated international financing mechanisms.

3.3. UESF: Physical Protection

Strengthening the physical protection of energy infrastructure remains a priority for the Government and the Ministry of Energy. Energy companies are implementing a second level of physical protection; however, internal resources are insufficient.

Requests related to physical protection are allocated relatively quickly. The table below summarizes the submitted needs by company.

Ukrainian company	Total Estimated Amount SR, EUR
PJSC "DTEK Pavlohradcoal"	5 045 486,1
PJSC "Naftogazvydobuvannya"	636 255,0
JSC "Chernihivoblenergo"	636 255,0
LLC "Kremenchuk CHP"	566 049,5
JSC "Mykolaivoblenergo"	214 200,0
JSC "Vinnytsiaoblenergo"	203 000,0
LLC "Naftogaz Teplo"	67 620,0
TOTAL	7 368 865,6

In addition, companies are reporting further needs, including gabions, concrete blocks, sand/granite rubble, barrier mesh, soft containers, materials for protective structures, as well as rapidly deployable modular civil protection shelters for 15–20 people, which we would like to receive as humanitarian assistance.

3.4. UESF: Distributed generation

The Russian Federation attacks continue to increase the value of local gas-based generation solutions. Distributed gas generation and cogeneration can sustain critical services when centralized plants or key network elements are damaged.

Government efforts are focused on energy-deficit regions and communities, taking into account gas availability and grid connection requirements.

As of 07 September 2026, **34 key projects** are at different stages of implementation, including: **22 projects financed** for a total of EUR 350.2 million (584.7 MW).

In southern Ukraine, damage to high-voltage substations (220–750 kV) and distribution networks (110–150 kV) has created bottlenecks in the 330–750 kV transmission grid, limiting the ability to meet demand in energy hubs around **Odesa**. In this context, additional gas-generation units are prioritised to strengthen energy security and grid stability.

Projects requiring financing (**around 550 MW**) are summarized below.

Ukrainian company	Total Estimated Amount SR, EUR
JSC Odesa CHP	47 600 000
PJSC Kharkiv CHPP-5	41 700 000
PJSC Trypilska TPP Centrenergo	25 800 000
PJSC Zmiivska TPP Centrenergo	25 800 000
LLC "Sumyteploenergo"	13 875 980
JSC Kherson CHP	11 300 000
JSC Ukrnafta	12 000 000
Teplokomunenergo (Chernihiv CHP)	7 237 600
PrJSC "Cherkasy Khimvolokno" Cherkasy CHP	1 581 600
LLC Kramatorskteploenergo	1 007 484
TOTAL	187 902 664

3.5. UESF: Special-purpose vehicles and equipment

The total unmet need for automotive and special equipment is estimated at **EUR 14.7 million**. Commonly requested items include forklifts, excavators, truck cranes, telescopic handlers, aerial work platforms, trucks with crane arms, and other specialised equipment for emergency repairs and rubble removal.

We would also like to highlight the critical and urgent need of energy companies, particularly **JSC Sumyoblenergo**, for utility crew vehicles, as follows:

- Toyota Hilux utility crew vehicle, equipped with additional equipment, including a canopy and a winch, or equivalent — 3 units;
- TK-IV-ARM utility crew vehicle based on an IVECO EURO CARGO MLC110E22WS 4×4 chassis, with seating capacity for at least 7 persons, or equivalent — 2 units.

4. EU Civil Protection Mechanism (UCPM) and the Emergency Response Coordination Centre (ERCC)

The UCPM is one of the main tools within the European Union to facilitate the delivery of in-kind energy assistance. The main counterparts are the National Civil Protection Authorities of EU Member States and Participating States. The ERCC (in DG ECHO) facilitates transport support and coordination between the UCPM and the Emergency Energy Assistance Centre of the Ministry of Energy of Ukraine, which carries out a technical assessment of the proposed assistance, organizes its delivery as humanitarian aid and provides comprehensive support from the Ukrainian side throughout the entire process.

Assistance via the UCPM typically takes the following steps:

4.1. Donor submits an offer

The National Civil Protection Authority submits an offer of in-kind energy assistance under the Union Civil Protection Mechanism (UCPM) and registers it via its communications platform (CECIS).

4.2. Coordination with Ukraine

The ERCC shares the offer with the Ministry of Energy of Ukraine through the Emergency Energy Assistance Hub, and the Ukrainian side confirms the need and readiness to receive the equipment.

4.3. Acceptance and donation agreement

Following Ukraine's acceptance, the donor is informed and a draft donation agreement is prepared, enabling the transfer of assistance.

4.4. Delivery

Transport can be arranged by the donor with its own transport means or with logistical support from the ERCC via its logistical hubs or its transport broker, while transport costs are generally co-financed by the UCPM according to applicable transport modalities.

The UCPM has also established a complementary tool, **the rescEU Private Donations Scheme**. Specifically designed to channel offers from the private sector and third countries via the UCPM donations hub in Poland to Ukraine. Interested donors can be redirected to ECHO-DONATIONS@ec.europa.eu to start the donation process.

Ukraine: Immediate Energy and Utilities Restoration and Repair Needs Comprehensive Needs of the Government of Ukraine in Energy Equipment (updated based on urgent emergency needs)

