SYRIAN ARAB REPUBLIC
MINISTRY OF ELECTRICITY

PUBLIC ESTABLISHMENT FOR TRANSMITTING AND DISTRIBUTION OF ELECTRICITY ( PETDE )

# CALL FOR OFFERS DOCUMENTS FOR ONE (TWO-PARTS) MOBILE SUBSTATION ( 66/20 ) KV 10 MVA WITH 20 K.V GIS METAL ENCLOSURE SWITCHGEAR

## TECHNICAL SPECIFICATIONS

# CALL FOR OFFERS DOCUMENTS

# FOR

# ELECTRICAL SUBSTATION

## BOOK 1 – A

## GENERAL INFORMATION AND DESCRIPTION

## ART ( 1 ) SCOPE OF CALLING FOR OFFERS :

This calling for offers comprises the design , manufacturer , assembly testing at works, packing , shipping , CFR delivery to Syrian port or CPT of :

**One ( two-part)** mobile substation ( 66/20 ) kV with ( 20 ) kV GIS metal enclosure ( without truck ) .

The offer shall cover the supply of the following main items for two-parts mobile substation .

1- One main transformer ( 66/20 ) kV ( 10 ) MVA .
2- ( 66 ) kV switchgear consisting of one bay for the transmission line feeding the main transformer .
3- One earthing transformer ( 20/0.4 ) kV ( 100 ) KVA .
4- ( 20 ) kV GIS metal enclosure switchgear consisting of one incoming feeder from power transformer (10 MVA) , one incoming feeder from diesel generator (1 MVA) , four outgoing feeders ; one capacitor feeder,and complete terminal plug-in cables ( 1×300 ) mm2 **/Cu/** for incoming feeder from PT(10 MVA) ,complete terminal plug-in cables (1×185 ) mm2 **/CU/** for incoming feeder from DG (1 MVA) And complete terminal plug-in cables (1×185 ) mm2 **/AL/** for outgoing feeders.
5- XLPE flexible cables (1×300) mm2 **/Cu/** connecting between the power transformer and the incoming feeder with not less than ( 30 ) m length from each of the two parts of the mobile substation with complete terminal plug-in cables.
6- Capacitor sub-bank (2.5 MVAR) for the mobile substation on 20 kv side.
7- Control , protection and measuring devices .
8- AC and DC auxiliaries .
9- LV cables .
10- Two complete- trailer units without trucks having suitable dimensions and international transport dimensions .
11- An easy removable portal for connecting with ( 66 ) kV .
12- An easy removable safety fence .
13- Spare parts acc. to book-two schedules.
14- Maintenance tools and materials for safety operation acc. to book-two schedules .
15- Special care must be taken to select the lowest possible dimensions, weight and simplicity of maintenance and operation works and it will be preferable in evaluation. In addition to the above – mention supplies , the supplier will be entrusted with the following services :
    - Supply of final documentation including instructions for installations , operation , maintenance , and site arrangements .
    - Bearing the guarantee responsibilities within the guarantee period .
    - contractor is responsible for the deputing of PETDEengineers to participate in

the testing personals in manufacturer's country **in accordance to book B**

- Outside the scope of this calling of offer , PETDE will transport the mobile substations from harbor to site .

## ART ( 2 ) STRUCTURAL SUPPORTS :

The scope of supply shall be complete with all the necessary supporting frame works which shall satisfactorily protected against corrosion .

## ART ( 3 ) CONNECTION TO ( 66 ) KV OVERHEAD LINES :

Offerers will describe in details the method adopted for connecting the bay equipment to the overhead transmission line . All materials needed for this connection will be a part of the scope of the supply .

The said materials shall include the following :

a) All insulators ( post, suspension and tension ) with their fittings and arcing gaps to be erected on the portal .
b) Lightning rods to be mounted on the portal complete with suitable cross section earthing wire for connection between lightning rods and terminals of earthing mesh .
c) All additional insulators , T-connectors bimetallic elements and any other fittings that may be needed either on the substation equipment or ( 66 ) kV network .

## ART ( 4 ) LOCATION WHERE MOBILE SUBSTATION WILL BE INSTALLED :

Mobile substation are intended to be utilized in wadi alobied oilfield in al-raqa region and will be connected to ( 66 ) kV O.H.T.L network .

The ( 66 ) kV overhead transmission lines are generally equipped with A.C.S.R. ( 240/40 ) Sq. mm conductors or ( 66 ) kV and ( 50 ) Sq. mm steel ground wire transmission lines routes are generally near to agriculture roads .

## ART ( 5 ) AUXILIARY EQUIPMENT :
## ART ( 5-1 ) EARTHING SYSTEM :

An effective earthing system shall be provided for the substation. It shall be so designed that in case of any fault, whether inside or outside the substation the voltage to earth of any part that is supposed to be earthed shall be within the limits stated by the IEC regulations.

The measured earth resistance should not exceed 0,5 Ohm.
The earthing system should be so designed as to keep the "step" and "touch" potentials within acceptable limits, thereby ensuring safety to the personnel.
The design shall be based on taking into consideration that the soil specific resistivity at substation site is about ( 500 ) Ohm-m .

The strip connections to the earth plates, rods or pipes shall be melted . Earthing strip connecting the various equipment to be earthed to the earthing pit, shall be of copper conductors and shall be arranged in an orderly manner ground the substation equipment. The cross-section of the earthing equipment shall be sufficient to carry the maximum short circuit current of the system and 1 sec. duration

All parts of apparatus, tanks, tank covers, as well as one side of all the secondaries of current and potential transformers shall be earthed. There shall also be provided sufficient earthing sockets for connecting earth terminals on isolating links, operating handles, and insulating jaws for fuse changing. The transformers , apparatuses , and leads of the switchgear are protected from direct lightning strokes by a system of lightning rods ( basically 24 rods per mobile substation )

Offerers must submit with their offers a detailed description of the method of earthing they propose for all parts required to be kept at the potential of the ground. All calculations shall be also enclosed with offers .
Excavation and earth filling for the earthing system of the first installation / of mobile substation will be effected by PETDE.

