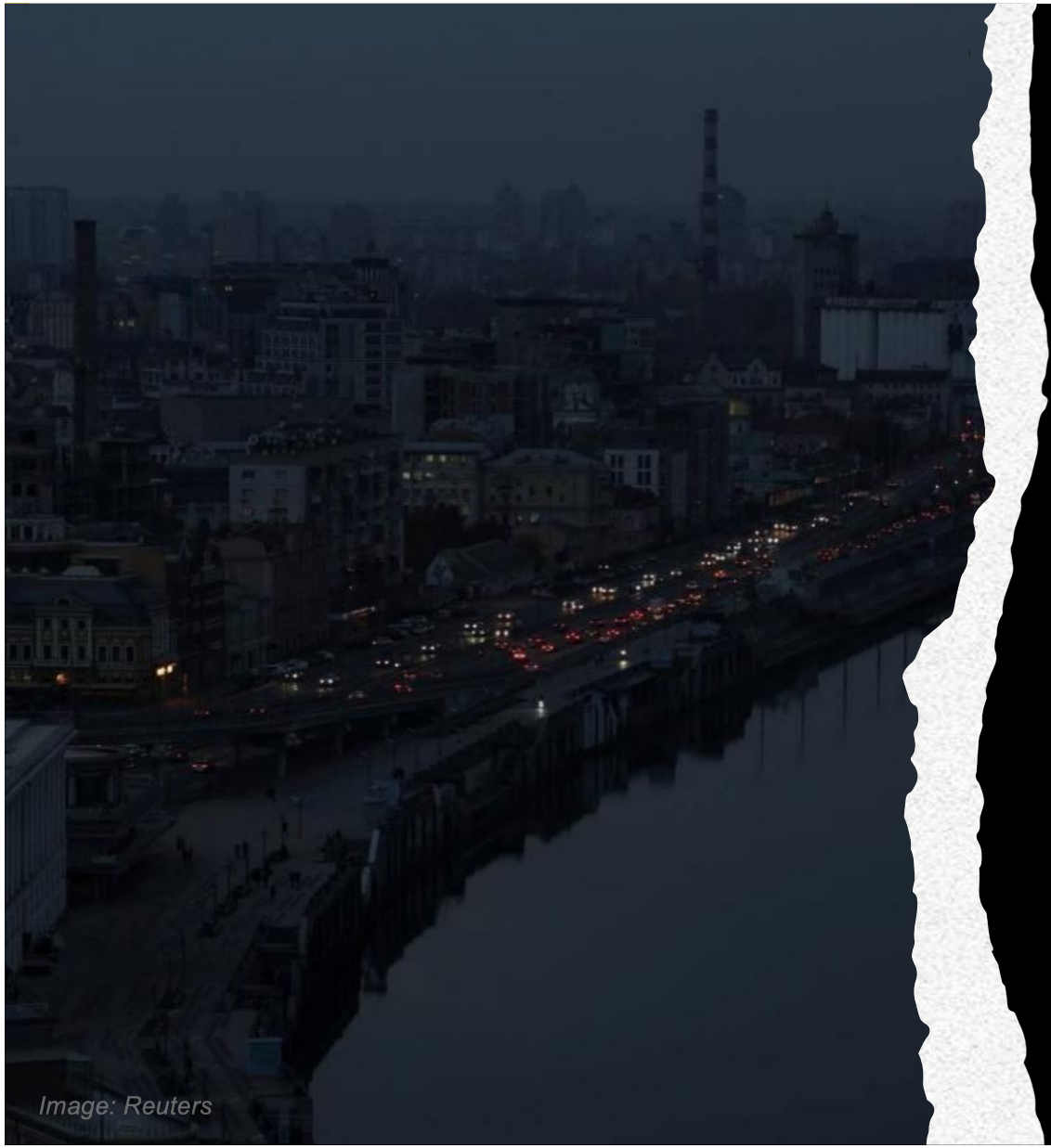


Image: Reuters

Cabinet of Ministers of Ukraine

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

UKRAINE IN THE DARK: EMERGENCY NEEDS IN THE ELECTRICITY SECTOR

NOVEMBER 2022

ASSESSMENT OF THE GOVERNMENT'S PRIORITY NEEDS IN ELECTRICITY SECTOR IN THE CONTEXT OF RDNA

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

- The rapid Damage and Needs Assessment **as of June 2022** estimated total damages of energy sector at USD 3 bln.
- Targeted Russian attacks **in October-November 2022** have damaged up to 50% of Ukraine's electricity distribution network.
- The estimated cost of emergency support to electricity sector is estimated at USD 500 mln.
- Emergency support in district heating is estimated at USD 500 mln (outside of the scope of this presentation).
- The damage of **high voltage autotransformers** (750/330/110kV) have de-stabilized the electricity grid and led to scheduled and unscheduled electricity outages nationally.
- Urgent repairs and priority equipment are key to stabilizing the electricity grid.

rDNA vs emergency support	US$ bln
Damages as of June, US$ bln	3
Losses as of June, US$ bln	11.7
Total Needs as of June, US$ bln	10.4
Short-term Needs as of June, US$ bln	7.3
Emergency support in district heating, as of Nov, US$ bln	0.5
Emergency support electricity sector, as of Nov, US$ bln	**0.5**

Urgent needs:	Priority I	Priority II	Priority III	Priority IV	2023	2032
Equipment:	High voltage auto-transformers	Other high voltage equipment	DSO equipment	Other equipment	Short-term needs, rDNA	Long term needs

TOP-PRIORITY EMERGENCY REPAIR AND EQUIPMENT NEEDS

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Estimates are indicative as the needs are increasing every day due to military attacks.