UNFUNDED NEEDS UNDER THE FUND

As of 07 September 2026

TOTAL UNFUNDED NEEDS: €645,671,737.57

P1 + P1.1 €201,990,298.64 Priority 1 €170,482,814.64 - Repair and restoration €96,677,585.39 - Physical protection €7,368,865.62 - Emergency stock/reserve €66,436,363.63 Priority 1.1 €31,507,484.00 - Distributed generation €23,700,000.00 - Emergency stock/reserve The need is currently covered - Special vehicles €7,807,484.00 This priority covers the needs of enterprises in the heat and gas sectors for repair and restoration, physical protection, the development of distributed generation and backup power supply for CHP plants, the establishment of emergency reserves, and specialised vehicles for emergency response and restoration works.	P2 + P2.1+P2.2 €133,612,710.00 Priority 2 €40,557,500.00 - Distributed generation €23,100,000.00 - Emergency stock/reserve €17,244,500.00 - Modernisation €213,000.00 Priority 2.1 €9,041,630.00 - Repair and restoration €9,041,630.00 Priority 2.2 €84,013,580.00 - Distributed generation €84,013,580.00 This priority covers the needs of thermal power plants, combined heat and power plants, district heating utilities, and coal-mining enterprises for distributed generation equipment, the establishment of emergency reserves, and the repair and restoration of energy infrastructure.	P3 + P3.3 €310,068,728.93 Priority 3 €65,595,971.93 - Repair and restoration €50,455,000.00 - Distributed generation €9,489,084.00 - Modernisation €3,278,271.93 - Special vehicles €2,373,616.00 Priority 3.3 €244,472,757.00 - Repair and restoration €192,401,519.00 - Distributed generation €47,600,000.00 - Special vehicles €4,471,238.00 This priority covers the needs of enterprises in power generation (TPPs/CHPs), electricity distribution (DSOs), gas production, transmission and distribution, and district heating for repair and restoration, equipment modernisation, the development of highly flexible distributed generation, and specialised vehicles.
Priority 4* The total estimated value of Priority 4 is approximately EUR 160 million. The priority includes the needs of NPC Ukrrenerg — EUR 30 million for emergency support to the power system; Naftogaz of Ukraine — EUR 100 million for the procurement of 526 million m³ of natural gas and equipment for the restoration of filling stations; and JSC Ukrtransnafta — EUR 30 million for the construction of six underground storage tanks with a total capacity of 60,000 m³ and the replenishment of the emergency stock of electrical and process equipment, automation systems, and control equipment for the Brody LDS. * Priority 4 is not included in the total unfunded needs of EUR 645.7 million		

As of 07 September 2026, an analysis was conducted of the unfunded needs of Ukraine's energy sector, including equipment requests submitted by electricity generation companies, district heating utilities, gas sector companies, and electricity transmission and distribution system operators under Priorities 1, 1.1, 2, 2.1, 2.2, 3, 3.3 and **Priority 4**, which covers emergency support for the power system, the procurement of natural gas and equipment for the restoration of filling stations, the construction of underground fuel storage tanks, and the replenishment of emergency equipment stocks. **Priority 4 is not included in the total unfunded needs.**

Based on the analysis, the following main categories of equipment were identified:

Priority 1: Equipment for the physical protection, repair and restoration of critical energy infrastructure, including transformers, switchgear, cable products, compressor and pumping units, and auxiliary equipment.

Priority 1.1: Equipment for distributed generation and backup power supply at combined heat and power plants (CHPs), the establishment of emergency reserves, and specialised vehicles and machinery for emergency response and restoration works.

Priority 2: Equipment for distributed generation, the establishment of emergency reserves, and the repair and restoration of energy infrastructure at thermal power plants, combined heat and power plants, district heating utilities, and coal-mining enterprises.

Priority 2.1: Equipment required for the repair and restoration of damaged energy infrastructure.

Priority 2.2: Distributed generation equipment and associated infrastructure for thermal power plants, combined heat and power plants, district heating utilities, and coal-mining enterprises.

Priority 3: Equipment for the repair and restoration of energy infrastructure, the development of distributed generation, equipment modernisation, and the provision of specialised vehicles and machinery.

Priority 3.3: Equipment required by enterprises operating in power generation (TPPs/CHPs), electricity distribution (DSOs), gas production, transmission and distribution, and district heating for repair and restoration, equipment modernisation, the development of highly flexible distributed generation, and the provision of specialised vehicles and machinery.

Priority 4 — approximately EUR 160 million: emergency support for the power system of NPC Ukrenergo; procurement of natural gas and equipment for the restoration of filling stations for Naftogaz of Ukraine; and construction of underground storage tanks and replenishment of the emergency equipment stock of JSC Ukrtransnafta. **Priority 4 is not included in the total unfunded needs.**

Overall, the identified needs are focused on restoring damaged generation, electricity distribution, gas and district heating infrastructure, developing distributed generation, establishing emergency reserves, modernizing energy facilities, and strengthening the resilience of Ukraine's energy system.

The main categories of requested energy equipment are presented below:

Physical Protection Equipment and Materials

1. Mobile Protective Shelters

- Modular civil protection fortifications for up to 10 persons — 8 units in total.
- Modular civil protection fortifications for up to 20 persons — 8 units in total.
- Modular civil protection fortifications for up to 40 persons — 2 units in total.
- Single-module personnel shelters — 7 sets.
- XGC1900 protective structures, or equivalent — 2 sets.

2. Protective Materials

- Square steel hollow sections, 60 × 60 × 3 mm, steel grade St3ps, compliant with DSTU 8940:2019 — 426.355 tonnes.
- Nylon anti-drone mesh, mesh size 100 × 100 mm, thickness 4 mm — 1,293,600 m².
- Low-carbon reinforcing steel wire VR-1, diameter 4 mm — 75.679 tonnes.
- Polyamide cord, Ø8 mm, for anti-drone curtains — 116,200 metres.
- Materials for the installation of anti-drone netting — 1 set.
- Construction sand — 20,000 tonnes.
- Modular concrete blocks LB 2400 × 600 × 600 mm — 1,025 units.
- Modular concrete blocks LB 1200 × 600 × 600 mm — 325 units.
- Modular concrete blocks LB 600 × 600 × 600 mm — 165 units.
- Reinforced-concrete beams, 9000 × 600 × 400 mm — 85 units.
- Reinforced-concrete beams, 10000 × 600 × 400 mm — 82 units.
- Military defensive gabions, 1000 × 2000 × 4000 mm — 59 units.
- Military defensive gabions, 1000 × 1000 × 4000 mm — 236 units.
- Seamless steel pipes, diameter 114 mm, wall thickness 8 mm, steel grade St1-3ps/sp — 9,027 metres.
- Gabions, 1.4 × 1 × 1 m — 4,713 units.
- Concrete modular blocks: 2400 × 600 × 600 mm — 160 units; 1200 × 600 × 600 mm — 40 units; 600 × 600 × 600 mm — 40 units; 240 units in total.
- Prefabricated geotextile-lined HESCO-type fortification gabions, or equivalent, 2000 × 1000 × 2000 mm — 180 units.
- Concrete modular blocks compliant with DBN V.2.2-5 — 1,505 units.
- PAG-14 high-strength reinforced-concrete slabs — 30 units.

- Turchi 260F pile-driving machines, or equivalent — 2 units.
- Dino 220 RXT self-propelled articulated boom lifts, or equivalent — 4 units.

