Annex. I

المواصفات الفنية للأعمال المطلوبة لمشروع تأهيل وصيانة شبكة الكهرباء في مدينة الحسكة

تسلسل	نوع الاعمال	الوحدة	الكمية
1	تقديم وتركيب محولة استطاعة 400 KVA مطابقة للمواصفات الفنية تخضع للاختبارات العالمية مع كل مايلزم	عدد	3
2	تقديم و تركيب محولة استطاعة 630 KVA مطابقة للمواصفات الفنية تخضع للاختبارات العالمية مع كل مايلزم	عدد	1
3	تقديم و تركيب محولة استطاعة 100 KVA مطابقة للمواصفات الفنية تخضع للاختبارات العالمية مع كل مايلزم	عدد	1
4	تقديم و تركيب براميل زيت محولات مع تعبئة المحولات التي هي بحاجة لزيت	عدد	8
5	تقديم و تركيب كابلات المخارج مقطع 95*4 مم2 مع كل مايلزم	م.ط	300
6	تقديم و تركيب رؤوس كابلات 95 مم2 مع كل مايلزم	عدد	200
7	تقديم و تركيب يونيات قياس 500 A مع كل مايلزم	عدد	600
8	تقديم و تركيب بار المنيوم توتر منخفض قياس 6 سم , سماكة 2 سم مع كل مايلزم	كغ	25
9	تقديم و تركيب براغي طول 7 سم مع كل مايلزم	عدد	100
10	تقديم و تركيب براغي طول 5 سم مع كل مايلزم	عدد	100
11	تقديم و تركيب مرس المنيوم 95 مم2 مع نزع القديم و إعادة مايلزم الى مستودعات الشركة	كغ	4000
12	تقديم و تركيب مرس المنيوم 70 مم2 مع نزع القديم و إعادة مايلزم الى مستودعات الشركة	كغ	5000
13	تقديم و تركيب قفيص مزيبق 16 مم2 مع كل مايلزم	عدد	3000
14	تقديم و تركيب وصلات نحاس المنيوم قطر 95 مم2 مع كل مايلزم	عدد	1500
15	تقديم و تركيب وصلات نحاس المنيوم قطر 70 مم2 مع كل مايلزم	عدد	1000
16	حفر خندق للكابلات التوتر المنخفض مع إزالة القديم و تركيب الكابل الجديد و ترحيل الأنقاض (مهما كان نوع الحفر)	م3	15

Technical Specifications

Item	Works	Unit	QTY.
1	Provision and Installation of a 400 KVA Transformer according to the attached technical specifications and international tests with all needed accessories.	Number	3
2	Provision and Installation of a 630 KVA Transformer according to the attached technical specifications and international tests with all needed accessories.	Number	1
3	Provision and Installation of a 100 KVA Transformer according to the attached technical specifications and international tests with all needed accessories.	Number	1
4	Provision and Installation of transformer oil barrels and filling the transformers which lack oil.	Number	8
5	Provision and Installation of Output Cables size 95 x 4 mm2	m	300
6	Provision and Installation of Cable lugs size 95mm2 with all what is needed.	Number	200
7	Provision and Installation of isolation hats 500 Amps with all what is needed.	Number	600
8	Provision and Installation of low voltage copper bar size 6cm, 2cm thickness with all what is needed.	Kg	25
9	Provision and Installation of screws 7 cm long with all what is needed.	Number	100
10	Provision and Installation of screws 5 cm long with all what is needed.	Number	100
11	Provision and Installation of stripped aluminum cables 95mm2, removing the old ones and return to the company what is left over.	Kg	4000
12	Provision and Installation of stripped aluminum cables 70mm2, removing the old ones and return to the company what is left over.	Kg	5000
13	Provision and Installation of galvanized 16 mm2 with all what is needed.	Number	3000
14	Provision and Installation aluminum connectors 95mm2 with all what is needed.	Number	1500
15	Provision and Installation aluminum connectors 70mm2 with all what is needed.	Number	1000
16	Digging a low voltage cable trench, removing the old cable, install the new one and take away the derbies regardless of the nature of digging.	M3	15

20/0.4 KV DISTRIBUTION TRANSFORMER

OPEN TERMINAL BUSHINGS AND HERMETICALLY SEALED FULLY FILLED WITH OIL

630 K.V.A

400 K.V.A

100 K.V.A

The equipment offered shall comply with the requirements of the IEC standards applicable at the time of contract placement and the technical requirements of this specification.

