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**DRUK HOLDING & INVESTMENTS LTD.**

**GROUP STANDARD BIDDING DOCUMENT**

**GOODS**



Part I: NOTICE INVITING TENDER

**NIT No: BT/Supply and Installation of DEG sets with inbuilt AMF Panels/2023 dated 26<sup>th</sup> December 2022**

1. Bhutan Telecom Ltd. invites eligible bidders to submit your e-bid for the supply and installation of DEG with inbuilt AMF Panels.
2. Bhutan Telecom Limited would like to inform the interested firms to kindly visit the website [www.tender.bt](http://www.tender.bt) for vendor registration and to submit the proposal online.
3. The user manual for vendor registration and bidding process is available on the website [www.tender.bt](http://www.tender.bt) or else can be downloaded from following links:-User manual for vendor registration-User manual for Bidding process
4. SBD Timeline

<b>NIT No.</b>	<b>BT/Supply and Installation of DEG sets with inbuilt AMF Panels/2023</b>
<b>Bid Submission &amp; EMD Submission Date &amp; Time</b>	On or before 30 <sup>th</sup> January 2023 (17:00 hrs)
<b>Bid Opening Date &amp; Time</b>	31 <sup>st</sup> January 2023 (14:00 hrs)
<b>RFP shall be available at</b>	<a href="http://www.tender.bt">www.tender.bt</a>

Part II: Terms and Conditions

**1 Scope of Supply**

- 1.1 The bidder(s) may quote for any or all items as per the technical specification as attached at Annexure -IV

**2 Clarification to the bidding document**

- 2.1 Further information can be obtained in writing from [procurement@bt.bt/manager.powerandinfra@bt.bt](mailto:procurement@bt.bt/manager.powerandinfra@bt.bt) not later than 29<sup>th</sup> January 2023.

**3 Documents comprising bid**

- 3.1 The bid must be accompanied by the following document:

- i. Bid Security
- ii. Valid Trade license
- iii. Tax clearance
- iv. Integrity Pact Document
- v. OEM certificate
- vi. Catalogue and Datasheet
- vii. Any other relevant documents as required

**4 Bid Price**

- 4.1 All prices shall be quoted in BTN/INR. The quoted price shall be CIF, Phuntsholing including taxes, duties and other levies to the final place of delivery, if required.
- 4.2 The final place of delivery of Equipment is Central Stores, Phuntsholing.
- 4.3 The bidder(s) must quote for all the items under this bid if in lot. Price bids will be evaluated for all the items together and contract awarded to the firm offering the lowest evaluated total cost of all the items.
- 4.4 All price quoted shall be on per unit basis and valid for 12 months from the date of bid opening. The selected bidders shall be contacted for additional supply of any in-listed item in the future or repeat order basis for the entire period.

**5 Bid Validity**

- 5.1 The bid shall be valid for 90 days from the date of submission of the bid. In exceptional circumstances, prior to the expiration of the bid validity period, the Purchaser may solicit the Bidder's consent to an extension of the bid validity period. The request and responses shall be made in writing. A bid valid for a shorter period shall be considered non-responsive.

**6 Bid Security**

- 6.1 The bid shall be accompanied by the bid security of **2% of the bid value** in the form of Cash Warrant/ Unconditional Bank Guarantee/ Banker Cheque/ Demand draft in the name of the **Chief Executive Officer, Bhutan Telecom Ltd** issued by the Financial Institution enforceable in any Banks in Bhutan.

- a) The Bid security shall be valid up to 3 months.
- b) The Bid Security is to be submitted as a part of the Bid in a separate sealed envelope and be submitted to Finance & Accounts Division or to our nearest Branch Office within the specified time in SBD timeline.
- c) Any Bid not accompanied by bid security of adequate value and validity shall be rejected by the Purchaser and considered as non-responsive.

6.2 The bid security shall be forfeited in the following cases:

- a) If the Bidder withdraws the bid after Bid opening during the period of Bid validity.
- b) If the Bidder does not accept the correction of the Bid price;
- c) In the case of a successful bidder, if the bidder fails within the specified time limit to sign the Contract or furnish Performance Security.

## 7 Purchaser's Right to Accept Any Bid, and Reject Any or All Bids

7.1 The Purchaser is not bound to accept the lowest bid and reserves the right to accept or reject any or all the bids without assigning any reason whatsoever.

## 8 Quantity Variation

8.1 Depending on the final requirement, at the time of the award of the Contract, the Purchaser may increase or decrease the quantities by twenty five percent (25%) of the indicated quantity.