I. Power Supply and Grid Equipment

1. Power Transformers

- Power transformer, 80 MVA, type TDTsN-80000/150/10.5 — 3 units.
- Power transformer, 100 MVA, type TDTsN-100000/150/10.5 — 1 unit.
- Power transformer, 16,000 kVA, 110/35/6 kV — 2 units.
- Three-winding power transformer, 16,000 kVA, HV voltage 115 kV — 2 units.
- Three-winding power transformer, 40,000 kVA, HV voltage 115 kV — 2 units.
- Three-winding power transformer, 25,000 kVA, HV voltage 158 kV — 1 unit.
- Power transformer, 25,000 kVA, 150/35/6 kV — 8 units.
- Power transformer, 10,000 kVA, 35/6 kV — 2 units.
- Power transformer, 6,300 kVA, 35/6 kV — 2 units.
- Power transformer, 6,300 kVA, 35/10 kV — 2 units.
- Power transformer, 6,300 kVA, 10/6 kV — 2 units.
- Power transformer, 4,000 kVA, 6.3/6.3 kV — 6 units.
- Distribution transformer, 1,000 kVA, 6/0.4 kV — 6 units.
- Dry-type power transformer, 2,500 kVA, 0.4/6.3 kV, containerized — 4 units.
- Three-phase power transformers, 80 MVA, 150/35 kV — 3 units.
- Three-phase transformer, type TMG-630/35/0.4-U1 — 1 unit.
- Power transformer, type TMN-4000/35/6, 4 MVA — 1 unit.
- Power transformer, type TDTN-25000/150/35/10, 25 MVA — 1 unit.
- Power transformer, type TDTN-40000/150/35/10, 40 MVA — 1 unit.
- Power transformer, 63,000 kVA, 150/35/6 kV — 1 unit.
- Power transformer, 115/38.5/11 kV, 10 MVA — 1 unit.
- Power transformer, type TMN-6300/110/10, or equivalent — 1 unit.
- Power transformer, type TDC-400000/330 or equivalent — 2 units.
- Power transformer, type TRDNS-32000/35 or equivalent — 2 units.
- Excitation transformer, type TMP-3200 — 2 units.
- Power transformer, type TDTN-16000/110, 16 MVA, 110/35/10 kV — 1 unit.
- Power transformer, 10 MVA, 110/35/10 kV — 3 units.
- Step-up transformer, 400 MVA, 330/20 kV (18T), or equivalent — 1 unit.

2. Autotransformers

- Autotransformer, 125 MVA, 220/110/35 kV — 2 three-phase sets.
- Autotransformer, 333 MVA, 750/330/15.75 kV — one three-phase set and 21 single-phase units.
- Autotransformer, 250 MVA, 330/150/10 kV — 7 three-phase sets.
- Autotransformer, 250 MVA, 330/150/35 kV — 3 three-phase sets.
- Autotransformer, 200 MVA, 330/110/35 kV — 2 three-phase sets.
- Autotransformer, 200 MVA, 330/110/10 kV — 1 three-phase set.
- Autotransformer, 200 MVA, 330/110/6 kV — 4 three-phase sets.
- Autotransformer, 125 MVA, 330/110/10 kV — 2 three-phase sets.
- Autotransformer, 125 MVA, 330/110/35 kV — 1 three-phase set.

The transformers, autotransformers are required for the restoration of electricity generation and distribution facilities, the establishment of strategic emergency reserves, and the connection of distributed generation units.

3. Switchgear and Circuit Breakers

- 10 kV switchgear comprising six cubicles — 1 unit.

- 10 kV switchgear comprising seven cubicles — 1 unit.
- Modular packaged switchgear, type KRPZ-1-2, 6 kV — 2 units.
- 10 kV KRPZ switchgear comprising one incoming-feeder cubicle, one 10 kV voltage-transformer cubicle, five 10 kV overhead-line cubicles, two 10 kV cable-line cubicles and one 10/0.4 kV, 63 kVA auxiliary transformer — 1 set.
- 10 kV outdoor metal-enclosed switchgear comprising 25 panels — 1 set.
- Continuously adjustable 10 kV arc-suppression reactor — 1 unit.
- 10 kV indoor metal-enclosed switchgear comprising three panels — 1 set.
- 10 kV indoor metal-enclosed switchgear comprising seven panels, complete with protection and automation devices and reinforced-concrete sleepers — 1 set.
- 110 kV SF₆ circuit breaker, type LTB 145 D1/B — 5 units.
- 110 kV SF₆ circuit breakers, 3150 A, 40 kA — 7 units in total, including live-tank and dead-tank circuit breakers.
- 110 kV SF₆ circuit breaker — 1 unit.
- 150 kV SF₆ circuit breaker, type LTB 170 D1/B — 1 unit.
- 35 kV vacuum circuit breaker, type OVB-VBF 40.16.32 — 1 unit.
- 35 kV line circuit-breaker bay complete with disconnectors and current transformers — 1 unit.
- Complete 10 kV indoor switchgear comprising 33 cubicles, including 29 cubicles equipped with vacuum circuit breakers, complete with relay protection and automation equipment — 1 set.
- Complete 35 kV indoor switchgear comprising 14 cubicles, including 11 cubicles equipped with vacuum circuit breakers, complete with relay protection and automation equipment — 1 set.
- Automatic reactive power compensation system, 6,000 kVAr — 1 unit.
- Automatic reactive power compensation system, 4,000 kVAr — 1 unit.
- Circuit breaker, type VRS-110 III-31.5/2500, or equivalent — 1 unit.
- Operating-mechanism cabinet for a VRS-110 circuit breaker, or equivalent — 1 unit.

4. Instrument Transformers, Disconnectors and Surge Arresters

- 35 kV voltage transformers, type ZNOM-35 — 2 units.
- 110 kV single-phase voltage transformers — 9 units.
- 110 kV current transformers — 8 units.
- 110 kV coupling capacitors — 3 units.
- 110 kV coupling transformer — 1 unit.
- 110 kV neutral disconnector — 1 unit.
- Three-pole 110 kV disconnectors, 1000 A, with manual operating mechanisms and earthing switches — 4 units.
- 110 kV disconnectors — 2 units.
- 110 kV line traps, type VZ-630-0.25 U1 — 3 units.
- 110 kV surge arresters with operation counters — 6 units.

5. High-Voltage Bushings, Insulators and Structural Components

- 150 kV high-voltage bushings — 12 units.
- 35 kV high-voltage bushings — 15 units.

