BHUTAN POWER CORPORATION LIMITED

(An ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified Company)

(Registered Office, Thimphu)

PROCUREMENT SERVICES DEPARTMENT

THIMPHU: BHUTAN

(**Tender No**:BPC/PSD/2021 Materials/2020/09 dated August 15, 2020)

BID DOCUMENT
FOR
The Supply and Delivery of Electrical Line & Substation Material.
(Package – A)

Procurement Services Department
Thimphu : Bhutan
Bhutan Power Corporations Limited

འབྲུག་གློག་མེ་ལས་འཛིན།།

Bhutan Power Corporation Limited

(An ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified Company)

Registered Office, Thimphu

Procurement Services Department

Thimphu: Bhutan

Invitation for Bids

Date: August 15, 2020

Tender No.: BPC/PSD/2021 Materials/2020/09

1. The *Procurement Services Department* invites sealed bids from eligible bidders for the supply and delivery of *Electrical Line & Substation Materials (Package –A).*
2. Interested eligible bidders may obtain further information on the bid form and inspect the bidding documents at the office of *General Manager, Procurement Services Department, Bhutan Power Corporation Ltd., Thimphu, Bhutan.*
3. A complete set of bidding documents can be purchased by any interested eligible bidder on the submission of written application to the above address on or before ***12:30 hours*** **on** ***15th September 2020*** and upon payment of non-refundable fee of **Nu. 2,000.00.**
4. Bidding documents can be also downloaded from the Purchaser's website but should register with the Purchaser on or before ***12:30 hours*** **on** ***15th September 2020*** after paying registration fee of **Nu. 200.00** (Ngultrum two hundred) only. The registration shall be done through written application together with the business license copy and tax clearance certificate to make the bid enforceable.
5. All bids must be accompanied by a bid security and must be delivered in accordance with the Instructions to Bidder on or before ***12:30 hours*** **on** ***15th September 2020*** and will be publicly open immediately thereafter.

Sl.#	Lot Description	Amount (Nu.)
1	ABC & AAAC Conductors	1,868,000.00
2	ACSR Conductors	125,000.00
3	XLPE Cables	230,000.00
4	PVC Cables	317,000.00
5	HV ABC Fittings	9,000.00
6	LV ABC Fittings	113,000.00
7	Energy Meter	607,000.00
8	CT Ring	24,000.00
9	Cable Jointing Kits and Cable Glands	48,500.00

Procurement Services Department * Thimphu : Bhutan * Bhutan Power Corporations Limited

10	Copper Wires	21,000.00
11	Paints	50,000.00
12	Transformer Spare Parts & Line Materials	28,000.00

6. *Procurement Services Department, Bhutan Power Corporation Ltd.* shall not be responsible for any costs or expenses incurred by bidders in connection with the preparation or delivery of bids.

Procurement Services Department * Thimphu : Bhutan * Bhutan Power Corporations Limited

(General Manager)

CHECKLIST FOR BID SUBMISSION

Sl #	PARTICULARS	Purchasers Requirement	Bidders to fill up
		YES/NO	YES/NO
1	Signed Bid Form and Price Schedule (BOQ)	**YES**	
2	Power of Attorney	**YES**	
3	Valid Trade License/ Manufacturing License	**YES**	
4	Manufacturer's authorizations	**YES**	
5	Document Establishing Eligibility of the Bidder	**YES**	
6	Documents establishing of the Bidders qualification to perform the contract	**YES**	
7	Documents establishing the goods' conformity to the bidding documents	**YES**	
8	Guaranteed Technical Particulars (GTP)	**YES**	
9	EMD drawn in favour of Director, Finance & Account Services, BPC, Thimphu, Bhutan.	**YES**	
10	Signed Integrity Pact	**YES**	
11	Signed Vendor Performance Management System (VPMS)	**YES**	
12	Joint Venture, Consortium or Association (JV/C/A) Partner Information Form (If applicable)	**YES**	

Procurement Services Department ★ Bhutan Power Corporations Limited ★ Thimphu · Bhutan

Phone: +975-2-325095 (Extn. No. 441); Fax: +975-2-333583; E-mail: psd@bpc.bt;

Section II. Bid Data Sheet (BDS)