## 9 Award of Contract

9.1 The Purchaser shall award the Contract to the Bidder whose offer has been determined to be the lowest evaluated Bid. The Purchaser shall issue Notification of Award/ Purchase Order to the successful Bidder. Until a formal Contract is prepared and executed, the Notification of Award/Purchase Order shall constitute a binding Contract.

## 10 Delivery Schedule

10.1 The supply of the **Goods** shall be completed within **two months** from the date of issue of the Purchase Order/ signing of the contract.

10.2 **Services** : Installation and commissioning of AMF panel shall be completed within **one month** from the date of ready of site

## 11 Performance Security

11.1 The Supplier shall be required to furnish Performance Security of 10% of the quoted price in the form of cash warrant, demand draft or unconditional Bank Guarantee in the name of Chief Executive Officer, Bhutan Telecom issued by a financial institution enforceable in any Banks in Bhutan, which shall be furnished upon issuance of notification of the award. Performance Security shall be valid till the end of warranty period and will be returned after the end of warranty period.

## 12 Liquidated Damage

12.1 If the Supplier fails to deliver any or all of the Goods by the date(s) of delivery or fails to perform the Related Services within the period specified in the Contract/ Purchase Order, the Purchaser shall deduct Liquidated Damages at the rate of **0.1%** per day for each day to a maximum of 10% of the total PO value.

### 13 Payment Terms

- 13.1 **Goods: 100% payment** shall be released on receipt of full quantity of materials and no part payment shall be entertained during the execution of the supply order.
- 13.2 Services: 100% payment shall be released after successful completion of I&C of DEGs, UAT and taking over of component.
- 13.3 At the time of release of payment, Tax shall be deducted at Source [TDS] from the gross amount of bills as per the Income Tax Act of the Bhutan. The Purchaser shall furnish necessary TDS Certificate to the Bidders, issued by the Department of Revenue & Customs, RGoB.

### 14 Warranty Period

- 14.1 The Supplier shall provide the warranty for a period of one year, for the goods to be supplied and confirm that if any faults are detected within the warranty period in the supplied/installed Goods, the Supplier shall be bound to rectify the fault or replace the Goods as the case may be. The performance security shall be used to cover the cost of supplies not delivered or defective items not replaced or rectified.
- 14.2 Any goods found defective during the warranty period shall be replaced/ repaired by the supplier at his cost. If the supplier fails to rectify and or replace the defective goods, the Purchaser shall do it at the cost of the supplier.

### 15 Submission of Bid

- 15.1 The Bidder shall submit the Bid Submission Form using the Form in the Annexure I if so required: This form must be completed without any alterations to its format, and no substitutes shall be accepted. All blank spaces shall be filled in with the information requested.
- 15.2 As such a bid in which the Bid Submission Form not duly filled, signed and sealed by the bidder shall be rejected.

### 16 Termination

- 16.1 The Purchaser may, by written notice, terminate the Purchase Order or Contract in whole or in part at any time for its convenience:
- 16.2 If the Supplier fails to perform any other terms and conditions specified with the Purchase Order/ Contract, or exceeds the maximum amount of Liquidated Damages; and
- 16.3 If the Supplier fails to perform any other obligation(s) under the Purchase Order / Contract, and if the

Supplier does not take any remedial action within a period of one month after receipt of a notice of default from the Purchaser specifying the nature of the default(s).

## **17 Governing Law**

17.1 The Contract/ Purchase Order shall be governed by and interpreted in accordance with the Laws of Bhutan.

## **18 Dispute Resolution**

18.1 Any settlement of dispute or arbitration of matter arising from the contract shall be settled as per the Alternative Dispute Resolution Act of Bhutan 2013 for Bhutanese Supplier and United Nations Commission on International Trade Law [UNCITRAL] Arbitration Rules of 1976 for International Supplier and will be binding for both parties.

Part III: Forms:

**Annexure-I Bid Submission Form**

*[The Bidder shall fill in this form in accordance with the instructions indicated. No alterations to its format shall be permitted and no substitutions shall be accepted.]*

Date : .....*[insert date of Bid submission]*

Tender No.: .....*[insert number ]*.