6. Cables, Automation and Auxiliary Equipment

- 6 kV power cable, type VEVBBShv 3 × 95 + 1 × 10 — 3,000 metres.
- 6 kV power cable, type VEVBBShv 3 × 120 + 1 × 10 — 3,000 metres.
- 6.3 kV power cable, type NA2XS(FL)2Y 1 × 400/35 — 4.8 kilometres.
- 35 kV power cable — 5,000 units.
- 0.4 kV control cable — 3,000 units.
- Control cable, type KVVGE-ngd 4 × 35 — 0.42 kilometres.
- Control cable, type KVVGEgd 10 × 2.5 — 3 kilometres.

- Control cable, type KVVGEngd 14×2.5 — 4 kilometres.
- Control cable, type KVVGEngd 4×35 — 0.42 kilometres.
- Control cable, type KVVGng 4×2.5 — 1,450 metres.
- Control cable, type KVVGng 7×2.5 — 1,880 metres.
- Control cable, type KVVGng 4×2.5 — 1,641 metres.
- Control cable, type KVVGng 7×2.5 — 1,270 metres.
- Control cable, type KVVGng 14×1.5 — 1,000 metres.
- 110 kV circuit-breaker automation panel based on a microprocessor device — 1 unit.
- 110 kV overhead-line protection panels based on microprocessor devices — 2 units.
- 110 kV line protection cabinets — 3 units.
- Main protection panel for a three-winding 110/35/10 kV power transformer — 1 unit.
- Backup protection panel for a three-winding 110/35/10 kV power transformer — 1 unit.
- Technological protection panel for a three-winding 110/35/10 kV power transformer — 1 unit.
- 110 kV voltage-transformer monitoring panel based on microprocessor devices — 1 unit.
- Central alarm panel based on a microprocessor device — 1 unit.
- Central alarm cabinets — 2 units.
- Operational interlocking cabinet — 1 unit.
- DC switchboard with charging devices and storage batteries — 1 unit.
- 35 kV line protection cabinets — 3 units.
- 35 kV incoming-feeder protection cabinets — 2 units.
- 35 kV voltage-transformer protection cabinet — 1 unit.
- Transformer protection cabinets — 2 units.
- 35 kV feeder control panel — 1 unit.
- Control power-supply cabinets — 2 units.
- Automatic under-frequency load-shedding cabinet — 1 unit.
- Auxiliary power distribution cabinet — 1 unit.
- Control panel — 1 unit.
- Regina IDK cabinet — 1 unit.
- Room for relay protection and automation cabinets — 1 unit.
- Telecontrol/telemetry station — 1 unit.
- Telecommunications cabinet — 1 unit.
- SVERKER 900 test system for relay protection and electrical equipment of power plants and substations — 1 unit.

7. Gas-Piston and Cogeneration Units

- Complete gas-engine power plant comprising gas-engine generator units rated at 2,300–2,600 kW, 6 kV — 3 units.
- Variable-frequency drive, 1,000 kW, three-phase, 6,000 V — 1 unit.
- Gas-engine cogeneration unit, 2.5 MW — 1 unit.
- Equipment for the restoration of three JMC 420 gas-piston generators — 1 set.
- Equipment for connecting three gas-piston units to the power supply system — 1 set.
- Equipment for connecting three gas-piston units to the gas supply system — 1 set.
- Equipment for connecting three gas-piston units to the heat supply system — 1 set.
- Caterpillar XGC1900 containerized gas-piston generator sets — 4 units.
- Gas-piston cogeneration units rated at 4.5–5 MW each — 4 units.
- Gas-piston power plants rated at 12 MW each, equipped with 6.3 kV generators — 3 units, with a total capacity of 36 MW.
- Containerized gas-piston cogeneration units rated at 3,350 kW each and operating on natural gas — 7 units.
- Gas-piston generator sets rated at 2.3 MW each — 10 units.

- Gas-piston power plants rated at 9–12 MW, equipped with 6.3 kV generators and waste-heat boilers — 6 units.
- Gas-piston generator sets with a total installed capacity of 23 MW — 10 units.

8. Gas-Turbine Units

- Gas-turbine unit rated at 16.5 MW, complete with auxiliary equipment — 1 unit.
- Gas-turbine unit rated at 5.67 MW, complete with auxiliary equipment — 1 unit.
- Gas-turbine unit rated at 6–10 MW — 1 unit.

The distributed generation equipment is required to provide decentralised and backup power supply, strengthen the resilience of combined heat and power plants and district heating utilities, and replace generating capacity damaged or destroyed as a result of attacks.

9. Thermal Power Plant Restoration Equipment

- Turbogenerator, type TGV-300 — 1 unit.
- Diesel generator, 2,250 kVA, 6 kV — 3 units.
- Pneumatic compressor, 200 kW, 7.5 bar — 6 units.
- Weak-acid cation-exchange resin, Hydrolite ZGC258 or equivalent — 6,000 litres.

10. Oil and Gas Sector Equipment

10.1 Compressor Equipment

- Complete skid-mounted compressor package with a gas engine, suction/discharge pressure 0.4/5.0 MPa, inlet temperature 15°C and capacity 360,000 m³/day — 2 units.
- Complete skid-mounted compressor package with a gas engine, suction/discharge pressure 1.1/5.0 MPa, inlet temperature 15°C and capacity 490,000 m³/day — 2 units.
- Complete skid-mounted compressor package with a gas engine, suction/discharge pressure 2.2/5.0 MPa, inlet temperature 15°C and capacity 690,000 m³/day — 2 units.
- Complete skid-mounted compressor package with a gas engine, suction/discharge pressure 0.04/4.5 MPa, inlet temperature 20°C and capacity 170,000 m³/day — 3 units.
- Gas-pumping units rated at 16 MW — 5 sets.
- Sets of gas-pumping units based on reciprocating compressors driven by gas engines — 4 equipment positions.
- Electric-driven air-compressor units with adsorption dryers, operating pressure 0.8 MPa, capacity 250 litres/minute and receiver volume 200 litres — 3 units.

10.2 Pumping Equipment

- Skid-mounted electrically driven pump units, suction/discharge pressure 0.5/3.5 MPa, capacity 60 m³/h, designed for crude oil and water-oil emulsions — 6 units in total.

The compressor and pumping equipment is required for the restoration and stable operation of gas production, gas transmission and oil-production facilities.