## ART ( 5-2 ) SUBSTATION LIGHTING :

### 5-2.1 General :

The main lighting circuit shall be fed from the low voltage AC supply 220V (phase to neutral) and shall be installed in all parts of the substation . A separate emergency lighting circuit shall be fed from the D.C. supply and shall be automatically connected in case of failure of the A.C. supply. Emergency lighting lamps shall be located in appropriate positions to ensure continuity of operation and control .

Emergency lighting lamps ( flashing and phosphoric lamps ) shall be located in appropriate positions at the site , front , rear , of both parts of the mobile substation and it should be fed from the tractor batteries .

Both circuits shall be installed in both parts of the mobile substation .

Fluorescent lighting and filament lamps shall be installed in both parts of the mobile substation and the intensity of illumination shall not be less than 300 lux at the ( 66 ) kV and ( 20 ) kV. Control room shall be $\geq$ 450 lux .

The intensity of illumination of emergency lighting shall not be less than 50 lux. For external lighting the illumination intensity shall be of the outdoor-drip proof (not less than 50 lux).

### 5.2.2 Lighting Distribution Panels :

A main lighting distribution board shall be installed feeding the sub-distribution panels in the different parts of the mobile substation. The distribution panels shall be complete with the necessary switches, C.B, protection, etc...

### 5.2.3 Lighting Connections and Appliances :

The wiring shall be carried out by rubber or P.V.C. installed wires places in steel tubes .

Separate systems being used for the A.C. and D.C. circuits. Power sockets of suitable rating shall be provided in appropriate positions in both parts of the mobile substation .

## ART ( 6 ) TRAILER UNITS WITHOUT TRUCKS :

The required mobile substations shall consist of two trailers . The first one is for ( 66 ) kV switchgear , main transformer and may be for the earthing transformer . The second is for battery sets , ( 20 ) kV GIS , chargers, control , AC/ DC panels, protections, signals, capacitor banks and may be for the earthing transformer .

Both trailers shall be suitable for locating the mobile substation equipment while providing for necessary clearances ; as fixed in IEC norm and for the sufficient clear passages so as to guarantee safety of personnel as well as cases of operation and maintenance . The color should be yellow.

It shall be equipped with the necessary number of axles to limit the applied load down to ( 13 ) metric tons per axle .

It is meant to achieve the following max. speeds during transportation :
30 KM/h on paved road , 10 KM/h on unpaved roads .

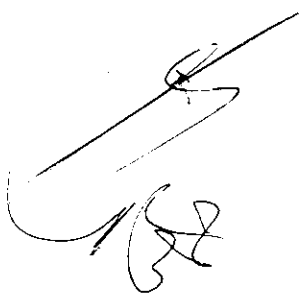
### General :

Both semi trailers shall be of rugged reliability designed and built by reputable manufacturer to give long trouble free service under the worst climatic conditions:

- All materials and works are brand new and absolutely first class and in strict conformity with the latest relevant recommendation of the IEC standards specifications .
- The offerer must offer trailer without truck

**Both semi trailers should be :**

- Without lateral site , low surface to transport mobile substations not less than ( 40 ) tons for ( 66 ) kV trailer and not less than ( 20 ) tons for ( 20 ) kV trailer .
- Pay load .
- Max. width not to exceed ( 3 ) m .
- Max. length not to exceed ( 15 ) m and not less than ( 13 ) m .
- Max. height not to exceed ( 4.5 ) m .
- Max. load at each axle not to exceed ( 13 ) tons .
- Outriggers of both semi trailers able to hold the total load preferable hydraulic operation system.
- Offerer has to define the axles number of both semi trailers and number of tires , their quality and specifications , suspension , distance between the axles , the dimensions and specifications of used beams .



**King Bin :**
According to the European standards its preferable to be ( 3.5 ) inch . Both trailers should achieve the following :
**Outrigger** : mechanical .
**Suspension** : leaf spring .
**Spare Tires** : two with portals .

## ART ( 7 ) PORTAL :

The required mobile substation shall be equipped with a beam steel portal of an easily removable type . It shall be used for the entry of a single circuit , three phase A.C.S.R. conductors ( 240/40 ) mm2 .So offerer should keep enough place for this reason and suitable clamp .

The portal members shall be of steel hot-dip galvanized and provided with bolts , nuts , plain washers , spring washers , two sets of stubs per portal .

## ART ( 8 ) SAFETY FENCE :

Mobile substation shall be equipped with all elements and materials to form a safety fence of an easily removable type and of ample dimensions to guarantee the safety of personnel .

Offerers have to describe in details the proposed safety fence .

## ART ( 9 ) TIME SCHEDULE :

The mobile substation are needed to be put into operation .
Offerers are requested to submit the program of manufacture , testing , supply , and dates of submitting design and drawings works to execute the substation.

## ART ( 10 ) PRE-MADE KIOSK ( Shelter ) :

Pre-made kiosk ( shelter ) shall be supplied with the mobile substation with suitable isolating , for environmental conditions ( heat , dust , etc.... ) and with air conditioning . Taking into consideration that the ( 20 ) kV GIS bays protection , control , AC,DC will be installed in it keeping suitable operation temperature range ( -5,+55 ) °C .

## ART ( 11 ) DRAWINGS TO BE SUBMITED BY CONTRACTOR FOR APPROVAL :

The Contractor shall submit to the PETDE for approval detailed working drawings of the various parts of equipment and buildings together with the calculations justifying their use as soon as possible after awarding the contract acceptance of his tender and in any way not later than ( 15 ) days from the effective date of contract .

The PETDE/SPCE approval of detailed working drawings should be obtained before starting the manufacture of any part of the equipment . In any case , the manufacture of any part shall be at the sole risk and expense of the Contractor if it is executed before receipt the PETDEapproval .