In particular, the following IEC standards shall apply:

IEC 76:	Power transformers
IEC 137:	Insulated bushings for alternating voltages above 1000 V
IEC 296:	Specification for unused mineral insulating oils for transformers and switch-gear
IEC 354:	Loading guide for oil-immersed power transformers

System Details and Service Conditions (General Data)

The performance of the transformers shall be guaranteed for the following operating, installation and environmental conditions of Syria.

20 kV Distribution System

- 20 kV ± 5%
- Three phases, three wires
- Earthed through an earthing transformer 20/0,4kV (Zn Yn11)
- Vector group of distribution transformer 20 kV/0,4 kV DYN11
- Maximum service voltage: 24 kV
- Rated frequency: 50 Hz
- Impulse withstand voltage level: 125 kV at 1.2/50 μs
- Short circuit apparent power of the system 500 MVA

Environmental Conditions

- Altitude above sea level: 1000 m
- Max. ambient temperature: 50 ^{o}C
- Min. ambient temperature: - 10 ^{o}C
- Average annual temperature: 35 ^{o}C
- Maximal temperature variation in one day: 20 ^{o}C
- Average max. relative humidity: 80% at 30 deg
- (Relative humidity - in some sites of Syria - up to 100% is possible)

The offered products should be suitable for use under semi - arid conditions as well as for use on coastal area.

Technical Requirements

Rating

Ratings shall be based on permissible winding temperature rises (as measured by resistance) and top-oil temperature rises (as measured by thermometer) with maximum ambient air temperature, as specified in 'General Data'.

The transformer shall have overload capabilities in accordance with IEC 354 (item 2-3).

All associated components of the transformer, including bushing and tap switches shall have overload capabilities not lower than of the transformer with which they are associated.

The transformer shall be capable of providing full rated power at all tap positions.

Short circuit capability

Transformers together with all equipment and accessories shall be designed and constructed withstanding the thermal and dynamic effect of external short circuit under the condition specified in item 2.3 without damage

Tank

The transformers must be equipped with flexible (variable volume) folded corrugation tank that is needed to accommodate the expansion and contraction of oil due to varying service condition.

The number, depth and length of corrugations are chosen to give safe dissipation of the internal heat generated during operation of transformer.

The tank cover is bolted and sealed to it.

There is one thermometer pocket on the tank cover for thermometer, also there are two lifting lugs on the cover for lifting and carrying the transformer.

The tank cover is equipped with a filling pipe which is high enough to ensure a safe oil filling

level in the insulated elements lead-through bushings at all times.

In the lower side there is a device for draining and down sampling of the transformer oil.

The earthing screws M12 are provided for earthing the transformer, one is fitted at the bottom on the high voltage side of the tank and the other on the tank cover adjacent to low voltage neutral bushing.

The tank must have fixing at the bottom to prevent any movement of the active part during transportation.

Two base frames that carrying the bidirectional wheels and have four puling lugs are welded to tank bottom.

After tank parts have been assembled by welding process, it is checked for leakage with control liquid and ultraviolet radiation. The tank with its sealed cover is capable to withstand over-pressure of 0.3 Bar

Cleaning and Painting:

All metal parts such as cover, tank, core clamping, etc. shot blasted first to eliminate all signs of rust, welding spatters, grease, oil and mil scale and to achieve a good abrased surface for the paint to hold for long period of time.

Painting of transformer can be done with flooding or electrostatic process. In the process three coats of paint are applied, one under coat, one intermediate and one top coat, each coat has a minimum 40μm thickness. In the electrostatic process one coat of paint with a minimum thickness of 80μm is applied. The transformers are delivered in the final color shade RAL 6003 Olive green or RAL 7023 Concrete gray.

painting by hand and natural drying is not accepted.

The offeror should submit the method of painting in details.

Windings

The LV Windings shall be made of either foil or rectangular copper conductor with paper insulation. In the foil windings, there are diamond pattern papers as interlayer

insulator, which have epoxy adhesive and cures during oven process to form a high strength winding against short circuit.

The HV Windings shall be made of enameled round copper conductors and wounded in layers, the extension of tap changer steps are determined accurately by using full automatic winding machine.

The insulation of windings shall be designed to give full protection against dielectric voltage stresses.

Insulation material meet the requirements of class A insulating's material withstanding maximum continuous operating temperature of 105 degrees of centigrade without loss of life.