11. Reclosers

- 35 kV recloser, type SOM-38-16-800, Noja Power — 10 units.
- Recloser, type OSM15-16-800-310 — 30 units.
- Recloser, type OSM 15-16-800 — 80 units.
- Recloser, type OSM 38-16-800 — 4 units.
- Recloser, type OSM 38-12-800 — 4 units.
- Recloser, type OSM-38-16-800-300 — 10 units.

12. Diagnostic Equipment

- Portable battery-powered X-ray devices — 3 units.
- Honeywell gauge pressure transmitter STG73L-E1G000-1-0-BH0-11S-B-10A0-F1-0000 — 12 units.

- Honeywell gauge pressure transmitter STG74L-E1G000-1-0-BH0-11S-B-10A0-F1-0000 — 39 units.
- Honeywell absolute pressure transmitter STA74L-E1G000-1-0-BH0-11S-B-10A0-F1-0000 — 11 units.
- Honeywell gauge pressure transmitter STG77L-E1G000-1-0-BH0-11S-B-10A0-F1-0000 — 29 units.
- Honeywell gauge pressure transmitter STG78L-E1G000-1-0-BH0-11S-B-10A0-F1-0000 — 12 units.
- Honeywell gauge pressure transmitter STG79L-E1G000-1-0-BH0-11S-B-10A0-F1-0000 — 12 units.
- Honeywell differential pressure transmitter STD720-E1AC4AS-1-0-BH0-11S-B-10A0-F1-0000 with a three-valve manifold — 46 units.
- Honeywell differential pressure transmitter STD730-E1AC4AS-1-0-BH0-11S-B-10A0-F1-0000 with a three-valve manifold — 13 units.
- Honeywell differential pressure transmitter STD820-E1AC4AH-1-0-BH0-11S-B-10A0-F1-0000 with a three-valve manifold — 31 units.
- Honeywell differential pressure transmitter STD830-E1AC4AH-1-0-BH0-11S-B-10A0-F1-0000 with a three-valve manifold — 12 units.
- SPS-24/3.1 power-supply units for transmitters, or equivalent — 217 units.
- NPM-612 converters for transmitters, or equivalent — 217 units.

13. Specialized Vehicles and Machinery

- Self-propelled mobile crane with a lifting capacity of 100 tonnes — 1 unit.
- Truck crane with a lifting capacity of 160 tonnes — 1 unit.
- Truck crane with a lifting capacity of 60 tonnes, 6 × 6 — 1 unit.
- Heavy-duty low-loader semi-trailer with a carrying capacity of 100 tonnes — 1 unit.
- AGP-18 aerial work platform mounted on an IVECO Daily 60 chassis with a seven-seat cab, or equivalent — 3 units.
- Truck tractor with a low-bed semi-trailer with a carrying capacity of at least 100 tonnes — 1 unit.
- Mobile crane with a lifting capacity of at least 200 tonnes and a maximum boom length of at least 62 metres — 1 unit.
- JCB 4CX backhoe loaders, or equivalent, equipped with hydraulic breakers — 3 units.
- AGP-18 aerial work platforms mounted on an IVECO Daily 60 chassis with a seven-seat cab, or equivalent — 6 units.
- Truck-mounted drilling cranes on IVECO Eurocargo 4×4 chassis, or equivalent — 3 units.
- IVECO T-WAY 6×4 trucks with a payload capacity of at least 16 tonnes, equipped with 8-tonne loader cranes, or equivalent — 2 units.
- Emergency repair workshop for six personnel — 4 units.
- Truck equipped with a loader crane — 1 unit.
- Trucks with dump bodies and loader cranes — 23 units.
- AGP-18 aerial work platform — 1 unit.
- Dump truck with a lifting capacity of 15–20 tonnes — 2 units.
- Full-rotation excavator with a bucket capacity of 1.2 m³ — 2 units.
- Diesel forklift with a lifting capacity of 5,000 kg — 1 unit.
- Telescopic forklift with a lifting capacity of 4,000 kg and a boom length of at least 17 meters, complete with auxiliary attachments — 1 unit.
- AGP-45 aerial work platform with a lifting height of 45 metres, lateral outreach of 27 metres and basket capacity of 600 kg — 2 units.

The worksheet also includes the following specialised vehicles for which quantities are not specified:

- AGP-56 aerial work platform with a 6 × 4 wheel configuration.
- Drilling and crane machine equipped with a 600 mm drill bit and mounted on a 4 × 4 chassis.

- Drilling machine equipped with 600 mm and 800 mm drill bits and mounted on a 6 × 6 chassis.
- AP-18 vehicle with six seats and a 4 × 4 wheel configuration.
- Tractor-mounted drilling and crane machine.
- AP-24 vehicle with six seats and a 4 × 2 wheel configuration.

The specialized vehicles and machinery are required for emergency response, network restoration, lifting operations, equipment transportation and repair works at electricity generation, distribution and district heating facilities.

14. Electricity Generation (Diesel and Backup Power)

14.1 Diesel and Autonomous Generators (Consolidated including energy facilities, district heating, water supply companies, and mobile reserve stock)

Total requirement: over 724 units with a total installed capacity exceeding 270 MW.

By capacity range:

- 0.1 MW — approximately 415 units
- 0.1–0.6 MW — approximately 166 units
- 1–5 MW — approximately 123 units
- ≥5 MW — approximately 20 units

For the connection of consumers to generation units, copper power cables with cross-sections ranging from 25 mm² to 400 mm² are required, depending on generator capacity and connection scheme, including parallel cable runs for higher-capacity generators.

Additionally, for the connection of approximately 1,500 generator units with capacities ranging from 50 kVA to 1.5 MVA, approximately 84 km of copper power cable are required.

The consolidated cable requirement includes:

- copper cable 4×25 mm² — 4.0 km;
- copper cable 4×35 mm² — 5.0 km;
- copper cable 4×50 mm² — 6.0 km;
- copper cable 4×70 mm² — 8.0 km;
- copper cable 4×95 mm² — 7.0 km;
- copper cable 4×120 mm² — 6.5 km;
- copper cable 4×150 mm² — 7.0 km;
- copper cable 4×185 mm² — 6.0 km;
- copper cable 4×240 mm² (single run) — 16.5 km;
- copper cable 4×240 mm² (parallel runs, 2–4 runs) — 18.0 km.

Additionally, cable lugs for copper conductors with cable cross-sections ranging from 25 mm² to 240 mm² are required in an estimated total quantity of approximately 12,100 pcs, depending on generator capacity and connection configuration.