Emergency support electricity sector, as of November 2022	US$ mln
TOTAL MINIMUM NEEDS	**500**
TSO high voltage (Ukrenergo) Annex 1	**147**
DSO mid-low voltage (Ukrenergo) Annex 1	**55**
Other needs of power generation, electricity/gas/heat supply, extractive companies (100+ energy sector companies) (source - Minenergy)	**298**

- new
- used/pre-owned
- repairable
- available in warehouses

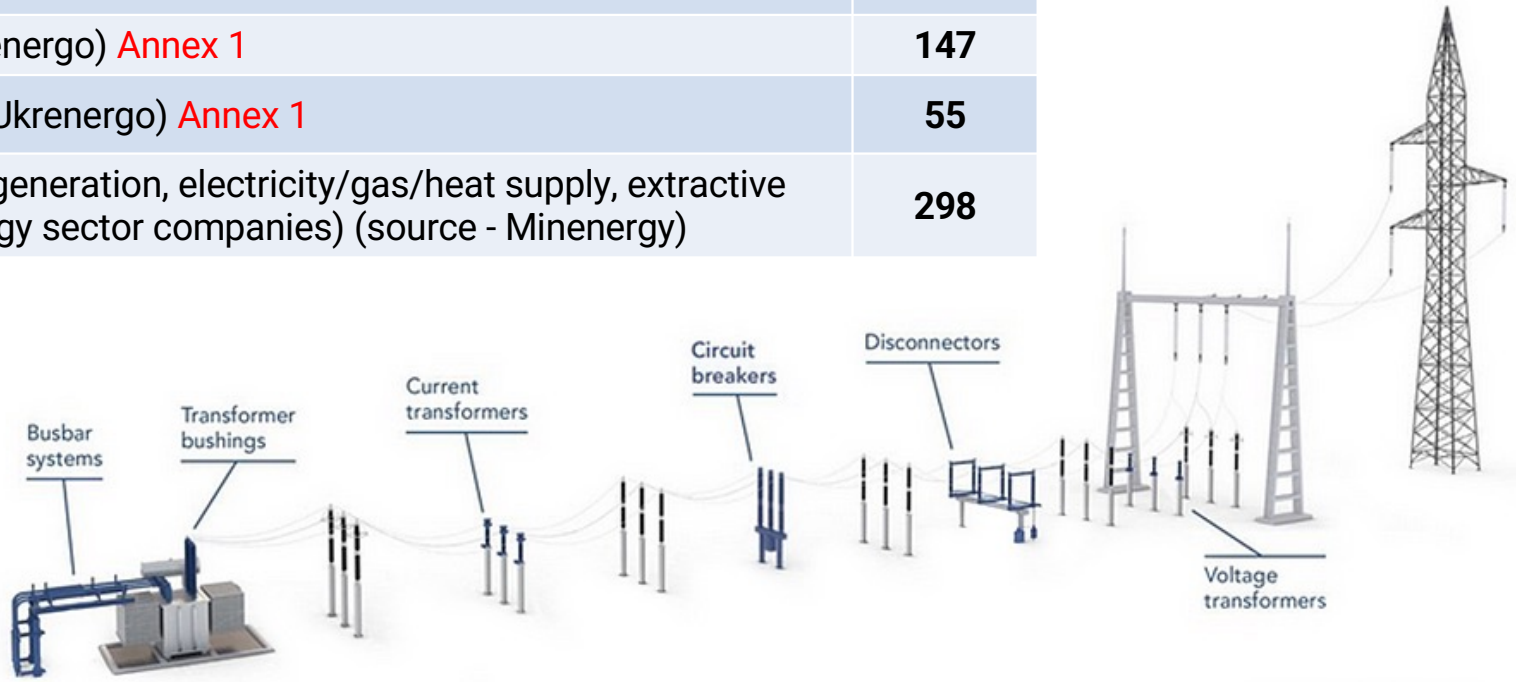


Image: Pfiffner

EXTRAORDINARY CHALLENGES REQUIRE UNCONVENTIONAL SOLUTIONS

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

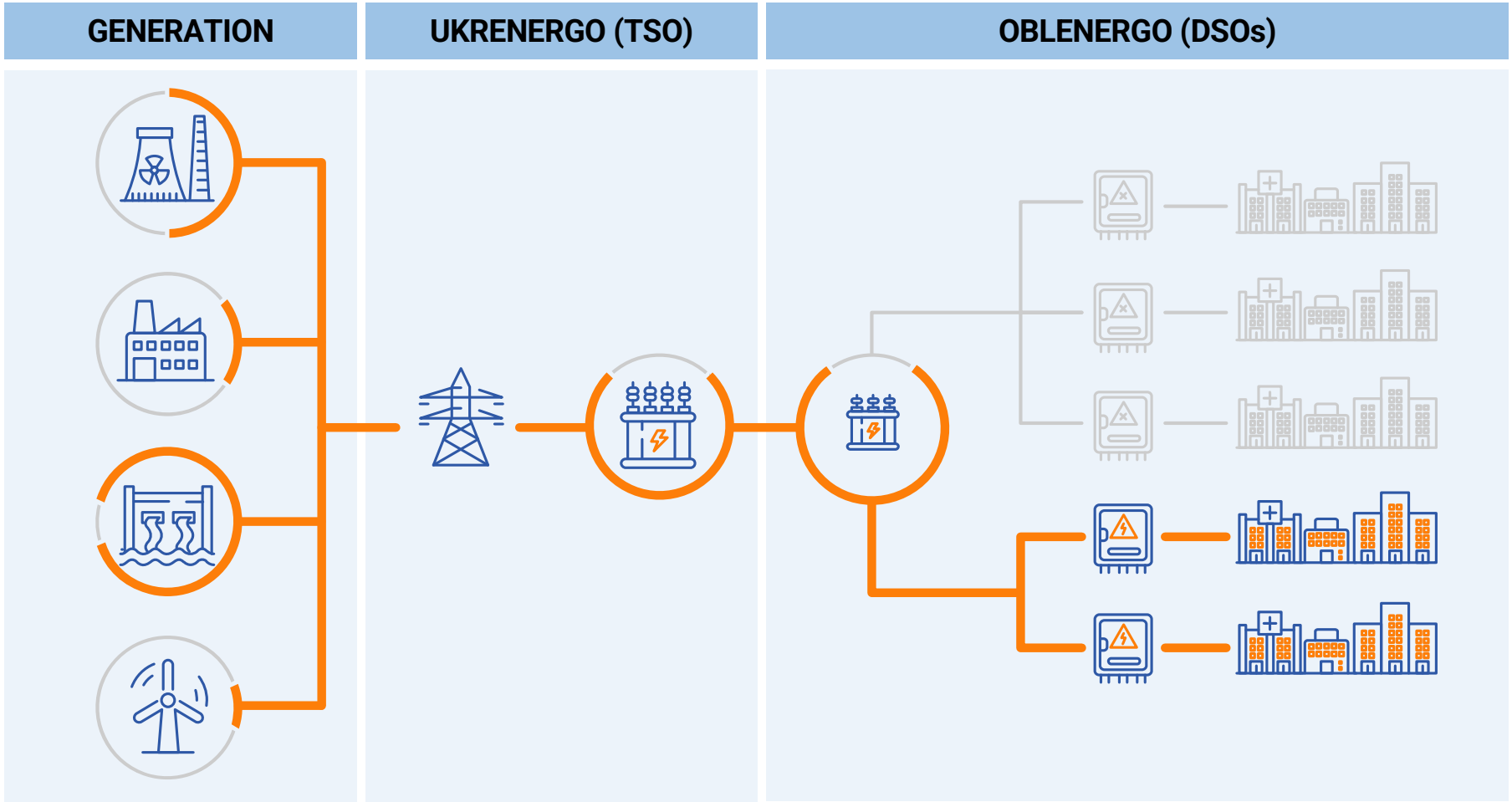
1	**EQUIPMENT NOT READILY AVAILABLE**	Contact targeted suppliers in select countries (post-Soviet/Asia) to secure extra high voltage equipment
2	**EQUIPMENT IS VERY PRICEY AND DISPOSABLE DUE TO ATTACKS**	Unconventional solutions (e.g. gas peakers, diesel generator for winterization)
3	**LONG DURATION OF PRODUCTION UP TO 18 MONTHS**	Request priority production and delivery for Ukraine
4	**MASSIVE LIST OF NEEDS 13,000 POSITIONS AND GROWING**	Focus on crucial equipment to stabilize the grid. Optimize the process (IT solution, extra capacity)
5	**COMPLICATED LOGISTICS**	Deliver via European Civil Protection Mechanism from any EU port