The Contractor shall supply during the execution of the works such further drawings and/or samples as may be required from time to time by the PETDE

## ART ( 12 ) DESIGN AND QUANTITIES :

- Offerers should take into consideration that the more simple safe and economical design with respecting the single line diagram, will be preferable , and will be taken into account during the evaluation ..
- Offerers should submit with their offers a correct bill of quantities for all the materials which will be used in the substation with a detailed prices and preliminary drawings clearing the basic design of the substation with accordance of the above mentioned quantities for mechanical and
- Design for the substation should take into considerations the following items :

1- Interlock system should prevent access to live parts .
2- Interlocking should be taking in conserderation between the disconnector switches and circuit breakers for both 20 kv incoming feeders from 10 MVA power transformer and 1 MVA diesel generator so that 20 kv busbar will be fed from one source only.
3- Design should ensure easy maintenance .
4- Design should ensure complete protection for operators maintenance groups along with damage , risks ,in case of fault and failures .
5- Transformer shall be outdoor design .
6- Special care shall be made to noise level at transformers , transformer fan and ventilators , as the substation will be located in residential areas . Offerers have to clarify the measures which will be taken to reduce noise levels .
7- All indoor ( AC, DC, protection, control, ... ) panels should be IP51 degree protection .
8- All outdoor panels should be IP54 degree protection .
9- ( 20 ) kV cells should be according to Book-one A DWG.

The OLTC design shall be according to the Tap – selector switch principle or shall consist of tap – selector and a rotary type diverter switch of high speed

transition resistor type . the OLTCs shall be mounted into the transformer . the diverter switches and/or selector / vacuum switches shall have oil compartments separated from the transformer oil as well as their own closed sub- sections in the conservator .

The OLTC operation principle shall use vacuum cells instead of cooper or tungsten arcing contacts. The manufacturer must have an international field experience .

The OLTC shall be inconformity with IEC 60214 . only designs which have been typ tested in accordance with relevant IEC standars will be accepted

The OLTC and equipment related to the OLTC shall be supplied by the original OLTC manufacturer from west Europe countries .

**licence products etc. are not acceptable .**

The power of the transformers shall remain constant at all tap positions and the OLTC shall be capable of successful tap changes for the maximum current to which the transformer can be loaded . the OLTC shall be designed for the necessary rated through currents and the permissible continuous through current of each tap changer unit at rated switching capacity shall cover all cyclic loading duties as per IEC 60354 at highest current tap and rated system operation voltage applied on the transformer terminals .

10- The substation will be in accordance with the specifications mentioned in Books ( 1-A ) – ( 1-B ) and Book ( 2 ) taking into consideration that in case of discrepancy between Book ( 1-A ) and other books , Book ( 1-A ) will be applied .

11- The substation will be designed specially to fit the available spaces and to integrate with the environment keeping high performance, quality, reliability, safety of operation and maintenance, and safety of personal

12- Road Conditions : a) maximum axial metric load ( 13 ) tons .
b) maximum height is ( 4.50 ) m .
c) maximum width ( 3 ) m

## ART ( 13 ) SITE CONDITIONS :

The climatic conditions of the site is desert.
The desert climate prevails in summer and temperate climate in winter

**Operation Range :**

- Maximum ambient temperature : +55 °C
- Minimum ambient temperature : -5 °C for indoor equipment .
  -10 °C for outdoor equipment .
- Maximum wind velocity : 35 m/s
- Prevailing wind direction : north-west .
- Relative air humidity , average : 70-80 %
- Altitude :≤1000 m
- Seismicity :0.1 g

**Storage Conditions :**

- Maximum ambient temperature : +70 ◦C
- Minimum ambient temperature :
- -5 ◦C for indoor equipment .
- -10 ◦C for outdoor equipment.
- Relative air humidity average : 95 %

## ART ( 14 ) EQUIPMENT RATINGS :

All rating mentioned in this document for all equipment are the rating at site, unless specifically noted otherwise Arts ( 14 and 15 ) Book ( 1- A ) .

## ART ( 15 ) AUXILIARY POWER SUPPLY :

The equipment shall be designed to operate under the voltage range as follows :

1- ( 48 ) VDC- 30% + 10% for :
   * Circuit breakers trip coils .
   * Protection .
   * Emergency lighting .

2- ( 220 / 380 ) VAC - 20% + 10% single phase or/and three phase for :
   * Transformers fans .
   * Heating , ventilation , air conditioning , lighting .

3- ( 48 ) VDC - 20% + 10% for :
   * Control and interlocking circuit
   * Operating mechanism C.B .
   * C.B.Closing coil .

## ART ( 16 ) PROTECTIONS :

PETDEaccept only numeric relays for all relays and insist on the relays passing the type tests successfully . And we insist on the type tests certificates being included with the tender documents , otherwise we reserve us the right to disqualify the offer .

**1- Relays :**

Only offers of numeric relays which satisfy the following conditions will be acceptable .

1-1 The relays shall conform to all relevant IEC standards and especially IEC 255

1-2 Type test certificates from an international and independent organization shall be submitted with the offer for all relays .

1-3 Reference list demonstrating that at least ( 3 ) relays of each type have been in successful service for at least three years shall be submitted with the offer

1-4 The relays shall be guaranteed for at least two years from the date of commissioning .

1-5 The offerer shall give guarantee period five years for spare elements .

1-6 The relays shall be able to be monitored from a PC .

1-7 The offerer shall provide evidence of full ISO 9000 certificate .

**2- Protection cabinets :**

2-1 Relays shall be mounted on standard 19 inch racks in sealed cabinets with transparent local front door .

2-2 As the site atmosphere is very dusty , the protection class of panels shall be of protection degree ≥IP41( indoor ) , ≥IP53 ( outdoor ) in accordance with IEC 529 .

2-3 Cabinets shall be so designed that **their internal temperature** does not exceed the allowable operating temperature of the protection relays as specified in this specification for any operative duty .

2-4 The offerer shall provide internationally witnessed test certificates which demonstrate this .

**ART ( 17 ) CONTROL SYSTEM FOR SUBSTATIONS :**

The offerers are requested to offer a digital local control unit , control panels with compact design and this item which shall satisfy the following conditions will be acceptable :

1- Numerical Local control units should be submitted as a part of this system

2- The offerers shall submit sufficient evidence to prove reliability of system under all conditions .

3- The system should have acceptable type test certificates from an independent international test organization .