To : *[insert complete name of the Purchaser]*

We, the undersigned, declare that:

- (a) We have examined and have no reservations to the Bidding Documents, including Addenda number: ..... *[insert the number and date of issue of each addendum]*;
- (b) We offer to supply, **install, testing & commissioning** in conformity with the Bidding Documents and in accordance with the Schedule of Supply the following Goods and Related Services: *[insert a brief description of the Goods and Related Services]*;
- (c) The total price of our Bid, excluding any discounts offered in item is: *[insert the Bid Price in words and figures, indicating the various amounts and their respective currencies]*;
- (d) The discounts offered and the methodologies for their application are:

*Discounts.* If our Bid is accepted, the following discounts shall apply: *[Specify in detail each discount offered and the specific item of the Schedule of Supply to which it applies.]*

*Methodology of Application of the Discounts.* The discounts shall be applied using the following methodology: *[Specify in detail the methodology that shall be used to apply the discounts]*;

- (e) Our Bid shall be valid for a period of *[insert number]* from the date fixed for the Bid submission deadline and it shall remain binding upon us and may be accepted at any time before expiry of that period;
- (f) If our Bid is accepted, we commit to provide a Performance Security in accordance with Clause 15 for the due performance of the Contract;

- (h) We, including any subcontractors or suppliers for any part of the Contract, have nationality from eligible countries, viz: [insert the nationality of the Bidder, including that of all parties that comprise the Bidder if the Bidder is a JV/C, and the nationality each subcontractor and supplier]
- (i) We have no conflict of interest;
- (j) Our firm, its affiliates or subsidiaries - including any subcontractors or suppliers for any part of the contract - has not been declared ineligible by the Purchaser under the laws or official regulations of Bhutan;
- (k) We have read the terms and conditions carefully, understood and agree to comply with all the clauses which are mentioned therein. In case of any breach of any condition on our part, we shall be liable for actions as per terms and conditions of the Contract.
- (l) We understand that this Bid, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract is prepared and executed.
- (m) We understand that you are not bound to accept the lowest evaluated Bid or any other Bid that you may receive.
- n) We accept the Vendor Performance Management System.

Signed: \_\_\_\_\_ [insert signature of person whose name and capacity are shown]

In the capacity of \_\_\_\_\_ [insert legal capacity of person signing the Bid Submission Form]

Name: \_\_\_\_\_ [insert complete name of person signing the Bid Submission Form]

Duly authorized to sign the bid for and on behalf of: \_\_\_\_\_ [insert complete name of Bidder]

Dated on \_\_\_\_\_ day of \_\_\_\_\_ [insert date of signing]



*Annexure II- Performance Security Form*

*[The bank, as requested by the successful Bidder, shall fill in this form in accordance with the instructions indicated] Date: [insert date (as day, month, and year) of Bid submission]*

IFB No. and title: *[insert no. and title of bidding process]*

Bank's Branch or Office: *[insert complete name of Guarantor]*<sup>[L]</sup><sub>[SEP]</sub> **Beneficiary:** *[insert complete name of The company]*<sup>[L]</sup><sub>[SEP]</sub> **PERFORMANCE GUARANTEE No.:** *[insert Performance Guarantee number]*

We have been informed that *[insert complete name of Supplier]* (hereinafter called "the Supplier") has entered into Contract No. *[insert number]* dated *[insert day and month]*, *[insert year]* with you, for the supply of *[description of Goods and related Services]* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a Performance Guarantee is required.

At the request of the Supplier, we hereby irrevocably undertake to pay you any sum(s) not exceeding *[insert amount(s)]*<sup>1</sup> *in figures and words* upon receipt by us of your first demand in writing declaring the Supplier to be in default under the Contract, without cavil or argument, or you needing to prove or to show grounds or reasons for your demand or the sum specified therein.

This Guarantee shall expire no later than the *[insert number]* day of *[insert month]* *[insert year]*,<sup>2</sup> and any demand for payment under it must be received by us at this office on or before that date. We agree to a one-time extension of this Guarantee for a period not to exceed *[six months]* *[one year]*, in response to The company's written request for such extension, such request to be presented to us before the expiry of the Guarantee.