CONTEXT

Image: Ukrenergo

RUSSIA HITS KEY NODES TO INFLICT MAXIMUM PAIN

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE



ESCALATION OF TARGETED ATTACKS ON ENERGY SYSTEM SINCE 10 OCTOBER

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Since the beginning of the full-scale invasion, Russia has carried out **126 attacks on the energy system** of Ukraine, including **92 in October and November**.

As of November 16 **2 to 4 million consumers remained without electricity supply** across Ukraine.

Around 50% of the assets are destroyed and many more critical high voltage lines are targeted.

Several hundred missiles and drones were shot to bring the energy system down. Every wave of attacks had its own set of targets:

- **750 kV and 330 kV power substations** – the backbone of the energy system;
- **maneuverable power generation/substations** (heat and hydro power plants);
- power supply substations **transmitting power from nuclear power plants (NPPs).**

The only strategy that the enemy has not tried yet is a direct attack on the NPPs.

NPPs provide 50%+ of the power supply; locking them down will mean **full and long blackouts.**

Center and East are affected the most.

Recent attacks are throwing entire Ukraine on the verge of a full blackout.

PRIORITIZING EMERGENCY REPAIRS NEEDS

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Emergency repairs are required in a **wide range of infrastructure objects and facilities**.

Repair requests are prioritized according to their impact on restoring energy supply to:

1. **Transmission system (UkrEnergo) –** Critical National Infrastructure such as defense and security systems, critical transport and water lines, communication systems etc.
2. **Disaster prevention** (threatening human lives; e.g. NPPs, coal mines etc)
3. **Facilities ensuring livelihood security** (utilities, food supply, medical facilities, security services) – by number of affected household consumers
4. **Businesses and industrial capacities** – by number of jobs, importance for defense, tax revenue
5. **Maintain availability for renewable and nuclear energy generation**
6. **Maintain interconnections with EU and other countries**

TOP-PRIORITY EMERGENCY REPAIR AND EQUIPMENT NEEDS

Image: Ukrenergo

TOP-PRIORITY EMERGENCY REPAIR NEEDS

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

High-voltage (750-110 kV) equipment for TSO Ukrenergo (Annex 1)

- autotransformers
- voltage and current transformers
- 750 kV shunt reactors
- control and relay panels
- high-voltage inputs
- SF6 busbar systems
- SF6 and vacuum switches
- circuit breakers and disconnectors
- surge arresters
- protective structures of closed or semi-closed type

TOP-PRIORITY EMERGENCY REPAIR NEEDS

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

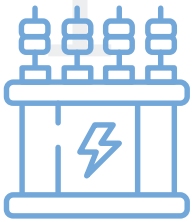
Mid-voltage (115 kV and below) equipment for DSOs (Annex 1)

- power transformers
- voltage and current transformers
- complete transformer substations
- high-frequency stoppers (jammers)
- SF6 and vacuum switches
- circuit breakers and disconnectors
- high-voltage inputs
- vacuum reclosers
- surge arresters
- protective structures of closed or semi-closed type

OTHER EMERGENCY REPAIR NEEDS

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

1



Other equipment

- Substation compressors
- Arc extinguishing chambers
- Disconnector support columns
- Distributing current retractable equipment
- Insulators, fuses
- Wires, cables

2

Transport

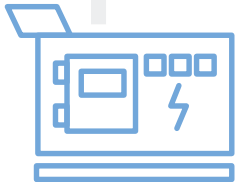
- Autotowers
- Mini-excavators
- Mobile cranes
- Cargo lifting mechanisms
- Cargo vehicles
- Passenger vehicles

3

Tools, materials

- Electrical engineering laboratories
- Chainsaws
- Armature, traverses, clamps
- Reinforced concrete supports
- Satellite phones, means of telemechanics and radio communication

4



Power backup, fuel

- Batteries and UPS devices
- Diesel generators
- Diesel and gasoline
- Transformer oil

HOW TO SPEED UP THE HELP?

Image: Ukrenergo

KEY CHALLENGE – LACK OF READILY AVAILABLE HIGH VOLTAGE EQUIPMENT AND EFFECTIVE FINANCING VEHICLES

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

To streamline the process, we suggest that partners agree on areas of responsibility and specialize.

A partner (or a small group of partners) to organize a complete process of support to selected area, in coordination with the line ministry.