4- The offerers shall submit reference list to prove successful service for ( 6 ) control systems in different networks for two years .

5- Spare parts to be included as mentioned in book two .

6- The control system should be guaranteed for at least two years from the date of substation commissioning .

**ART( 18 ) PACKING AND SHIPMENT :**

1- The type of packing should be suitable for export and provide complete protection for marine or truck or rail transportation and for loading & unloading , for example ( boxes , cases , etc. … ) should be robust enough and have suitable dimensions and weights , lifting , hooking , and handling facilities .

2- Offerer shall take care on his own account that the commodity will be packed carefully in order to avoid damage of delivered materials and to be acceptable to the insurance company .

3- The strength and quality of packing materials should correspond to the weight of the packed materials .

4- Appropriate measures according to each commodity type shall be taken to prevent vibration , sliding or movement inside boxes or cases .

5- Boxes which should be handled with care according to the contents must be marked accordingly and clearly .

6- Sufficient steel band for boxes shall be in accordance with their weight and dimensions . Sensitive instrument and similar materials must be packed carefully to prevent exposure of elements to rain , sun , dust , etc. … with the

appropriate packing of nylon bags , oiled paper and foam materials as necessary . All packing should be suitable for long term storage outside .

7- Packing list : each box or case must contain equipment of the same kind and complete with relevant accessories .

8- Each box or case must include the packing list fixed on the case and protected in addition to the list inside the case .

## ART( 19) MARKING AND IDENTIFICATION :

### A-Packing :

It is important to mark each case or box clearly by the following :

-Contract number

-PETDE, the purchaser.

Delivery number , shipment number;

-Manufacturing date;

-Name of manufacturer;

-Kind of materials;

Quantities contained;

-Main technical specification;

-Gross weight , net weight;

-Item number.

-Mobile substations number

-Storage category.

The marking must be clear , unerasable and written on two sides of the case or box

.

### B - Name Plate :

Each equipment shall be provided with name plate of corrosion resisting material ( Preferably stainless steel ) . It shall be fitted on a position clearly visible to the operator .

The plate shall be indelibly marked in English and all units shall be shown in MKS system . It shall include the information according to the relevant standards. In addition , name plate for main equipment shall include at least the following :

- Manufacturer
- Country of origin
- Type
- Year of manufacture
- Owner : PETDE
- Main ratings and terminal codes
- Applicable standards

Name plate shall include also all data specifically noted otherwise in the tender documents .

Details of each label shall be subject to approval by PETDE.

| | |
|---|---|
| 21/1 | DISTANCE PROTECTION - MAIN 1 |
| 21/2 | DISTANCE PROTECTION - MAIN 2 |
| 25 | CHECK SYNCHRONSING |
| 26WTA | WINDING TEMPERATURE ALARM |
| 26WTT | WINDING TEMPERATURE TRIP |
| 27 | NO VOLTS PROTECTION |
| 49 | THERMAL OVERCURRENT PROTECTION |
| 50 | INSTANTANEOUS OVERCURRENT PROTECTION |
| 50N | INSTANTANEOUS EARTH FAULT PROTECTION |
| 50BF | CIRCUIT BREAKER FAIL |
| 51 | INVERSE TIME OVERCURRENT PROTECTION |
| 51N(1) | INVERSE TIME EARTH FAULT PROTECTION - STAGE 1 |
| 51N(2) | INVERSE TIME EARTH FAULT PROTECTION - STAGE 2 |
| 67N(T) | DIRECTIONAL OVERCURRENT PROTECTION WITH DEFINITE TIME CHARACTERISTIC |
| 79(S/D) | TWO SHOT SINGLE PHASE FOLLOWED BY DELAYED THREE PHASE AUTO RECLOSE |
| 80A | BUCHHOLZ GAS TRIP |
| 80T | BUCHHOLZ SURGE TRIP |
| 87T | TRANSFORMER DIFFERENTIAL PROTECTION |
| 96 | TRIP CIRCUIT SUPERVISION |
| KWh | METERING KWh IMPORT/EXPORT |
| KVAh | METERING KVAh IMPORT/EXPORT |
| MW ~ | METERING MW |
| MVAr ~ | METERING MVAr |
| COSΦ | POWER FACTOR METER |