*[signatures of authorized representatives of the bank and the Supplier]*

*Annexure III- Contract Forms*

*[The successful Bidder shall fill in this form in accordance with the instructions indicated]*

THIS CONTRACT AGREEMENT made the *[insert number]* day of *[insert month]*, *[insert year]*,

BETWEEN

1. (1) *[insert complete name of Purchaser]*, a *[insert description of type of legal entity, for example, an agency of the Ministry of .... of the Government of Bhutan, or corporation incorporated under the laws of Bhutan]* and having its principal place of business at *[insert address of Purchaser]* (hereinafter called “The company”), and [SEP]
2. (2) *[insert name of Supplier]*, a corporation incorporated under the laws of [SEP]*[insert country of Supplier]* and having its principal place of business at *[insert address of Supplier]* (hereinafter called “the Supplier”). [SEP] WHEREAS The company invited Bids for certain Goods and ancillary services, viz., *[insert brief description of Goods and Services]* and has accepted a Bid by the Supplier for the supply of those Goods and Services in the sum of *[insert Contract Price in words and figures, expressed in the Contract currency/ies]* (hereinafter called “the Contract Price”). [SEP] NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to. [SEP]

The following documents shall constitute the Contract between The company and the Supplier, and each shall be read and construed as an integral part of the Contract, viz.: [SEP]

- (a) This Contract Agreement; [SEP]
- (b) The Special Conditions of Contract; [SEP]
- (c) The General Conditions of Contract; [SEP]
- (d) Technical Requirements (including Schedule of Supply and Technical Specifications.) [SEP]
- (e) The Supplier’s Bid and original Price Schedules; [SEP]
- (f) The company’s Notification of Award of Contract; [SEP]
- (g) The form of Performance Security; [SEP]
- (h) The form of Bank Guarantee for Advance Payment; [SEP]

(i) *[Insert here any other document(s) forming part of the Contract]* <sup>[ ]</sup><sub>[SEP]</sub>

This Contract shall prevail over all other Contract documents. In the event of any discrepancy or inconsistency within the Contract documents, then the documents shall prevail in the order listed above.

In consideration of the payments to be made by The company to the Supplier as

3. hereinafter mentioned, the Supplier hereby covenants with The company to provide the Goods and Services and to remedy defects therein in conformity in all respects with the provisions of the Contract.
4. The company hereby covenants to pay the Supplier in consideration of the provision of the Goods and Related Services and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.
5. IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of Bhutan on the day, month and year indicated above.
6. For and on behalf of The company Signed: *[insertsignature]*
7. in the capacity of *[insert title or other appropriate designation]* <sup>[ ]</sup><sub>[SEP]</sub> in the presence of *[insert signature]* *[insert identification of official witness]*
8. For and on behalf of the Supplier <sup>[ ]</sup><sub>[SEP]</sub> Signed: *[insert signature of authorized representative(s) of the Supplier]*
9. in the capacity of *[insert title or other appropriate designation]* <sup>[ ]</sup><sub>[SEP]</sub> in the presence of *[insert signature]* *[insert identification of official witness]*

*19. Scope of Work*

*Supply and Installation of Diesel Generator Sets (with inbuilt AMF Panels) based on the technical specifications and compliances furnished below:*

**19.1 Technical Specification of Diesel Generators**

**19.1.1 Make/Model**

Make/Model	Compliance
Make Model of Engine: Cummins/Jakson/TMTL Eicher	
Make Model of Alternator: Stamford/Caterpillar/Perkins	

**19.1.2 General Requirements:**

General Requirement	Compliance
The Diesel Engine shall be of ‘Generator set’ application type & shall generally conform to ISO 3046 / BS 5514 / IS 4722/1992 with amendments respectively.	
The engine shall have Cold starting capability up to -5 deg. C and shall have capability to start directly to RUN speed (1500 RPM) without any interim warm up speed (Idle speed).	
The Diesel – Generator set shall comprise of a Diesel Engine of specified capacity, directly coupled to an Alternator of specified capacity mounted over a common base frame with Anti-vibro-mounts (AVM pad as recommended by Engine Manufacturer). The diesel engine shall be of four stroke cycle multi-cylinder, air cooled/water cooled, turbo charged with after cooler, developing required BHP @ 1500 rpm under NTP condition with an over load capacity of 110% for one hour in any specified 12 hrs of continuous operation.	
The alternator also should have an alternator heater inbuilt inside the alternator winding	

**19.1.3 Acoustic Enclosure:**

Description	Compliance
The enclosure shall meet the stringent noise levels shall be <b>75 dB(A)</b> at 1 metre from the enclosure surface	
The acoustic is composite in construction & is a fully assembled integral unit. A tough glass is to be provided for viewing the set	
Base fuel tank to be supplied & located inside the acoustic enclosure.	
The Acoustic enclosure parts will be powder coated after pre-treatment process. The common base frame will be epoxy painted with black shade in color	
Ease of access and serviceability	
Insulation conforms to UL94-HF1 class for flammability	

19.1.4 Base Frame:

Description	Compliance
The diesel engine & alternator shall be perfectly aligned & assembled on Sturdily fabricated adequately machined integral base frame made out of high-quality MS channels. The base frame shall be provided with lifting facility & predrilled foundation holes for installation on anti-vibration mounting (AVM pads).	