The process could include the following components:

1. Set up a dedicated team with necessary technical qualifications to process requests from impacted companies and identify potential suppliers/donors.
2. Organize funding, payment channels and procurement process to enable fast purchases of identified equipment.
3. Ensure logistics, delivery and transfer of procured equipment to a specified warehouse in Ukraine and/or end recipient.

Initiatives, which are not providing the complete cycle yet, should be expanded or grouped with other initiatives accordingly to increase efficiency and remove bottlenecks.

The specializing partner to coordinate the entire chain.

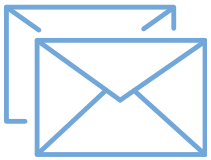
AID ENERGY PLATFORM (DISCUSSED WITH EBRD)

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

13,000+ requests are to be processed. Detailed breakdown on damages and final recipients is confidential. Basic humanitarian aid module with warehouse CRM integration and automatic updates.

- **Suggested platform:** Microsoft BI, IT system
- **Estimated term of roll-out:** 1-2 months
- **Estimated cost:** EUR 50 000
- **Integration with similar platforms** serving other needs (Ukrenergo's CRM, Damaged.in.ua, Uneeds)
- **Estimated need of additional personnel:** 10 persons, incl.
  – 2 persons working with the Ministry of Energy
  – 8 persons dedicated to Khmelnytskoblenergo

USEFUL CONTACTS



Oleksandra Vasylenko	coordinator for humanitarian assistance, Ministry of Foreign Affairs oleksandra.vasylenko@mfa.gov.ua
Yulia Kyian	coordination with partners, Ministry of Energy yuliia.kyian@gmail.com
Ruslan Slobodyan	clarification of specifications of equipment slobodianR@sies.gov.ua Ruslan.slobodyan@gmail.com
Petro Lutsiv	logistics, management of warehouses plutsiv@gmail.com
Roman Andarak	coordination with partners, Ministry of Energy roman.andarak@mev.gov.ua
Oleg Pavlenko	high voltage equipment coordinator, Ukrenergo donoraid@ua.energy

ANNEX 1:

PRIORITY EQUIPMENT INDICATIVE PRICES

(SOURCE: UKRENERGO)

Image: Ukrenergo

PRIORITY EQUIPMENT AND INDICATIVE PRICES. TSO

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Item	Description	Quantity	Indicative price per unit USD	Total*, USD, VAT excl.
Autotransformers	333 000 kVA, rated voltage HV/MV/LV 750/330/15,75 kV	18	4 025 000,00	72 450 000,00
	250 000 kVA, rated voltage HV/MV/LV 330/150/35 (10) kV, rated voltage HV/MV/LV 330/220/35 kV	6	3 593 750,00	21 562 500,00
	200 000 kVA, rated voltage HV/MV/LV 330/110/35(10) kV	3	2 875 000,00	8 625 000,00
	125 000 kVA, rated voltage HV/MV/LV 330/110/35(10) kV	4	1 796 300,00	7 185 200,00
	200 000 kVA, rated voltage HV/MV/LV 220/110/10 kV	1	2 875 000,00	2 875 000,00
	125 000 kVA, rated voltage HV/MV/LV 220/110/35 (10, 6)kV	6	1 796 300,00	10 777 800,00
Transformer	20 000 kVA, rated voltage HV/MV/LV 110/35/6 kV	1	611 800,00	611 800,00
Circuit breakers	750 kV /4000A/40 kA	4	455 400,00	1 821 600,00
	330 kV/3150A/40 kA	20	126 500,00	2 530 000,00
	220 kV/3150A/40 kA	11	64 515,00	709 665,00
	150 kV/3150A/40 kA	9	44 965,00	404 685,00
	110 kV/3150A/40 kA	25	27 830,00	695 750,00
	35 kV/2000A/40 kA	4	13 225,00	52 900,00
Disconnectors	750-330kV/3150A	38	115 000,00	4 370 000,00
	220-150-110-35 kV/2000A	18	34 500,00	621 000,00
	150-110 kV/ 2000A	79	23 000,00	1 817 000,00

* prices are indicative, range +/- 20% depending on specifications and manufacturers. Insurance, transport and additional costs for installing equipment are not included.

PRIORITY EQUIPMENT AND INDICATIVE PRICES. TSO

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Item	Description	Quantity	Indicative price per unit USD	Total*, USD, VAT excl.
Current transformers	750 kV, transformation ratio - 3000/1, accuracy class - 0,2S/0,2S/10P/10P/10P/10P	5	73 600,00	368 000,00
	330 kV, transformation ratio - 2000/1, 2000/5, accuracy class - 0,2S/0,2S/10P/10P/10P/10P	36	34 500,00	1 242 000,00
	220 kV, transformation ratio - 1200/1, 600/5, 600-1200/5, accuracy class - 0,5/10P/10P/10P	15	27 600,00	414 000,00
	150 kV, transformation ratio - 1200/5, accuracy class - 0,5/10P/10P/10P	27	20 700,00	558 900,00
	110 kV, transformation ratio - 750-1500/1, 1500/5, 600-1000/5, accuracy class - 0,5/10P/10P/10P	39	13 800,00	538 200,00
Voltage transformers	rated voltage - 330 kV	9	43 700,00	393 300,00
	rated voltage - 220 kV	15	28 750,00	431 250,00
	rated voltage - 110 kV	9	14 950,00	134 550,00
Surge arrestors	750 kV, SA rated voltage - 612 kV, line grade class as per IEC - 3	4	25 300,00	101 200,00
	330 kV, SA rated voltage - 288 kV, line grade class as per IEC - 2	14	6 900,00	96 600,00
	220 kV, SA rated voltage - 192 kV, line grade class as per IEC - 2	5	2 875,00	14 375,00
	150 kV, SA rated voltage - 138 kV, line grade class as per IEC - 3	7	1 725,00	12 075,00
	110 kV,SA rated voltage - 108 kV, line grade class as per IEC - 2	6	1 380,00	8 280,00
	35 kV, SA rated voltage - 37,5 kV, line grade class as per IEC - 2	4	1 035,00	4 140,00
Relay protection and emergency automatics	Relay protection devices for 110-750 kV primary equipment	Multiple devices	5 750 000,00	5 750 000,00
	Total:			**147 176 770**