Detailed requirements for cable products and cable lugs are provided in the **Annex “Information Note on Cables and Cable Lugs for Connecting 1,500 Generators”**.

15. Special Project

15.1 Emergency Electricity Supply

- Funding for emergency electricity supply from the power systems of neighbouring countries and for emergency restoration services.

15.2 Natural Gas

- Natural gas — 526 million m³.

15.3 Underground Oil Storage Tanks

- Construction of underground reinforced-concrete oil storage tanks, type RZB-10000, with a capacity of 10,000 m³ each, at the Brody Main Oil Pumping Station:
 - Stage 1 — 4 tanks;
 - Stage 2 — 2 tanks.

The total requirement comprises six underground storage tanks with an aggregate storage capacity of 60,000 m³.

II. GAS supply

Urgent emergency equipment needs of the Gas TSO of Ukraine and the Naftogaz Group include:

- Compressor Ariel KBK/4 CU (3-stage reciprocating compressor) with engine – 2 units
- Compressor Ariel KBE/4 CU (2-stage reciprocating compressor) with engine – 2 units
- Compressor Ariel KBK/4 CU (1-stage reciprocating compressor) with engine – 2 units
- Gas processing unit (packaged equipment for gas treatment) – 2 units
- Gas turbine unit with a capacity 16 MW – 8 units
- Gas turbine unit with a capacity 13 MW – 3 units
- Gas turbine unit with a capacity 6 MW – 16 units
- Gas turbine unit with a capacity 8 MW – 6 units
- Gas turbine unit with a capacity 2-3 MW – 3 units
- Gas motor compressor unit with a capacity 2-3 MW – 12 units
- Gas motor compressor unit with a capacity 1.1 MW – 1 unit
- Gas processing unit Titan 130 – 1 unit
- Gas processing unit Centaur 40 – 3 units
- Compressor Ajax DPC 2804 – 4 units
- Compressor Caterpillar + Ariel – 1 unit
- Turbine Taurus 70 or similar – 4 units.

III. Heat Generation

6. Cogeneration and Heat Generation Equipment: represent 123 units (294,23 MW)

6.1. Cogeneration Equipment

- 0–1 MW: 48 units (11.01 MW)
- 1–2 MW: 32 units (35,33 MW)
- 2–5 MW: 34 units (106.9 MW)
- >5 MW: 9 units (141.0 MW)

6.2. Modular Boiler Houses

Total: 96 units, total installed capacity 407,85 MW

- 0.04–2 MW: 40 units (35,35 MW)
- 2.1–4.8 MW: 23 units (82,5 MW)
- 5–7 MW: 11 units (64 MW)
- 7.5–15 MW: 19 units (168 MW)
- 15–18 MW: 2 units (34 MW)
- 20–25 MW: 1 units (24 MW)

IV. Water Supply and Heat supply Companies

According to the letter of the Ministry for Development of Communities and Territories of Ukraine dated 14 August 2026 No. 21394/25/10-26, the need for backup power sources is as follows:

- **up to 9 kW** — 58 units;
- **10–19 kW** — 134 units;
- **20–29 kW** — 48 units;
- **30–49 kW** — 90 units;
- **50–90 kW** — 173 units;

- 100–290 kW — 196 units;
- 300–900 kW — 57 units;
- 1–3 MW — 115 units.

Total: 871 generators with a combined capacity of 296.16 MW

V. Mobile Equipment Fund/Reserve Stock of equipment:

Operator: SARDI: STATE AGENCY FOR RESTORATION AND DEVELOPMENT OF INFRASTRUCTURE

Mobile Equipment Fund - on a chassis, for moving to different locations

Block-modular boiler houses:

- 1–3 MW: 586 units (1,284,185.23 kW heat power)

Diesel generators:

- 0.1-3 MW (1-3 MW priority): 136 MW (funded via state budget)

VI. Urgent need for cogeneration for the city of Kyiv (Kyivteploenergo Municipal Enterprise)

- Gas reciprocating unit (GPU) 2.3 MW 11 units
- Gas reciprocating unit (GPU) 2.5 MW 19 units
- Gas reciprocating unit (GPU) 4.5 MW 20 units
- Gas reciprocating unit (GPU) 5.0 MW 2 units
- Gas reciprocating unit (GPU) 10.0 MW 5 units
- Gas turbine unit (GTU) 57 MW 2 units
- Steam turbine unit (STU) 46 MW 1 unit
- Battery energy storage system (BESS) 10 MW 2 units

Electric Motors (or equivalents)(for district heating enterprises)

- 4AZM 5000/6000, 6 kV, 5000 kW, 2982 rpm - 1 unit
- DAZO-15-49-8/10, 6 kV, 630/320 kW, 734/595 rpm - 6 units
- AO2-92-4U2, 0.4 kV, 11 kW, 750 rpm - 2 units
- 4AM160M8UZ, 0.4 kV, 11 kW, 730 rpm - 2 units
- AIR160M8UZ, 0.4 kV, 11 kW, 730 rpm - 1 unit
- A02-81-2, 0.4 kV, 40 kW, 2920 rpm - 1 unit
- 4AMN225M2, 0.4 kV, 90 kW, 2930 rpm - 3 units

VII. Emergency Equipment Requirements of LVDS “Brody” of the Druzhba Oil Pipeline

The Linear Production and Dispatch Station (LVDS) “Brody” of the Druzhba oil pipeline is a critical infrastructure facility within the main oil pipeline system of Ukraine and is operated by JSC Ukrtransnafta.

To replace the destroyed terminal (with a capacity of 75,000 cubic meters) JSC Ukrtransnafta needs the financial assistance in amount of 30 mln EURO to construct 6(six) underground storage reservoirs, each with a capacity of 10,000 m³.