19.1.5 Starting:

Description	Compliance
Mode of starting: by electrical-12V (20 kVA, 1 phase) powered by DG cranking unit.	
Mode of starting: by electrical-12V (30 kVA, 3 phase) powered by DG cranking unit	
Mode of starting: by electrical-12V (45 kVA, 3 phase) powered by DG cranking unit	
<p><b><i>Extreme Cold Starting Kit: The cold starting kit should consist of engine oil heater, alternator heater, coolant heater with all necessary mounting hardware with a thermostat built in. All these heaters to be operated with 230V AC and 12/24V DC.</i></b></p> <p><b><i>When temperatures fall below an acceptable level (0 Deg C), the thermostat activates the heaters for the best generator starting</i></b></p>	

19.1.6 Fuel System

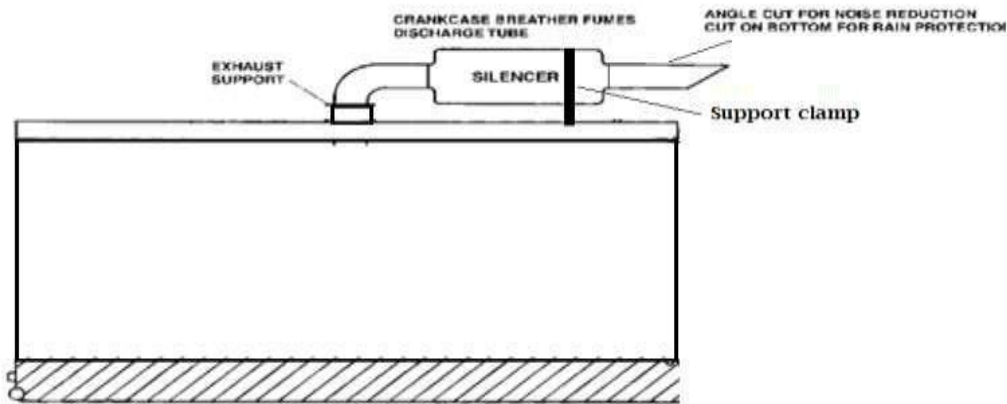
<b>External Fuel Tank: Capacity: 300 Ltrs</b>	Compliance
The tank shall be manufactured from carbon steel with thickness as U.L. Standard 142. The tank shall be externally coated with 2 layers of coatings. The prime layer using Red Oxide paint and the top layer using water proof plastic layer. Tank shall comply with the normal and emergency venting requirements NFPA 30. Tank shall carry a ten (10) years warranty including materials and workmanship. Fuel tank to have, lowest point drain facility for water and sludge, fuel level gauge direct mounted or remote electric, filler pipe and locking cap. Please see the picture of the fuel tank	
The tank shall be manufactured to support the following accessory equipment and shall be provided with suitably located lifting lugs	
- Direct Level Indicator: A steel pipe of suitable size shall protect the level indicating, the level indicator shall be made of plastic pipe connected through suitable valves and approved by the supervising engineer	
- Inspection Port Adapter Cap: Tank shall be equipped with a not less than 300 mm adaptor lockable cap for inspection and manual gauging of fuel level.	
- Tank Fill Opening: The tank shall be provided with a suitable sized filling opening that will minimize the oil spilling during tank filling operation	
- Vent Opening: The tank shall be provided with a suitable sized venting pipe to prevent the increase of gas pressure inside the tank. The vent opening should be covered with a wire mesh to prevent anything from entering and blocking the vent	
- Supply pipe connection	

- Drain Pipe Connection	
Drawings: The successful bidder should submit design drawings for the tank and fuel pipe distribution, location of fittings and accessories with specific dimensions, for approval prior to product fabrication.	

19.1.7 Earthing System:

Earthing Systems (make: LPI/ICON/Pragati/Equivalent)	Compliance
The generator body and the neutral must be connected to earth (2 earth pits to be supplied, 1 for body and 1 for neutral)	
Earthing set should be maintenance free chemical earthing where the earth resistance value to be achieved is less than 5 ohm per pit	

19.1.8 Silencer and Exhaust System:



The silencer and the exhaust system should be complied as per the specifications and picture shown above.