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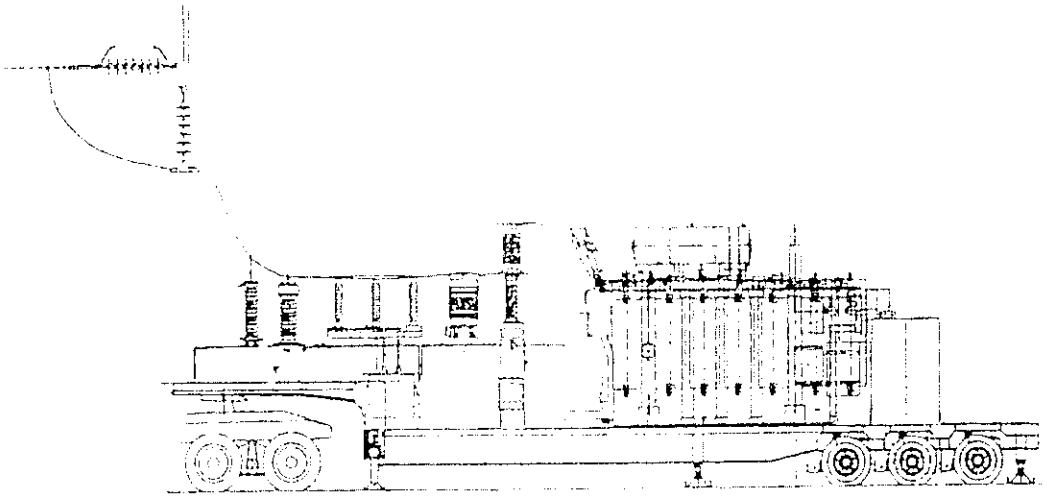
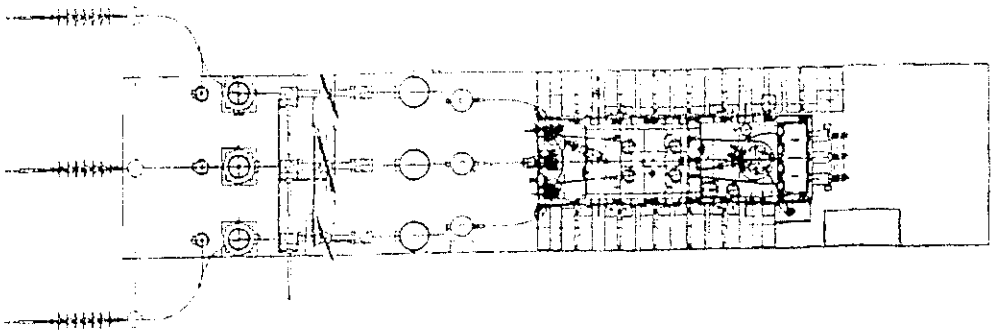
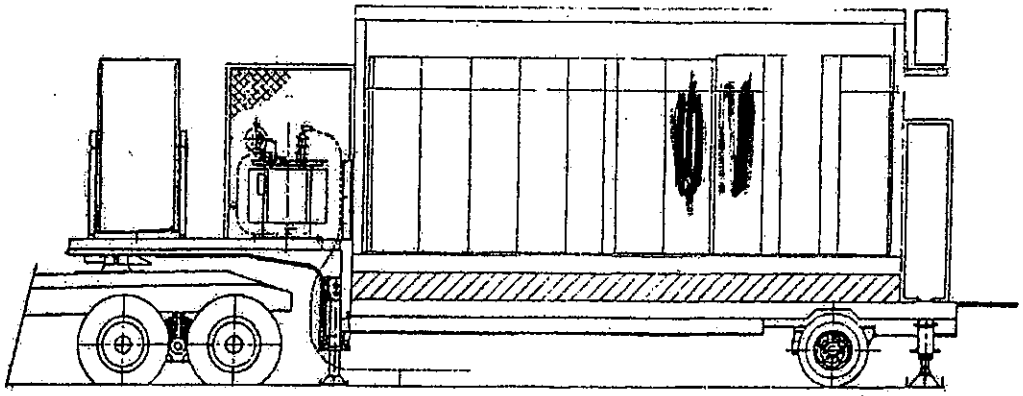
| | |
|---|---|
| A | AMMETER. |
| AS | AMMETER SELECTOR SWITCH |
| F | FREQUENCY METER |
| FL | FAULT LOCATOR |
| FSS | FREQUENCY SELECTOR SWITCH |
| PLC | POWER LINE CARRIER |

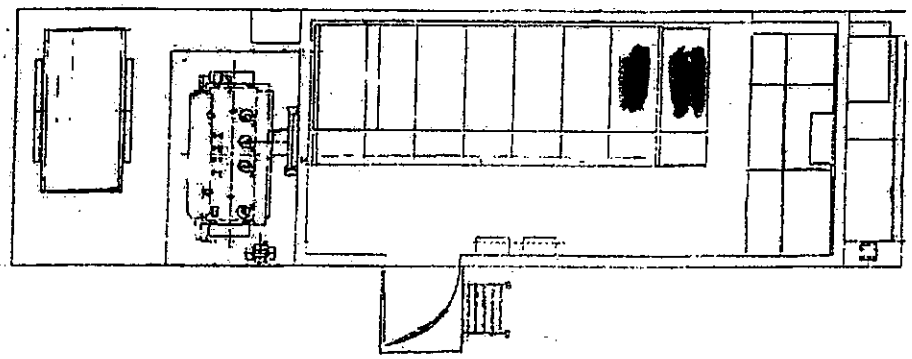
| | |
|---|---|
| SCADA | SYSTEM CONTROL AND DATA ACQUISITION |
| TComm | TELECOMMUNICATIONS INTERFACE |
| Tx | TRANSDUCER |
| V | VOLTMETER |
| VS | VOLTAGESELECTORSWITCH |