PRIORITY EQUIPMENT AND INDICATIVE PRICES. DSO

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Item	Description	Total Quantity Needed	Indicative price per Unit (insurance and transport included), USD	Total indicative price, USD, VAT excl.
Transformers	Three-phase autotransformer 240000/330/220, or similar (Rated voltage of windings, HV - 330 kV, MV -220 kV, LV - 38.5kV, Rated power: 240 MVA, Frequency, Hz: 50, with forced circulation of oil and air, lightning-proof, outdoor)	1	3 120 000	120 000
	Single phase autotransformer 210000/400/330-73, or similar (Rated voltage of windings, HV - 400 kV, MV - 330 kV, LV - 35 kV, Rated power: 240 MVA. Frequency, Hz: 50, with forced circulation of oil and air and on-load tap-changer)	2	2 730 000	460 000
	Single phase autotransformer 133000/400/220, or similar (Rated voltage of windings, HV - 400 kV, MV - 220 kV, LV - 35 kV, Rated power: 133 MVA. Frequency, Hz: 50, with forced circulation of oil and air, lightning-proof)	1	1 729 000	729 000
	Current transformer 2000/1, U=330 kV, accuracy class 0.2S, IEC 61869	27	17 000	459 000
	Current transformer 1200/1, U=220 kV, accuracy class 0.2S, IEC 61869	10	15 000	150 000
	Current transformer 1200/5, U=154 kV, accuracy class 0.2S, IEC 61869	16	13 000	208 000
	Current transformer 1200/5, U=110 kV, accuracy class 0.2S, IEC 61869	19	11 000	209 000
	Voltage transformer U1=400/√3 kV, U2=100/√3 V, accuracy class 0,2, IEC 61869	3	45 000	135 000
	Voltage transformer U1=330/√3 kV, U2=100/√3 V, accuracy class 0,2, IEC 61869	6	22 500	135 000
	Voltage transformer U1=220/√3 kV, U2=100/√3 V, accuracy class 0,2, IEC 61869	3	30 000	90 000
	Voltage transformer U1=150/√3 kV, U2=100/√3 V, accuracy class 0,2, IEC 61869	3	28 000	84 000
	Voltage transformer U1=110/√3 kV, U2=100/√3 V, accuracy class 0,2, IEC 61869	3	28 000	84 000

Item	Description	Total Quantity Needed	Indicative price per Unit (insurance and transport included), USD	Total indicative price, USD, VAT excl.
Circuit breakers and disconnectors	SF6 LTB 420E2/330kV/4000/40kA	13	141 699	1 842 093
	SF6 HPL245B1/220kV/4000/50kA	5	125 000	625 000
	SF6 LTB 170D1/154kV/3150/40kA	6	100 000	600 000
	SF6 HPL145B1/110kV/4000A/40kA	7	90 000	630 000
	4000 A - 160 kA peak - 63 kA/3sec (various voltage class)	51	45 000	2 295 000
	3150 A - 125 kA peak - 50 kA/3sec.	20	38 333	766 660
Other positions	Bushings for AT (RIP bushings with silicone composite insulator): 400 kV	9	50 000	450 000
	Bushings for AT (RIP bushings with silicone composite insulator): 245 kV	7	40 000	280 000
	Transformer Oil (T-1500 or similar oil)	60000 kg	2,2	129 000
	Total:			**19 480 753**

PRIORITY EQUIPMENT AND INDICATIVE PRICES. DSO

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Item	Description	Total Quantity Needed	Indicative price per Unit (insurance and transport included), USD	Total indicative price, USD, VAT excl.
Mobile Substation	Mobile substation 154 (110) kV (40 MVA transformer + set of switchgear 110, 35, 10, 6 kV)	3	3 000 000	9 000 000
Complete secondary substation	Complete secondary substation (2x630 kVA) with transformers	30	70 000	1 650 000
Transformers	Power transformer 63 MVA 150/35/10 kV	1	1 055 000	1 055 000
	Power transformer 40 MVA 150/35/10 kV	2	940 000	1 880 000
	Power transformer 80 MVA 110/35/10 kV	1	1 190 000	1 190 000
	Power transformer 63 MVA 110/35/10 kV	4	1 055 000	4 220 000
	Power transformer 40 MVA 110/35/10 kV	3	833 000	2 499 000
	Power transformer 40 MVA 110/10/10 kV	1	777 000	777 000
	Power transformer 25 MVA 110/35/10 kV	2	720 000	1 440 000
	Power transformer 25 MVA 110/10/10 kV	1	695 000	695 000
	Power transformer 16 MVA 110/35/10 kV	2	550 000	1 100 000
	Power transformer 10 MVA 110/35/10 kV	2	472 000	944 000
	Power transformer 16 MVA 35/10 kV	3	330 000	990 000
	Power transformer 10 MVA 35/10 kV	3	220 000	660 000
	Power transformer 6,3 MVA 35/10 kV	1	190 000	190 000
	Power transformer 4 MVA 35/10 kV	1	166 000	166 000

Item	Description	Total Quantity Needed	Indicative price per Unit (insurance and transport included), USD	Total indicative price, USD, VAT excl.
Joints	Medium Voltage Transition Joint (POLJ 24) 1x120 - 1x800 mm	754	279	210 000
	Power Cable Termination (POLT 24) 1x120 - 1x800 mm	502	414	208 000
Other positions	Circuit breaker 110 kV, SF6	24	24 976	599 424
	Circuit breaker 35 kV, vacuum 35-20-1600	19	23 000	437 000
	Conical reinforced concrete pole for OHL (22m)	16	2 875	46 004
	Power Cable 6-10 kV with XLPE Isolation 1x120 - 1x800 mm	102 km	30 127	3 073 000
	Steel-aluminum wire 120-400 mm^2	567 tones	4 877	2 765 117
	Total:			**35 794 545**

ANNEX 2:

POTENTIAL SUPPLIERS OF HIGH VOLTAGE EQUIPMENT

(SOURCE: UKRENERGO)

Image: Ukrenergo

POTENTIAL SUPPLIERS: AUSTRIA

Potential suppliers

Generation, TSO & DSO

- Austrian Power GridAG
- TIWAG-Netz AG
- VKW-Netz AG
- Vorarlberger Ьbertragungsnetz GmbH
- Verbund AG
- Wien Energie
- Linz Strom
- Salzburg Netz
- Wien Energie
- EVN
- BEWAG