The windings shall be one piece for each phase and made of electrolytic copper and shall comply in all respects with the relevant IEC standards.

The windings shall be designed such as they may be replaced with the minimum of difficulty.

The tenderer shall submit a detailed description of the windings and the insulation proposed.

Neutral earthing

The neutral point of the transformer L.V windings shall be brought out to a separate fully insulated bushing and shall be suitable for solid connection to the earth stud.

Core

The core shall be of beltless type equipped with Three limps and two yokes, manufactured of high grade, grain oriented, silicon steel laminations with 0.3 or 0.27 mm thickness and low hysteresis losses.

Both sides of laminations have an insulation coating which provide the required interlamination resistance for decreasing eddy current losses.

For precisely cutting and stacking full automatic machine shall be used.

The core shall be designed to facilitate removal and replacement of the windings.

The core stack shall be internally earthed.

Insulating Oil

Insulating oil shall be in conformity with IEC60296-2003.

The use of PCBs as the dielectric medium is strictly prohibited.

Cooling

The transformer cooling system shall be ONAN.

Bushings

The bushings shall be designed in such a way as to allow easy dismantling.

3 HV porcelain bushings and 4 LV (same rated current) porcelain bushings will be fitted on the cover.

The bushings shall be designed to withstand the different thermal, electrical and mechanical stresses as well as all forces that may be produced by the short circuit currents.

Tap Changer

The transformer shall be equipped with an externally operated off-load tap changer on the high voltage side. The tapping range shall be $\pm$ 5 % in five equal steps. The tap changer shall be manually operated and lockable and shall be mounted such that operation is in a horizontal plane. The tap position number shall be durable and clearly visible.

Transformer Accessories

The transformer shall be equipped with at least the following:

1- oil level reduction
2- pressure relief valve
3- thermostat with contacts (alarm and tripe)
   multi-functions device for items (1, 2, 3) is accepted
4- Rating plate
5- Thermometer pocket
6- Oil drain plug at bottom
7- Two earthing terminal
8- Oil Filling pipe
9- Four bidirectional wheels
10- four puling lugs are welded to tank bottom
11- Lifting eyes suitable for lifting by crane hook and ropes
12- Arcing horns on H.V. bushing (protection gap)
13- Off-load tape changer

Rating Plate

The transformer shall be provided with a rating plate of weatherproof and corrosion resistant material which shall be fitted in a position clearly visible to the operator.

The plate shall be indelibly marked in English. It shall include all information required by IEC 76-1.

SCHEDULE A

MANUFACTURER AND PLACE OF MANUFACTURE

(Information to be provided with the Tender

Signed and approved by the manufacturer and the offeror)

Item	Manufacturer	Place of Manufacture
Transformer bushings -LV -HV		
Windings Insulation paper - LV - HV		
Magnetic core steel		
Transformer oil		
Winding copper -LV -HV		
Off -load Tap changer		
a- Pressure relief valve b- oil level reduction c- Thermometer with two contacts - Or Multi-Functions Protection device for above items (a, b, c).		

SCHEDULE B

TECHNICAL GUARANTEES AND PARTICULARS

(Information to be provided with the Tender

Signed and approved by the manufacturer and the offeror)

Item No	Description	Units	Requirements	Offered Data
1	Name of manufacturer			
2	Country of origin			
3	Voltage ratio	kV	20/0.4	
4	Vector Group		Dyn11	
5	Method of cooling		ONAN	
6	Rated power when operated at the specified site conditions	kVA	200	
7	Maximum temperature rises above50 °C ambient at rated power:			
7.1	Winding temperature rise	°C	≤ 55	
7.2	Top oil temperature rise	°C	≤ 50	
7.3	Hot spot temperature rise	°C		
8	**Losses:**			
8.1	No load losses at rated voltage	W	≤ 500	
8.2	Load losses at rated power At u.p.f. and 75 °C	W	≤ 2400	
8.3	Total losses at 75 °C	W	≤2900	
9	Impedance voltage (at 75°C, rated power and principle tapping)	%	4	
10	Power frequency withstand voltage:			
10.1	20 KV winding and bushing	kV	50	
10.2	LV winding and bushing	kV	3	
11	Impulse withstand voltage 1.2/50 μs:			