19.1.9 Cabling & Terminations:

Cabling & Terminations	Compliance
<p>Power cabling work from DG/AMF panel to the Shelter shall be carried out by the successful bidder as follows:</p> <ol style="list-style-type: none"> <li>Supply, install, testing and commissioning of 25 sq.mm, 2C, XLPE, armored aluminium conductor (20 mtrs length)...for 20 kVA, 1phase</li> <li>Supply, install, testing and commissioning of 35 sq.mm, 4C, XLPE, armored aluminium conductor (20 mtrs length)...for 30 kVA/45 kVA, 3 phase</li> <li>All end terminations to be carried out by crimping type aluminium / copper sockets.</li> </ol>	

19.1.10 Tests and Inspection

Sl.No	Description	Specification	Compliance
1	Rating at 0.8 p.f. 50 Hz	20 kVA, 230 V, 50 Hz	
	Rating at 0.8 p.f. 50 Hz	30 kVA, 415 V, 50 Hz	
	Rating at 0.8 p.f. 50 Hz	45 kVA, 415 V, 50 Hz	
2	Engine RPM at rated Power	1500	
3	Gross Engine BHP.	Suitable to deliver required alternator output of 16 KW, 24kW & 36 kW	
4	<b>Type of cooling</b>	Air cooled/Water cooled	
5	Typical Alternator Efficiency @ 100 % FL	>95%	
6	Direction Of Rotation (SAE Std) FW end	Clockwise	
7	Lube oil change period (HRS)	To be furnished	
8	Recommended Lube oil	To be furnished	
9	De-rating of the engine – Altitude, temperature, pressure	To be furnished	
10	If situation arises, the successful bidder must be in a position to dismantle the DG canopy, de-assemble the engine and alternator at site for ease of transportation and once it reaches at site, the canopy, DG engine and alternator must be capable enough to assemble and commission		
11	Factory inspection (If required): One month prior to delivery of the DG sets, the successful bidder must inform the BT's representative for carrying out the inspection and tests at the manufacturing unit. Besides, the DG sets shall also be inspected at the delivery house in Pling before they are being further transported at the designated locations. Load test at site on each set shall be for a minimum period of four (2Hrs.30mins). Fuel oil and all other consumable required for the test shall be supplied by the contractor.		
12	Cleaning debris and scraps from DG premises equipment and auxiliaries on completion of the entire installation.		

19.2 Training and Documents:

Sl.No	Description	Qty	Compliance
1	Training at site for each DG set	Two persons at free of cost	
2	Detail spare part catalogues & Price list to be submitted along with the DG set	Two Sets (Hard & soft copy)	
3	The successful bidder must submit the Operation, Maintenance & Trouble shooting Manual along with the DG sets for alternator, engine, AMF Panel with drawings/electrical wirings	Two Sets (Hard & soft copy)	
4	The successful bidder must submit the original factory test reports along the gensets	Two Sets (Hard & soft copy)	
5	The successful bidder must submit an installation, testing and commissioning forms (UAT forms) along the DG sets	Two Sets (Hard & soft copy)	
6	Must submit the local service engineers' CV along with the contact nos certified by the OEM.		
7	One A4 size water and weather proof BT's logo mentioning the customer/site details must be provided in each DG set		
8	<i>Authorization letter for the supply of DG sets from the OEM must be submitted at the time of submission of the bid. Also must have fully fledged local authorized service center (letter to be issued by OEM) for carrying out after sales support. Both the letters to be submitted at the time of submission of the bid, failing which the bid shall be liable for rejection.</i>		

19.3 Warranty Period

Warranty Period	Compliance
<i>Systems supplied shall be covered under a warranty period of not less than 12 months from the date of commissioning of the unit at site. All spare parts required to be replaced during the warranty period shall be under the supplier's Scope, irrespective of the types of issues with the Generator sets</i>	

19.4 Technical Specification of the AMF Panels (To be supplied along with the DG Sets). The brand should be internationally accepted brand.

The AMF Panels which can interface with DG-Grid-Battery. Automatic mains failure (AMF) panel should automatically switch to DG in the event of loss or failure of commercial power or with 48V DC system. Further, the AMF panel also should have both Mains and DG contactors either having wide range of coil operating voltage (150 – 250V AC) or should operate on DC voltage (40 – 60V DC).