SUPPLIERS

- aWATTarGmbH
- EPRO GALLSPACH GMBH

POTENTIAL SUPPLIERS: AZERBAIJAN

Potential suppliers

Generation, TSO & DSO

- Azerenerji
- OSC «Azerisıq»

SUPPLIERS

- Azerkabel
- Azerbaijan Energy Construction
- STP - KABEL ZAVODU
- KASKAD - HİDRO MMC
- ATEF

POTENTIAL SUPPLIERS: BELGIUM

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO

- Elia Transmission Belgium
- Engie Electrabel (ENGIE Group)
- EDF Luminus
- E.ON Power Plants Belgium BV

SUPPLIERS

- Pauwells Transformers NV

** Companies highlighted in red: Ukraine contacted already*

POTENTIAL SUPPLIERS: CANADA

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO (up to 735 kV)*

- Hydro-Québec
- Ontario Independent Electricity System Operator (IESO)
- Alberta Electric System Operator
- Midcontinent Independent System Operator, Inc.
- Northeast Power Coordinating Council (NPCC)
- Western Electricity Coordinating Council (WECC)
- Hydro One Limited
- Ontario Power Generation Inc.
- Newfoundland and Labrador Hydro
- Bruce Power Limited PartnershipBruce Power Limited Partnership
- BC Hydro
- TransAlta Corporation
- ATCO Group
- Capital Power
- Manitoba Hydro
- Enmax Corporation

SUPPLIERS

- Surplec
- Delta Star
- PTI Transformers
- Société Générale d'Électrotechnique (SGE)
- Siemens Canada Limited
- Hitachi Energy Canada Inc.
- Emerson Electric Canada Limited
- Powerco Canada Inc.
- Hubbell Power Systems
- Northern Transformer Corporation
- Atlas Transformer Corporation
- Niagara Transformer Corporation

** The equipment operated by these entities might be different in voltage class and other parameters. As long as it is within the acceptable range of 35 x735 kV Ukraine would be willing to consider it*

POTENTIAL SUPPLIERS: CROATIA

Potential suppliers

Generation, TSO & DSO

- Hrvatski operator prijenosnog sustava d.o.o. (HOPS)
- HEP operator distribucijskog sustava d.o.o. (HEPODS)
- HEP Proizvodnja d.o.o.
- Hrvatska elektroprivreda (HEP Group)

SUPPLIERS

- Končar - Power Transformers Ltd.

POTENTIAL SUPPLIERS: CYPRUS

Potential suppliers

Generation, TSO & DSO

- Cyprus Transmission System Operator (TSOC)
- Electricity Authority of Cyprus (EAC)

SUPPLIERS

- Synenergia

POTENTIAL SUPPLIERS: CZECH REPUBLIC

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO

- Czech Republic Electricity Company (CEZ)
- Czech Transmission System Operator (CEPS)
- EPH
- Sev. en Energy
- PRE Group

SUPPLIERS

- Egem
- ENERGETICKÉ OPRAVNY
- VČE – montáže, a.s.

CONSULTING & ENGINEERING

- Export Promotion Agency
- IC ENERGO
- Czech Power Industry Alliance

** Companies highlighted in red: Ukraine contacted already*

POTENTIAL SUPPLIERS: DENMARK

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO

- Orsted
- Energinet
- Aalborg Forsyning
- Fjernvarme Fyn
- Vattenfall Denmark
- Energi Denmark
- Radius Elnet

SUPPLIERS

- Vestas
- NKT

** Companies highlighted in red: Ukraine contacted already*

POTENTIAL SUPPLIERS: ESTONIA

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO

- EESTI ENERGIA AS
- ENEFIT POWER AS
- ELEKTRILEVI OU
- ELERING AS

SUPPLIERS

- EnergoVeritas

** Companies highlighted in red: Ukraine contacted already*

POTENTIAL SUPPLIERS: FINLAND

Potential suppliers

Generation, TSO & DSO

- Fingrid Oyj
- Helen Oy
- Caruna
- Elenia
- Fortum
- Pohjolan Voima
- Teollisuuden Voima
- EPV Alueverkko

SUPPLIERS

- ELTEL Networks Oy
- Skarta
- Alfen Elkamo

POTENTIAL SUPPLIERS: FRANCE

Potential suppliers

Generation, TSO & DSO

- EDF
- Engie
- Veolia
- TotalEnergies
- RTE

SUPPLIERS
- GE Grid Solutions
- Schneider Electric

CONSULTING & ENGINEERING
- GE Grid Solutions
- Schneider Electric

ASSOCIATIONS
- AFIEG

** Companies highlighted in red: Ukraine contacted already*

POTENTIAL SUPPLIERS: GERMANY

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO

- TransnetBWGmbH
- TenneTTSO GmbH
- AmprionGmbH
- 50Hertz Transmission GmbH
- ABB
- RWE Generation SE

SUPPLIERS

- Siemens Energy
- Exide Technologies
- Tyco Electronics Raychem GmbH Tridelta
- Meidensha GmbH

POTENTIAL SUPPLIERS: HUNGARY

Potential suppliers

Generation, TSO & DSO

- MVM Group
- MAVIR
- Uniper Hungary

SUPPLIERS

- FUX zrt.
- HOFEKA
- Univill-Trade Kft.

** Companies highlighted in red: Ukraine contacted already*

POTENTIAL SUPPLIERS: INDIA

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO

- Power Grid Corporation of India Limited
- Adani Transmission Limited (ATL) (private sector)
- Andhra Pradesh Southern Power Distribution Company
- Limited (APSPDCL)
- Andhra Pradesh Central Power Distribution Company Limited (APCPDCL)
- Andhra Pradesh Eastern Power Distribution Company
- Limited (APEPDCL)
- Brihanmumbai Electricity Supply and Transport Undertaking
- Chamundeshwari Electricity Supply Corporation Limited (CESC Mysore)
- Dakshin Haryana Bijli Vitran Nigam (DHBVN)
- Maharashtra State Electricity Distribution Company Limited
- Mangalore Electricity Supply Company Limited (MESCOM)
- North Bihar Power Distribution Company Limited
- South Bihar Power Distribution Company Limited (SBPDCL)
- Tamil Nadu Generation and Distribution Corporation Limited
- (TANGEDCO)
- The Northern Power Distribution Company of Telangana
- The Southern Power Distribution Company of Telangana
- Uttar Pradesh Power Corporation Limited (UPPCL)
- Uttar Haryana Bijli Vitran Nigam (UHBVN)
- Uttar Gujarat Vij Company Ltd.
- Paschim Gujarat Vij Company Ltd.
- Madhya Gujarat Vij Company Ltd.
- Dakshin Gujarat Vij Company Ltd.
- NTPC Limited
- Tata Power
- JSW Energy Limited
- NHPC Limited
- Torrent Power
- Reliance Power Limited
- Satluj Jal Vidyut Nigam (SJVN)
- Calcutta Electric Supply Corporation
- Andhra Pradesh Power Generation Corporation
- Limited