A preliminary Diagram for
The First Trailer for ( 66 ) kV Equipment

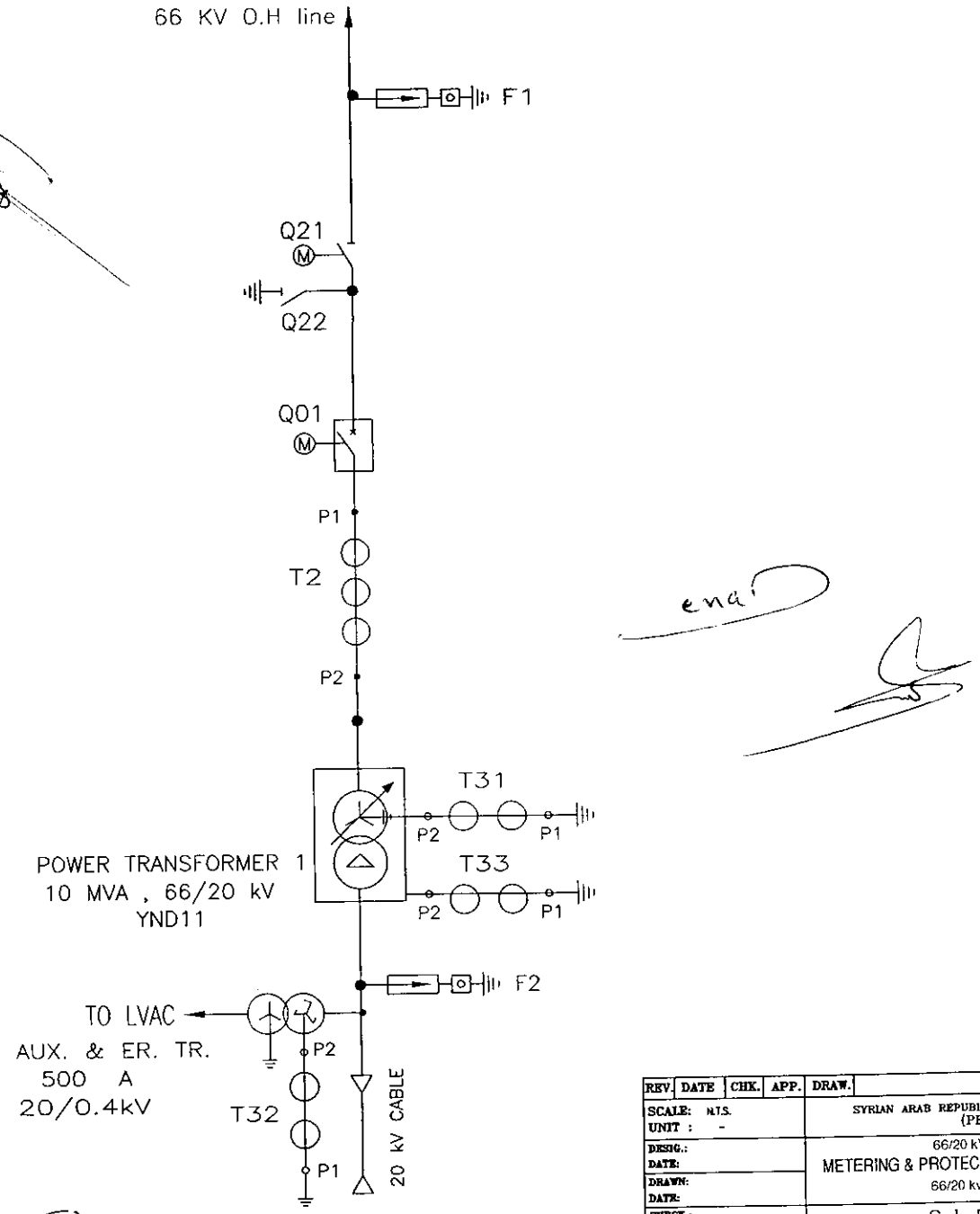




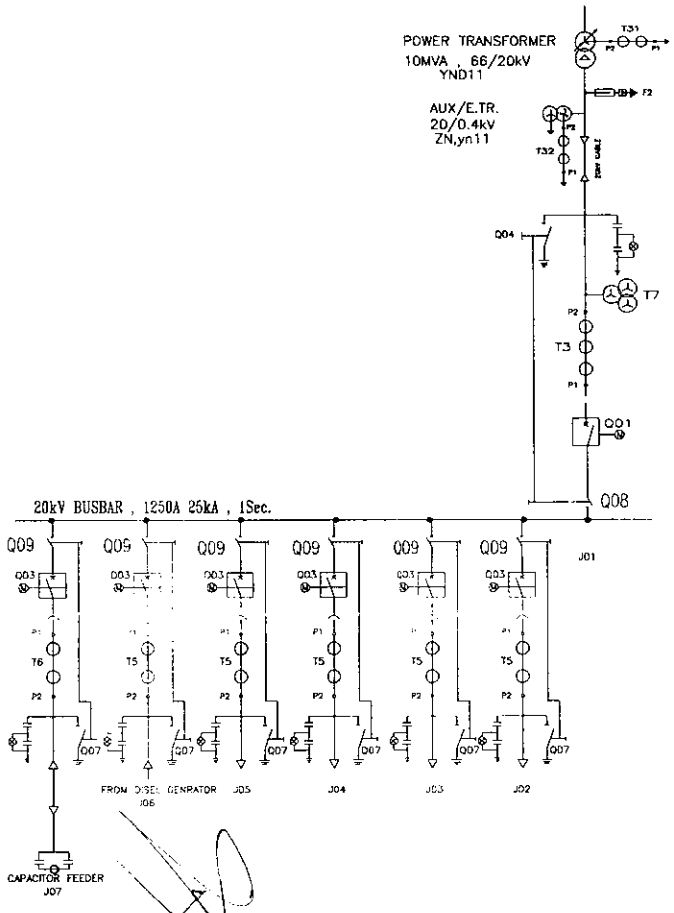
**A preliminary Diagram for**
**The Second Trailer for ( 20 ) kV and Low Voltage Equipment**

| SYMBOL | DESCRIPTION | APP. DESIGN | SPECIFICATION 66KV |
|---|---|---|---|
| | CIRCUIT BREAKER | Q01 | 1250A 31.5KA 1Sec |
| | DISCONNECT SWITCH WITH EARTHING SWITCH | Q21,22 | 1250A 31.5KA 1Sec |
| | CURRENT TRANSFORMER | T2 | CORE1:2x150/1 CLX , Vk>500V , RCT (IEC)<br>CORE2:2x150/1 , 5P20 , 20VA<br>CORE3:2x150/1CL0.5 , FS=5 , 20VA |
| | NEUTRAL CURRENT TRANSFORMER | T31 | CORE1:2x150/1, 20VA,CL5P20<br>CORE2:2x150/1 , 20VA,CL5P20 |
| | LIGHTNING ARRESTER WITH SURGE COUNTER | F1 | 60KV 10KA CLASS 3 |

| SYMBOL | DESCRIPTION | APP. DESIGN | SPECIFICATION 20 KV |
|---|---|---|---|
| | CIRCUIT BREAKER | Q01 | 1250kA,25kA 1Sec |
| | EARTHING SWITCH | Q04 | 1250A,25kA 1Sec |
| | CURRENT TRANSFORMER | T3 | CORE1:2x600/1 CL0.5<br>CORE2:2x600/1 , 5P10 , 20VA<br>CORE3:2x600/1 CL5P10 |
| | NEUTRAL CURRENT TRANSFORMER | T32 | CORE1:1200-600/1 CL.5P20,20 VA<br>CORE2:1200-600/1 CL.5P20,20 VA |
| | THREE SINGLE PHASE VOLTAGE TRANSFORMER | T7 | $\frac{20}{\sqrt{3}}/\frac{0.1}{\sqrt{3}}/\frac{0.1}{\sqrt{3}}$ KV , 0.5+3P, 50VA<br>0.5+3P, 50VA |
| | NEON INDICATOR | | |
| | LIGHTNING ARRESTER WITH SURGE COUNTER | F2 | 20KV 10KA CLASS 2 |
| | TANK CURRENT TRANSFORMER | T33 | 100/1 A |