Item No	Description	Units	Requirements	Offered Data
11.1	20 KV winding and bushing	KV_{peak}	125	
11.2	LV winding and bushing	KV_{peak}	6	
12	Winding resistance at 75°C:			
12.1	20 KV winding (tolerance +5 %)	Ω/phase		
12.2	LV winding (tolerance +5 %)	Ω/phase		
13	Magnetizing current in % of rated current at rated voltage	%	≤ 2	
14	2 sec short circuit withstand current: -HV winding -LV winding	kA		
15	Maximum flux density at normal voltage and frequency.	Tesla	≤ 1.7	
16	Conductor cross-section:			
16.1	20 KV winding	mm^2	≥ 1.4	
16.2	LV winding	mm^2	≥ 116	
17	Type and class of insulation:		Class A	
18	Transformer oil:		Acc. to IEC 60296-2003	
	- Viscosity at 40 º C - Viscosity at -30 º C - Flash point - Pour Point	mm^{2}/S mm^{2}/S º C º C	max 12 max 1800 min 140 max -30	
	-Appearance		Clear, free from sediment and suspended matter	
	-Acidity	mg/KOH/g	Max 0.01	
	-Density, at 20 º C	g/ml	Max 0.895	

Item No	Description	Units	Requirements	Offered Data
	-Water Content	mg/kg	Acc. to IEC	
	-Sludge		Max 0.8%	
	-DDF at 90 º C		≤ 0.005	
	- Breakdown voltage after laboratory treatment	KV	Min 70	
19	Physical parameters:			
19.1	Total weight (tolerance -5 %)	kg		
19.2	Active part weight (tolerance -3 %)			
19.3	Weight of magnetic core (tolerance -3 %)	kg		
19.4	Weight of single 20 KV winding with insulating paper (tolerance -2 %)	kg		
	Weight of single 20 KV winding without insulating paper (tolerance -2 %)	kg		
	Weight of single LV. Winding with insulating paper (tolerance -2 %)	kg		
19.5	Weight of single LV. Winding without insulating paper (tolerance -2 %)			
19.6	Weight of insulating Oil (tolerance -5 %)	kg		
19.7	Tank cover thickness	mm	≥ 4	
19.8	Tank bottom thickness	mm	≥ 4	
19.9	Side Thickness (at least two longitudinally tank sides must be corrugated)	mm	corrugated thickness ≥1.2 other sides ≥ 3	
20	Dimension:			
20.1	Overall length	mm		
20.2	Overall width	mm		

Item No	Description	Units	Requirements	Offered Data
20.3	Overall height	mm		
21	Transformer Bushings:			
21.1	Material		Porcelain	
21.3	Rated current (MV/LV)	A	≥ 250/400	
21.4	Cree-page distance (MV/LV)	mm	≥ 500/75	
22	Maximum noise level	dB		
23	Tapping:			
23.1	Tapping range		± 2 × 2.5 %	
23.2	Number of taps		5	
24	Clearances:			
24.1	Between the windings and the tank	mm	≥ 30	
24.2	Between phases	mm	≥ 15	
25	Painting:		Acc. to the specs.	
25.1	Paint type: flooding and drying by oven or electrostatic		preferable electrostatic	
25.2	The Thickness	micron		
26	Bi-directional wheels		Acc. to the specs.	

-The offeror must submit all the required data in detail (quantity and type).

-The offeror must submit all the necessary drawings for the transformers.

الشروط العامة:

صفة المتعهد :

يشــترط في المتعهد أن يكون مهندســاً ممن تنطبق عليهم أحكام القانون /17/ لعام 93 أو متعهداً يضــم جهازه العامل مهندس كهرباء و مهندس مدني، مارس المهنة خمسة سنوات على الأقل وعلى أن يكون كلاً منهما قد قام بتنفيذ أعمال التعهدات بمسؤوليه كاملة لا تقل عن خمس سنوات بكفاءة تامة وأن يضم جهازه العامل عناصر اختصاصية ومجموعة كافية من العدد النظامية للأعمال السابقة

مدة تنفيذ العقد :

إن مدة التنفيذ/30/ يوماً بدءاً من اليوم التالي لتسليم الموقع .

General Conditions:

The Contractor:

The contractor shall be an engineer to whom the law /17/ of 1993 applies or a contractor under who's work group are an electrical and civil engineer and who have been doing similar work for at least the last 5 years. Both engineers have to demonstrate that they have executed all their works during their last five years in full competence and to demonstrate that they were using sufficient numbers of qualified and specialized labor and that they were using specialized tools and machinery for all the works done.

Contract execution period:

The contract execution period is /30/ days starting from the next day of singing the contract. (Contract signature date).