Besides, the general operating parameters of the generator set are to be monitored using the state-of-



the-art technology. It shall have the facility like monitoring remotely at the NOC, metering and controlling of DG set using GPRS/Ethernet/RJ 45/GSM Modem/RS234/RS845, etc. The unit shall be environmentally sealed; solid state and microprocessor based and shall have following minimum features.

#### 19.4.1 Applications:

It should intelligently co-ordinates between available energy sources (grid, battery, DG) for keeping telecom loads in powered mode round the clock. In the event of mains failure or failure of any one phase of incoming mains voltage / frequency beyond the specified limits, the microprocessor controller will check the room temperature and system battery voltage. As long as the room temperature and system voltage is within the limit, the DG will not start and if either the voltage or temperature is above or below the threshold, the DG start signal will be given to start the generator set after a pre-set time. On firing of DG Set and built up of voltage which if within the specified limits of voltage & frequency, the output breaker / contractor shall be energized and power connected. Thus the AMF panel shall continuously monitor the quality of the incoming power and outgoing power of DG Set. Once the Mains power resumes/ stabilized within the set limits, the AMF panel shall trip the DG Set after disconnection of the DG output with the present time. The AMF panel shall have facility to operate the set under test, Auto, Manual mode.

Note: - AMF Panel should be able to operate within very wide input voltage range, i.e. between 150V – 300 V AC (single phase). A bypass switch for AMF panel should also be provided so that it can be used in case of malfunction of AMF panel.

-DG should start automatically when the battery voltage falls below threshold value (46 V DC) and should stop above threshold value (53 V DC) whichever is earlier.

The output of the AMF Panel should provide regulated power to the air conditioners and SMPS Chargers through static voltage regulator. Apart from these features like Auto Mains Failure (AMF), Power plant monitoring, AC and battery management facility provides the system a complete power solution to the user. The system not only provides common analog/digital inputs and outputs, but also does the DG control, fuel level monitoring, Temperature & Humidity Monitoring. Optional features such as Access control, Inventory data management, air-conditioner control, free cooling operations which will be added advantage for optimize the site running cost.

#### 19.4.2 Advanced Digital Controller of AMF Panel

#### 19.4.3 Standard Features

- a) Master switch: Control On/Off
- b) Event Log
- c) Remote two-wire start/stop capability
- d) One-source responsibility for generating system & accessories

- e) Automatic start with programmed cranking cycle
- f) Field software upgrade possibility
- g) Operating temperature: -20°C to 70°C (-4°F to 158°F)
- h) Storage temperature: -20°C to 70°C (-4°F to 158°F)
- i) Humidity: 0-95% condensing
- j) Control Panel
- k) Alternator to control panel connection with copper cable only MCCB/MCB details: with short circuit and overload protection. Output copper cable size (Sq. mm): 1 run/ph. Microprocessor based AMF control panel capable of extending Remote monitoring system GPRS/EDGE/WCDMA/LTE based generator for remote monitoring system.

19.4.4 Controller Information

LCD Display	LCD Display Faults	Display Warnings	Optional Accessories	Power Requirements
Runtime hours	High engine temperature	Low battery voltage	Battery charger 12 V	6 to 36 VDC with fuse protection
Engine speed	Low oil pressure	High battery voltage	Mains sensing relay	250 mA @ 12 VDC
Power factor KVAr	Overspeed / under speed	Low fuel level	Earth leakage protection	125 mA @ 24 VDC
Current	Over and under voltage	Maintenance alarm	VAF meter (multifunction)	
Voltage	Over and under frequency		kW-hr display	
Frequency	E-stop			
Engine temperature	Auxiliary fault			
Engine oil pressure	Low fuel level			
Battery voltage	Over load current			
Kilowatt & kVA	Phase reversal			
Fuel level (digital I/P)				

19.4.5 The AMF Panels should have the Remote Monitoring System facility with the following Modbus data on RS485 for Mains & DG Parameter with DG Alarm data for monitoring from Central Server.