SUPPLIERS

- Bharat Heavy Electricals Limited (BHEL)
- Hitachi Energy India Limited
- CG Power and Industrial Solutions Limited
- Siemens India
- GE T&D India Limited
- EMCO Limited
- Larsen & Toubro Ltd
- Schneider Electric India Pvt Ltd
- Toshiba Transmission & Distribution Systems
- (India) Pvt. Ltd.
- Pfiffner Instrument Transformers private Ltd
- Transformers and Rectifiers (India) Limited
- Voltamp Transformers Limited
- Century Transformers Pvt. Ltd
- Technical Associates Ltd
- Kirloskar Electric Company
- Vijai Electricals Ltd

** Companies highlighted in red: Ukraine contacted already*

POTENTIAL SUPPLIERS: ITALY

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO

- ENEL
- TERNA

SUPPLIERS

- ELETTROMECCANICA PIOSSASCO (EP)
- TESAR SRL
- SAREL SRL
- WESTRAFO
- SIRMET ELETTRICA SRL
- WESTRAFOSRL
- SEA

** Companies highlighted in red: Ukraine contacted already*

POTENTIAL SUPPLIERS: JAPAN

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO

- JERA*
- Tokyo Electric Power Company Holdings (TEPCO)
- TEPCO Fuel & Power
- Japan Atomic Power Company (JAPC)
- Electric Power Development (J-Power Group)
- Kansai Electric Power Company (KEPCO)
- Chubu Electric Power
- Kyushu Electric Power
- Tohoku Electric Power
- Chugoku Electric Power
- Hokkaido Electric Power Co (HEPCO)
- Hokuriku Electric Power Company
- Shikoku Electric Power
- TEPCO Power Grids

SUPPLIERS

- Mitsubishi Corporation*
- Mitsubishi Heavy Industries
- Nissin Electric Co.
- Marubeni Corporation
- MITSUI & CO.
- Toshiba
- Hitachi Energy*

CONSULTING & ENGINEERING

- Tokyo Electric Power Services Co. (TEPSCO)*

** Companies highlighted in red: Ukraine contacted already*

POTENTIAL SUPPLIERS: REPUBLIC OF KOREA

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO

- Korea Electric Power Corporation (KEPCO)
- Korea Hydro and Nuclear Power
- Korea South-East Power
- Korea Western Power
- Korea Midland Power
- Korea Southern Power
- Korea East-West Power Company
- POSCO Energy
- GS EPS
- GS Energy
- SK E&S
- Pocheon Power
- Pyeongtaek Energy Service

SUPPLIERS

- Hyusong Heavy Industries
- Hyundai Electric
- LG Energy Solution Ltd

** Companies highlighted in red: Ukraine contacted already*

POTENTIAL SUPPLIERS: LATVIA

Potential suppliers

Generation, TSO & DSO

- AS AUGSTSPRIEGUMA TĪKLS
- SADALES TĪKLS
- LATVENERGO

SUPPLIERS

- JAUDA

POTENTIAL SUPPLIERS: LITHUANIA

Potential suppliers

Generation, TSO & DSO

- LITGRID AB
- IGNITIS GROUP
- ENERGIJOS SKIRSTYMO
- OPERATORIUS (ESO)

SUPPLIERS

- UAB OZAS
- ARMETLINA

ASSOCIATIONS

- Lithuanian Electricity Association

POTENTIAL SUPPLIERS: NETHERLANDS

Potential suppliers

Generation, TSO & DSO

- Austrian Power GridAG
- TIWAG-Netz AG
- VKW-Netz AG
- Vorarlberger Übertragungsnetz GmbH
- Verbund AG
- Wien Energie
- Linz Strom
- Salzburg Netz
- Wien Energie
- EVN
- BEWAG

SUPPLIERS

- aWATTar GmbH
- EPRO GALLSPACH GMBH

POTENTIAL SUPPLIERS: NORWAY

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO

- STATNETT - TSO
- HAFSLUND
- STATKRAFT
- BKK
- SKL
- NORD-SALTEN KRAFT
- LYSE

POTENTIAL SUPPLIERS: POLAND

Potential suppliers

Generation, TSO & DSO

- Enea
- Energa
- PGE Group
- PGNiGTermika
- RWE
- Tauron
- ZE PAK
- UE Polska Stoen Operator
- Polenergia
- PSE Operator S.A.

SUPPLIERS

- Power Engineering Transformatory Sp. z o.o.
- Zakłady Porcelany Elektrotechnicznej ZAPEL S.A.
- ZPUE SA / Grupa Koronea
- ZREW Transformatory S.A.
- Tesar Polska Sp. z o.o.
- Fabryka Transformatorów wŻychlinie Sp. z o.o.
- ELEKTROMETAL ENERGETYKA SA
- INDEL Sp. z o.o.
- ELHAND TRANSFORMATORY Sp. z o.o.
- Hitachi Energy Poland Sp. Z O.O.
- Trutech Products

ASSOCIATIONS

- Polska Rządowa Agencja Rezerw Strategicznych
- PTPiREE

** Companies highlighted in red: Ukraine contacted already*

POTENTIAL SUPPLIERS: PORTUGAL

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO

- EDP
- REN - REDE ELÉCTRICA NACIONAL E-REDES

SUPPLIERS

- DIFERENCIAL - ELECTROTECNICA GERAL
- J.F.MIGUENS, LDA
- PINTO & BENTES, S.A.