This construction project consists of two phases:

Phase I - Construction of underground reinforced cement concrete oil storage tanks RCC-10000 (10,000 m³ each) at Brody Line Dispatching Station (LDS) – 4 pcs

Phase II - Construction of underground reinforced cement concrete oil storage tanks RCC-10000 (10,000 m³ each) at Brody Line Dispatching Station (LDS) (Phase 2) – 2 pcs

In order to replace the reserve and dismantled equipment from other facilities that was used during the repair of Druzhba pipeline JSC Ukrtransnafta needs to restock a list of electrical, technological, and automated equipment, namely:

Power transformers

- Power transformer 150/6 kV, 16 MVA – 1 pc
- Power transformer 110/10 kV, 16 MVA – 1 pc
- Power transformer 110/6 kV, 16 MVA – 1 pc

Process equipment

- Mixer Plenty 30(28)P-70-S TM-30 (50HP) or equivalent – 3 pcs
- Electric-operated flanged gate valve DN500 PN16 (complete set: valve, gearbox, electric actuator) – 3 pcs
- Electric-operated flanged gate valve DN600 PN16 (complete set: valve, gearbox, electric actuator) – 1 pc
- Electric-operated flanged butterfly valve DN500 PN16 (complete set: valve, gearbox, electric actuator) – 3 pcs
- Electric-operated flanged butterfly valve DN600 PN16 (complete set: valve, gearbox, electric actuator) – 1 pc
- Limitorque MX-40 electric actuator or equivalent – 2 pcs

Cable products

- Cable VBBSHV 5×2.5 – 2,662 m
- Cable VBBSHV 5×10 – 400 m
- Cable VBBSHV 5×4 – 350 m
- Cable VBBSHV 3×6 – 400 m
- Cable VBBSHV 5×16 – 500 m
- Cable VBBSHV 5×35 – 300 m
- Cable KVBSHV 7×1.5 – 500 m
- MG-10 wire – 300 m
- EuroSat RG-58 coaxial cable – 300 m
- MKEKShV 4×2×1.0 control cable – 200 m

Electrical installation materials

- Connecting coupling 0.4 kV (150–240) – 20 pcs
- Connecting coupling 0.4 kV (16–50) – 25 pcs
- Connecting coupling 0.4 kV (50–95) – 20 pcs
- Connecting coupling 0.4 kV (1.5–2.5) – 20 pcs
- End connector 0.4 kV (150–240) – 15 pcs
- End connector 0.4 kV (70–120) – 20 pcs
- Explosion-proof distribution box 300×350 – 15 pcs

Automation and control systems

- Schneider Electric PLC module 140 CRP 932 00 RIO Head – 1 pc
- Schneider Electric PLC module 140 CRA 932 00 RIO (Remote I/O) Drop Adapter – 2 pcs
- Splitter AEG Modicon MA-0185-100(C) – 4 pcs

To protect the pipeline Druzhba from possible future attacks JSC Ukrtransnafta needs to restock the special vehicles and equipment.

Fire-fighting and emergency equipment

- Fire truck (fire tanker) – 2 pcs
- PH-Poseidon 1 portable floating fire pump or equivalent – 2 pcs
- Genergy Limited 3000 portable petrol generator or equivalent – 2 pcs
- Lukas SC 358E3 battery-powered combination tool (spreader and cutter) – 2 sets
- Lukas R 521E3 battery-powered jack – 2 sets
- Streamlight Survivor personal flashlights with charger – 8 pcs
- Streamlight Fire Vulcan multi-lamp units with charger – 5 pcs
- Protek Style 366 multi-mode combination hand-held fire hose – 6 pcs
- Foam dispensing nozzles for Protek Style 213 hose – 6 pcs

Fire hoses

- Fire hose Ø51 mm (20 m) – 40 pcs
- Fire hose Ø66 mm (20 m) – 30 pcs
- Fire hose Ø77 mm (20 m) – 40 pcs

Protective equipment and tools

- Fireproof fire-fighting gloves – 100 pairs
- Petrol chainsaw (Husqvarna / Stihl / Makita or equivalent, with spare cut-off wheels and oil) – 2 sets
- Chainsaw (Husqvarna / Stihl / Makita or equivalent) – 2 sets

VIII. Equipment for the Restoration of Filling Stations

1. Fuel and LPG Dispensers

- 1.1. Fuel dispenser – TATSUNO OCEAN TOWER BMP 4048/OWD
- 1.2. Fuel dispenser – TATSUNO OCEAN TOWER BMP 40510/OWD
- 1.3. Fuel dispenser – Tatsuno BMP 2048
- 1.4. LPG dispenser – Tatsuno BMP 511
- 1.5. LPG dispenser – Tatsuno BMP 512
- 1.6. LPG dispenser – Tatsuno BMP 4024
- 1.7. LPG dispenser – ASTRA
- 1.8. LPG dispenser – SHELF
- 1.9. LPG dispenser – Gilbarco SK700-II
- 1.10. Fuel dispenser – Gilbarco SK-700II 8/0/8
- 1.11. Fuel dispenser – Gilbarco SK-700-2
- 1.12. Fuel dispenser – Gilbarco SK-700-1
- 1.13. Fuel dispenser – Gilbarco SK700-II
- 1.14. Fuel dispenser – Gilbarco SK-700II LPG 2/0/2
- 1.15. Fuel dispenser – GILBARCO SK 700-II 8-4-8
- 1.16. Fuel dispenser – GILBARCO SK 700-II 10-5-10
- 1.17. Fuel dispenser – DRESSER WAYNE HELIX 6000 II (8-4)
- 1.18. Fuel dispenser – DRESSER WAYNE HELIX 6000 II (10-5)
- 1.19. Fuel dispenser – TOKHEIM QUANTIUM ML 4-x-4
- 1.20. Fuel dispenser – TOKHEIM QUANTIUM ML 5-x-5
- 1.21. Fuel dispenser – TOKHEIM QUANTIUM 4/8, suction-type
- 1.22. Fuel dispenser – Tokheim Quantum 500
- 1.23. Fuel dispenser – Tokheim Quantum 510
- 1.24. Fuel dispenser – DOVER QUANTIUM ML 4-8-4 R, pressure-fed
- 1.25. Fuel dispenser – DOVER QUANTIUM ML 1-1-1 R, pressure-fed
- 1.26. Fuel dispenser – DOVER QUANTIUM ML 2-4-2 R, pressure-fed

- 1.27. Fuel dispenser – DOVER QUANTIUM ML 4-8-4 S, suction-type
- 1.28. Fuel dispenser – DOVER QUANTIUM ML 2-4-2 S, suction-type
- 1.29. LPG dispenser – DOVER QUANTIUM ML 1-2-1 LPG
- 1.30. AdBlue dispenser – DOVER QUANTIUM ML AdBlue (DOVER QUANTIUM ML 1-1-1 ADB)
- 1.31. Fuel dispenser – Adast V-line 46xx
- 1.32. Fuel dispenser – Adast V-line 47xx
- 1.33. Fuel dispenser – Shelf
- 1.34. Fuel dispenser – Scheidt & Bachmann
- 1.35. Fuel dispenser – SALZKOTTEN
- 1.36. Fuel dispenser – Tatsuno BMP4048, 4×8, pressure-fed
- 1.37. Fuel dispenser – Tatsuno BMP4048, 4×8, suction-type
- 1.38. Fuel dispenser – Gilbarco HORIZON 8-0-8, 4×8, pressure-fed
- 1.39. Fuel dispenser – Gilbarco HORIZON 8-4-8, 4×8, suction-type
- 1.40. Fuel dispenser – Dresser Global Star C 44-44-U
- 1.41. Fuel dispenser – Dresser Global Star C 55-55-HHR