SI No	Description	Modbus Address	Range
<b>Parameters</b>			
1	Mains Voltage	1061	0 to 720
2	Mains Frequency	1065	0 to 70
3	DG Voltage	1033	0 to 720

4	DG Frequency	1031	0 to 70
5	DG Power Factor	1555	-1 to +1
6	Load Current	1046	0 to 99999
7	DG Battery Voltage	1029	0 to 40
8	DG Fuel Level	1027	0 to 130
9	Engine Temperature	1025	-50 to 200
10	Engine Oil Pressure	1024	0 to 10000
11	Engine Speed	1030	0 to 6000
12	DG Run Hour	1799	0 to 4.29 x 10 <sup>9</sup> sec
13	DG Maintenance Due	1837	-2.14 x 10 <sup>9</sup> to +2.14 x 10 <sup>9</sup>
<b>DG Alarms</b>			
1	Emergency Stop	39426	0011 0000 0000 0000
2	Low Oil Pressure	39426	0000 0011 0000 0000
3	High Engine Temperature	39426	0000 0000 0010 0000
4	Engine Under Speed	39427	0011 0000 0000 0000
5	Engine Over Speed	39427	0000 0011 0000 0000
6	DG Low Frequency	39427	0000 0000 0010 0000
7	DG High Frequency	39427	0000 0000 0000 0010
8	DG Low Voltage	39428	0010 0000 0000 0000
9	DG High Voltage	39428	0000 0010 0000 0000
10	DG Low Battery	39428	0000 0000 0010 0000
11	DG High Battery	39428	0000 0000 0000 0010
12	DG Fail to Stop	39429	0000 0000 0010 0000
13	DG Fail to Start	39429	0000 0010 0000 0000
14	DG High Current	39431	0011 0000 0000 0000
15	Low Fuel Level	39435	0000 0011 0000 0000

19.5 BOM for Diesel Generators (20 kVA, 1phase) under Eastern Region

Sl.No	PC	Location	Qty
1	Lhuntse	Murmur	1 Set
2	Lhuntse	Jangchubling	1 Set
3	Mongar	Bainangzor	1 Set
4	Mongar	Barpang	1 Set
5	Mongar	Mongar Town	1 Set
6	Pemagatshel	Chungkhar	1 Set
7	Samdrupjongkhar	Nganglam Top	1 Set
8	Samdrupjongkhar	Tokaphu	1 Set
9	Samdrupjongkhar	Jangsa	1 Set
10	Samdrupjongkhar	Wangphu	1 Set
11	Samdrupjongkhar	Deothang Top	1 Set
12	Trashigang	Chaling	1 Set
13	Trashigang	Khalong	1 Set
14	Trashigang	Jomtshang	1 Set
15	Trashigang	Barshong	1 Set
16	Trashigang	Khaling Exge	1 Set
17	Trashigang	Ngangshing	1 Set
18	Trashiyangtse	Khitshang	1 Set

	<b>Total</b>	<b>18 Set</b>
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19.6 BOM for Diesel Generators (20 kVA, 1phase) under Western Region

Sl.No	PC	Location	Qty
1	Paro	Drugyel Dzong	1 Set
2	Paro	Drugyel High School	1 Set
3	Haa	Rangshigang	1 Set
4	Haa	Denchukha RS	1 Set
5	Punakha	Khuruthang	1 Set
6	Thimphu	Begana	1 Set
7	Thimphu	Bjemina	1 Set
8	Wangdue	Gaselo	1 Set
	<b>Total</b>		<b>8 Sets</b>

19.7 BOM for Diesel Generators (30 kVA, 3 phase) Western Region

Sl.No	PC	Location	Qty
1	Paro	Bondey	1 Set

19.8 BOM for Diesel Generators (45 kVA, 3 phase)

Sl.No	PC	Location	Qty
1	Mongar	Mongar Exge	1 Set

19.9 BOM for Portable Generator \_Western Region

Sl.No	PC	Specifications/Model	Qty	Remarks
1	Paro	5.5 kVA, 230V, Make	1 Set	To use during emergency
2	Thimphu	Honda, Model: EU70is	1 Set	
	<b>Total</b>		<b>2 Sets</b>	

19.10 BOM for Diesel Generators (20 kVA, 1 phase) Central Region

Sl.No	PC	Location	Qty
1	Sarpang	Shariphu (Singay)	1 Set
2	Gelephu	Dolungang	1 Set
3	Gelephu	Edi	1 Set
4	Trongsa	Bubja	1 Set
5	Trongsa	Ta Dzong	1 Set
6	Damphu	Gairigaon	1 Set
7	Damphu	Darechu	1 Set
8	Damphu	Dupidara	1 Set
	<b>Total</b>		<b>8 Set</b>

19.11 BOM for Diesel Generators (20 kVA, 1 phase) \_South Western Region

Sl.No	PC	Location	Qty
1	Phuntsholing	Wangdigatshel	1 Set
2	Phuntsholing	Pasakha	1 Set
3	Samtse	Gathiya	1 Set
4	Samtse	Dorokha	1 Set
	<b>Total</b>		<b>4 Set</b>