** Companies highlighted in red: Ukraine contacted already*

POTENTIAL SUPPLIERS: ROMANIA

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO

- Transelectrica SA
- Distributie Oltenia SA (part of CEZ Group)
- E-Distributie (part of Enel Group)
- Delgaz Grid SA (part of E.On Group)
- Distribuţie Energie Electrică Romania
- Hidroelectrica SA
- Nuclearelectrica SA
- Societatea Complexul Energetic Oltenia S.A.
- CEZ Romania (CEZ Group)

POTENTIAL SUPPLIERS: SLOVAKIA

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO

- Slovenská elektrizačná prenosová sústava, a.s. (SEPS)
- Východoslovenská distribučná a.s.
- Západoslovenská distribučná, a. s. (owned by Západoslovenská energetika, a.s.)
- Stredoslovenská distribučná, a.s. (SSD, a.s.)
- Slovenské elektrárne, a.s. (member of EPH group)
- ZSE Elektrárne, s.r.o. (owned by Západoslovenská energetika, a.s.)
- Západoslovenská energetika, a.s.

SUPPLIERS

- BEZ TRANSFORMÁTORY, a.s.
- NB! *RF owners – SVEL Group JSC*

** Companies highlighted in red: Ukraine contacted already*

POTENTIAL SUPPLIERS: SPAIN

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO

- IBERDROLA
- ENDESA
- NATURGY
- VIESGO
- VIESGO DISTRIBUCIÓN
- RED ELÉCTRICA DE ESPAÑA
- UFD
- I-DE
- E-REDES
- REN - REDE ELÉCTRICA NACIONAL
- E-REDES

SUPPLIERS

- ARTECHE
- MESA
- IMESA SPA
- NATIONAL CENTRE FOR CRITICAL
- INFRASTRUCTURES (CNPIC)

** Companies highlighted in red: Ukraine contacted already*

POTENTIAL SUPPLIERS: SWEDEN

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO

- Svenska Kraftnät
- Luossavaara-KiirunavaaraAktiebolag (LKAB)
- Vattenfall
- E.ON Sverige AB
- Ellevio AB
- Eskilstuna Energy and Environment (EEM)
- Mälarenergi AB
- Skellefteå Kraft
- Umeå Energi

SUPPLIERS

- Hitachi Energy Sweden AB

POTENTIAL SUPPLIERS: SWITZERLAND

Potential suppliers

Generation, TSO & DSO

- Swissgrid
- Axpo Holding AG
- BKW Energie AG
- Alpiq

SUPPLIERS

- PFIFFNER
- Hitachi Energy (ABB)
- Benning
- AXICOM HV AG
- TE CONNECTIVITY (TE) (Raychem)

CONSULTING & ENGINEERING

- Verband Schweizerischer Elektrizitдtsunternehmen VSE
- Swissmem
- Ansaldo Energia SpA

POTENTIAL SUPPLIERS: TURKEY

Potential suppliers

Generation, TSO & DSO

- Turkish Electricity Transmission Corporation (TEIAS)
- Dicle Elektrik DagitimAS
- Vangolu Elektrik DagitimAS
- Aras Elektrik DagitimAS
- Bogazici Elektrik DagitimAS
- Coruh Elektrik DagitimAS
- Firat Elektrik DagitimAS
- Yesilirmak Elektrik DagitimAS
- Akdeniz Elektrik DagitimAS
- Toroslar Elektrik DagitimAS
- Camlibel Elektrik DagitimAS
- Istanbul Elektrik DagitimAS
- Meram Elektrik DagitimAS
- Baskent Elektrik DagitimAS
- Goksu Elektrik DagitimAS
- Trakya Elektrik DagitimAS
- Kayseri Elektrik DagitimAS
- Gedis Elektrik DagitimAS
- Sakarya Elektrik DagitimAS
- Uldag Elektrik DagitimAS
- Osmangazi Elektrik DagitimAS
- Menderes Elektrik DagitimAS
- Elektrik Þretim A.Ş. (EÞAŞ)
- Akenerji Elektrik Þretim A.Ş.
- Alarko Holding
- Enka Power
- Isken
- IC İÇTAŞ ENERGY Investment Holding

SUPPLIERS

ASTOR

Balikesir Elektromekanik Sanayi Tesisleri

Emek ELECTRICAL INDUSTRY INC.

** Companies highlighted in red: Ukraine contacted already*

POTENTIAL SUPPLIERS: USA

REFORMS DELIVERY OFFICE
CABINET OF MINISTERS OF UKRAINE

Potential suppliers

Generation, TSO & DSO (up to 765 kV)**

- American Electric Power (AEP)
- Xcel Energy
- Pacific Gas & Electric
- Pennsylvania New Jersey Maryland Interconnection
- Midcontinent Independent System Operator (MISO)
- Electric Reliability Council of Texas (ERCOT)
- California Independent System Operator (CAISO)
- ISO New England Inc. (ISO-NE)
- Southwest Power Pool (SPP)
- New York Independent System Operator (NYISO)
- MidAmerican Energy Company
- American Transmission Company
- Bonneville Power Administration
- Southern California Edison

- American Electric Power (AEP)
- Xcel Energy
- Pacific Gas & Electric
- Pennsylvania New Jersey Maryland Interconnection
- Midcontinent Independent System Operator (MISO)
- Electric Reliability Council of Texas (ERCOT)
- California Independent System Operator (CAISO)
- ISO New England Inc. (ISO-NE)
- Southwest Power Pool (SPP)
- New York Independent System Operator (NYISO)
- MidAmerican Energy Company
- American Transmission Company
- Bonneville Power Administration
- Southern California Edison

SUPPLIERS

- GE
- Schweitzer Engineering Laboratories (SEL)
- Siemens USA
- Hyundai Power Transformers USA, Inc.
- WEG Transformers USA
- HICO America
- Sunbelt Solomon
- Southern States, LLC
- Spire Power Solutions
- Global Industrial Solutions, Inc (GiS)
- Southwest Electric Company
- Broomfield Lamb Holman, Inc.
- CANWIN
- JST Power Equipment
- DEA Incorporated
- Federal Pacific
- CTC Global

** Companies highlighted in red: Ukraine contacted already*
*** The equipment operated by these entities might be different in voltage class and other parameters. As long as it is within the acceptable range of 35 x765 kV Ukraine would be willing to consider it*