2. Power Equipment

- 2.1. TMGB-88 generator
- 2.2. FOGO FDG 80 I generator
- 2.3. GREEN POWER 66 generator
- 2.4. HIMOINSA 60–100 generator
- 2.5. AKSA 43–165 generator
- 2.6. JCB 45–115 generator
- 2.7. DALGAKIRAN 89 generator
- 2.8. Package transformer substations rated at 40/63/100/160/250/400 kVA
- 2.9. Explosion-proof electric motor rated at 3 kW, climatic category U2

3. Pumping Equipment

- 3.1. FE Petro pressure pump
- 3.2. FE Petro STP(RT) 150C-VL2-00 submersible fuel pump
- 3.3. Red Jacket P150U17-3RJ2 submersible fuel pump
- 3.4. Red Jacket 75 submersible fuel pump
- 3.5. FE Petro STP150C submersible fuel pump, USA
- 3.6. Red Jacket STP submersible fuel pump, USA
- 3.7. LPG pumping unit – SKC 4.08.5.1160 LPG
- 3.8. LPG pumping unit – Blackmer LGL158B
- 3.9. LPG pumping unit – EBSRAY RC40
- 3.10. LPG pumping unit – FAS FD-150
- 3.11. LPG pumping unit – RT 150A Europump
- 3.12. LPG pumping unit – EBSRAY R10F
- 3.13. SKC 4.08.5.1160 pump unit for transferring liquefied petroleum gas
- 3.14. Bennett T-75 pump for transferring fuels and lubricants
- 3.15. RC40 pump unit with a 5.5 kW electric motor, Australia
- 3.16. Hydro-Vacuum SKC 4.08 pump with a 3 kW electric motor, Poland

4. Fuel Metering and Monitoring Systems

- 4.1. GILBARCO VEEDER-ROOT **fuel measurement system comprising** one TLS-4 touchscreen console and seven **MAG-D3** magnetostrictive probes, **with direct fuel density measurement**
- 4.2. Veeder-Root MAG D3 tank level gauges
- 4.3. Veeder-Root MAG 12 tank level gauges
- 4.4. OPW Model 924B tank level gauges
- 4.5. UUS-01 ultrasonic level gauge and alarm unit
- 4.6. DMP-IS-485 1W IS probe with 2-inch fuel/water floats and a 1.5 m cable

- 4.7. 5-MAGLINK LX PLUS console

5. Storage Tank

- 5.1. 10 m³ liquefied petroleum gas storage tank

6. Other Equipment

- 6.1. ZVA Slimline 2 fuel dispensing nozzle
- 6.2. Elaflex Slimline SL LT 16 DN16 oil- and petrol-resistant hose
- 6.3. 1SN DN16 high-pressure hose
- 6.4. Bennett SB-100 dispenser
- 6.5. MARIA-303A1 electronic cash register
- 6.6. Leabon LB-T630 POS terminal

Focal points

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Information Note on Cables and Cable Lugs for Connecting 1,500 Generators

Standard Generator Capacities from 50 kVA to 1.5 MW

Lower capacities (commonly used for backup power supply to buildings)

- 50 kVA — 80 units
- 63 kVA — 100 units
- 80 kVA — 120 units
- 100 kVA — 160 units
- 125 kVA — 140 units
- 160 kVA — 130 units
- 200 kVA — 140 units

Medium capacities (distributed generation units)

- 250 kVA — 120 units
- 300 kVA — 110 units
- 320 kVA — 70 units
- 330 kVA — 40 units
- 400 kVA — 80 units
- 440 kVA — 30 units
- 500 kVA — 60 units
- 550 kVA — 20 units

- 600 kVA — 35 units
- 650 kVA — 10 units
- 700 kVA — 15 units
- 750 kVA — 10 units
- 800 kVA — 10 units
- 900 kVA — 8 units

Upper range up to ~1.5 MW

- 1,000 kVA — 6 units
- 1,100 kVA — 2 units
- 1,200 kVA — 2 units
- 1,250 kVA — 1 unit
- 1,500 kVA — 1 unit

Cable Requirements

To connect 1,500 generator units with capacities ranging from 50 kVA to 1.5 MVA, approximately 84 km of copper power cable with cross-sections from 25 mm² to 240 mm² is required, taking into account parallel cable runs for higher-capacity generators.

Consolidated Summary by Cable Type:

- Copper cable 4×25 mm² — 4.0 km
- Copper cable 4×35 mm² — 5.0 km
- Copper cable 4×50 mm² — 6.0 km
- Copper cable 4×70 mm² — 8.0 km
- Copper cable 4×95 mm² — 7.0 km
- Copper cable 4×120 mm² — 6.5 km
- Copper cable 4×150 mm² — 7.0 km
- Copper cable 4×185 mm² — 6.0 km
- Copper cable 4×240 mm² (single run) — 16.5 km
- Copper cable 4×240 mm² (parallel runs, 2–4 runs) — 18.0 km

Cable Lug Requirements

(for generators from 50 kVA to 1.5 MVA, 0.4 kV, copper conductors, 4-core connection scheme, including parallel runs)

Summary by Lug Size

- 25 mm² lugs — 640 pcs
- 35 mm² lugs — 800 pcs
- 50 mm² lugs — 960 pcs
- 70 mm² lugs — 1,280 pcs
- 95 mm² lugs — 1,120 pcs
- 120 mm² lugs — 1,040 pcs
- 150 mm² lugs — 1,120 pcs
- 185 mm² lugs — 960 pcs
- 240 mm² lugs — approx. 6,176 pcs

Overall Summary

Total number of cable lugs: approximately 12,100 pcs

Application: connection of generator units with capacities from 50 kVA to 1.5 MVA

Material: copper

Cable cross-section range: 25 mm² to 240 mm²