| REV. | DATE | CHK. | APP. | DRAW. | DESCRIPTION |
|---|---|---|---|---|---|
| SCALE: N.T.S.<br>UNIT : - | | | | | SYRIAN ARAB REPUBLIC-MINISTRY OF ELECTRICITY (PETDE) |
| DESIG.:<br>DATE: | | | | | 66/20 kV SUBSTATION<br>METERING & PROTECTION SINGLE LINE DIAGRAM<br>66/20 kv O.H.L FEEDER |
| DRAWN:<br>DATE: | | | | | |
| CHECK.:<br>DATE: | | | | | S .L .D .O.H.L |
| APPR.:<br>DATE: | | | | | 66/20 kv mobile substation |




| SYMBOL | DESCRIPTION | APP. DESIGN | SPECIFICATION 20KV |
|---|---|---|---|
| | CIRCUIT BREAKER | Q01 | 1250kA,25kA 1Sec |
| | CIRCUIT BREAKER | Q03 | 630A,25kA 1Sec |
| | EARTHING SWITCH | Q04 | 1250A,25kA 1Sec |
| | EARTHING SWITCH | Q07 | 630A,25kA 1Sec |
| | three position disconnecting switch | Q08 | 1250A,25kA 1Sec |
| | three position disconnecting switch | Q09 | 630A,25kA 1Sec |
| | CURRENT TRANSFORMER | T3 | CORE1:1200-600/1 , CLX , Vk>400V , RCT<4<br>CORE2:1200-600/1 , 5P20 , 20VA<br>CORE3:1200-600/1A CL0.5 FS=5 15VA |
| | CURRENT TRANSFORMER | T5 | CORE2:2X150/1 , 5P20 , 20VA<br>CORE3:2x150/1A CL0.5 FS=5 15VA |
| | CURRENT TRANSFORMER | T6 | CORE1:300-150/1 , CLX , Vk>400V , RCT(IEC)<br>CORE2:300-150/1 , 5P20 , 20VA |
| | CURRENT TRANSFORMER | T32 | CORE1:1200-600/1 , CLX , Vk>400V , RCT(IEC)<br>CORE2:1200-600/1 , 5P20 , 20VA |
| | THREE SINGLE PHASE VOLTAGE TRANSFORMER | T7 | $\frac{20}{\sqrt{3}}/\frac{0.1}{\sqrt{3}}/\frac{0.1}{\sqrt{3}}$ KV , 0.5+3P, 50VA<br>0.5+3P, 50VA |
| | NEON INDICATOR | | |

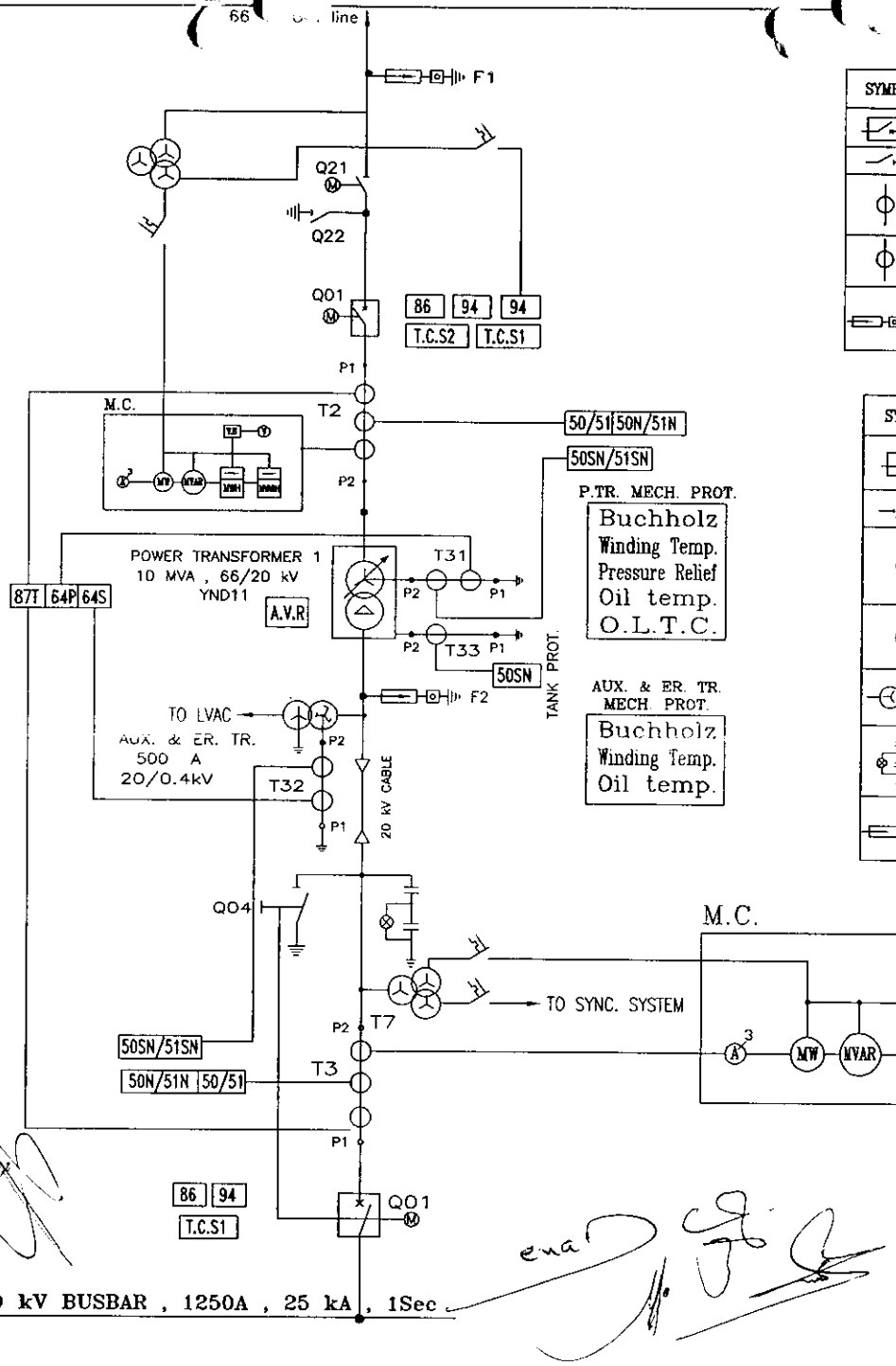
| REV. | DATE | CHK. | APP. | DRAW. | DESCRIPTION |
|---|---|---|---|---|---|
| SCALE:<br>UNIT : | | | | | SYRIAN ARAB REPUBLIC-MINISTRY OF ELECTRICITY (PETDE) |
| DESIG.:<br>DATE: | | | | | 66/20kV SUBSTATION<br>MOBILE S/S 20 KV GIS CELLS |
| DRAWN:<br>DATE: | | | | | |
| CHECK.:<br>DATE: | | | | | S.L.D.M.V.1 |
| APPR.:<br>DATE: | | | | | MOBILE S/S |

| DEVICE NUMBER | DEFINITION |
|---|---|
| 59 | OVER VOLTAGE RELAY |
| 27 | UNDER VOLTAGE RELAY |
| 21/67N | DISTANCE RELAY WITH DIRECTIONAL EARTH FAULT ELEMAN |
| F.L | FAULT LOCATOR |
| T.C.S | TRIP CIRCUIT SUPPERVISION |
| 67 | DIRECTIONAL OVER CURRENT RELAY |
| 67N | DIRECTIONAL EARTH FAULT RELAY |
| 87T | DIFFRENTIAL RELAY |
| 64P | PRIMARY RESTRICTED EARTH FAULT RELAY |
| 64S | SECONDARY RESTRICTED EARTH FAULT RELAY |
| 50 | INSTANTANEOUS OVER CURRENT RELAY |
| 51 | INVERSE TIME OVER CURRENT RELAY |
| 50N | INSTANTANEOUS EARTH FAULT RELAY |
| 51N | INVERSE TIME EARTH FAULT RELAY |
| 50SN | SENSITIVE INSTANTANEOUS EARTH FAULT RELAY |
| 51SN | SENSITIVE INVERSE TIME EARTH FAULT RELAY |
| V.C.R | VAR CONTROL RELAY FOR CAPACITOR BANK |
| A.V.R | AUTOMOTIC VOLTAGE REGULATION |
| 86 | LOCKOUT RELAY |
| 94 | TRIP FREE RELAY |
| F.F | FUSE FAILURE PROTECTION |
| PSB | POWER SWING BLOCKING |
| SOF | SWITCH ON TO FAULT |

## LEGEND

- (V) VOLTMETER
- (A) AMMETER
- M.C. — MEASURING CENTER TWO DIRECTION ENERGY METER
- M.C. — MEASURING CENTER ONE DIRECTION ENERGY METER

Note: MAIN RELAYS SHOULD BE EQUIPTED WITH FAULT & EVENT RECORDING FACILITIES.




| SYMBOL | DESCRIPTION | APP. DESIGN | SPECIFICATION 66KV |
|---|---|---|---|
| | CIRCUIT BREAKER | Q01 | 1250A 31.5KA 1Sec |
| | DISCONNECT SWITCH WITH EARTHIN SWITCH | Q21,22 | 1250A 31.5KA 1Sec |
| | CURRENT TRANSFORMER | T2 | CORE1:2x200/1 CL.X , Vk>500V , RCT (IEC)<br>CORE2:2x200/1 , 5P20 , 20VA<br>CORE3:2x200/1CL.0.5 , FS=5 , 20VA |
| | NEUTRAL CURRENT TRANSFORMER | T31 | CORE1:2x200/1, 20VA,CL5P20<br>CORE2:2x200/1 , 20VA,CL5P20 |
| | LIGHTNING ARRESTER WITH SURGE COUNTER | F1 | 60KV 10KA CLASS 3 |

| SYMBOL | DESCRIPTION | APP. DESIGN | SPECIFICATION 20 KV |
|---|---|---|---|
| | CIRCUIT BREAKER | Q01 | 1250kA,25kA 1Sec |
| | EARTHING SWITCH | Q04 | 1250A,25kA 1Sec |
| | CURRENT TRANSFORMER | T3 | CORE1:2x600/1 CL.0.5<br>CORE2:2x600/1 , 5P20 , 20VA<br>CORE3:2x600/1 CL5P20 |
| | NEUTRAL CURRENT TRANSFORMER | T32 | CORE1:1200-600/1 CL.5P20,20 VA<br>CORE2:1200-600/1 CL.5P20,20 VA |
| | THREE SINGLE PHASE VOLTAGE TRANSFORMER | T7 | $\frac{20}{\sqrt{3}}/\frac{0.1}{\sqrt{3}}/\frac{0.1}{\sqrt{3}}$ KV , 0.5+3P, 50VA<br>0.5+3P, 50VA |
| | NEON INDICATOR | | |
| | LIGHTNING ARRESTER WITH SURGE COUNTER | F2 | 20KV 10KA CLASS 2 |

| ITEM | OPTION INCLUDED IN DIFFERENTIAL RELAY |
|---|---|
| 1 | RESTRICTED EARTH FAULT PROTECTION FOR H.V. SIDE |
| 2 | RESTRICTED EARTH FAULT PROTECTION FOR L.V. SIDE |
| 3 | FAULT & DISTURBANCE RECORDER |

| REV. | DATE | CHK. | APP. | DRAW. | DESCRIPTION |
|---|---|---|---|---|---|
| SCALE: N.T.S.<br>UNIT : - | | | | | SYRIAN ARAB REPUBLIC-MINISTRY OF ELECTRICITY (PETDE) |
| DESIG.:<br>DATE: | | | | | 66/20 kV SUBSTATION |
| DRAWN:<br>DATE: | | | | | METERING & PROTECTION SINGLE LINE DIAGRAM |
| CHECK.:<br>DATE: | | | | | 66/20 kv TRANSFORMER FEEDER |
| APPR.:<br>DATE: | | | | | S.L.D.T.R. |
| | | | | | 66/20 kv mobile substation |