<table>
<tr><th colspan="2">A. Introduction</th></tr>
<tr><td>ITB 1.1</td><td>The Tender No. is: BPC/PSD/2021 Materials /2020/09 dated August 15, 2020</td></tr>
<tr><td>ITB 1.1</td><td>The Tender Name is: Supply and Delivery of Electrical Line and Substation Materials (Package – A)</td></tr>
<tr><td>ITB 1.1</td><td>The Purchaser is: Procurement Services Department, Bhutan Power Corporation Limited, Yarden Lam, Post Box No. 580, Thimphu, Bhutan.</td></tr>
<tr><td>ITB 1.1</td><td>The number and identification of Lots comprising this tender are:
<table>
<tr><th>Lot No.</th><th>Lot Description</th></tr>
<tr><td>Lot 1</td><td>ABC & AAAC Conductors</td></tr>
<tr><td>Lot 2</td><td>ACSR Conductors</td></tr>
<tr><td>Lot 3</td><td>XLPE Cables</td></tr>
<tr><td>Lot 4</td><td>PVC Cables</td></tr>
<tr><td>Lot 5A</td><td>HV ABC Fittings</td></tr>
<tr><td>Lot 5B</td><td>LV ABC Fittings</td></tr>
<tr><td>Lot 6</td><td>Energy Meters</td></tr>
<tr><td>Lot 7</td><td>CT Ring</td></tr>
<tr><td>Lot 8</td><td>Cable Jointing Kits & Cable Glands</td></tr>
<tr><td>Lot 9</td><td>Copper Wires</td></tr>
<tr><td>Lot 10</td><td>Paints</td></tr>
<tr><td>Lot 11</td><td>Transformer Spare Parts & Line Materials</td></tr>
</table></td></tr>
<tr><th colspan="2">B. Bidding Documents</th></tr>
<tr><td>ITB 8.2</td><td>For <u>clarification of Bid purposes</u> only, the Purchaser's address is:
Attention: The General Manager.
Address: Procurement Services Department, Bhutan Power Corporation Limited, Yarden Lam, Post Box No. 580, Thimphu, Bhutan.
Telephone number: +975-2-326289
Electronic mail address: <u>nim.dorji@bpc.bt</u>
copy to: <u>psdbpc@gmail.com</u>, jamyangchoda@bpc.bt & <u>alkapradhan@bpc.bt</u></td></tr>
<tr><th colspan="2">C. Preparation of Bids</th></tr>
<tr><td>ITB 11.1</td><td>The language of the Bid is: English</td></tr>
<tr><td>ITB 2.1(h)</td><td>The bidders shall submit a signed Integrity Pact: Yes</td></tr>
<tr><td>ITB12.1 (j)</td><td>The Bidder shall submit with its Bid the following additional documents: None</td></tr>
<tr><td>ITB 15.1</td><td>Alternative Bids "shall not be" permitted.</td></tr>
<tr><td>ITB 16.5</td><td>The Incoterms edition is: 2010 edition.</td></tr>
<tr><td>ITB 16.6 (a) (i) &(ii)</td><td>The price shall be inclusive of all taxes and duties that are applicable both inside and outside the purchaser's country.</td></tr>
</table>

<table>
<tr><td>ITB 16.6(b) (i)</td><td>The price of the goods quoted shall be DDP (Delivery duty paid), RSD, Malbase/Pasakha (Place of destination). Notwithstanding any possible misinterpretation/ambiguity in interpretation, it is explicitly clarified that the offered prices shall be all inclusive covering all costs including but not limited to transportation, insurance, taxes and duties and any other costs for delivery of the materials to the Purchaser at the designated place of delivery/destination.</td></tr>
<tr><td>ITB 16.6(b) (ii)</td><td>Add "The Price quoted shall be inclusive of all the taxes and duties that are payable inside as well as outside purchaser country".</td></tr>
<tr><td>ITB16.6(b) (iii)</td><td>Final destination (Project Site) if relevant: Not Applicable.</td></tr>
<tr><td>ITB 16.7</td><td>The prices quoted by the Bidder "shall not" be adjustable.</td></tr>
<tr><td>ITB 19 (a)</td><td>Manufacturer's Authorization (MA)"is" required
<table>
<tr><th>Lot No.</th><th>Item Description</th><th>MA</th></tr>
<tr><td>1</td><td>ABC & AAAC Conductors</td><td>Yes</td></tr>
<tr><td>2</td><td>ACSR Conductors</td><td>Yes</td></tr>
<tr><td>3</td><td>XLPE Cables</td><td>Yes</td></tr>
<tr><td>4</td><td>PVC Cables</td><td>Yes</td></tr>
<tr><td>5A</td><td>HV ABC Fittings</td><td>Yes</td></tr>
<tr><td>5B</td><td>LV ABC Fittings</td><td>Yes</td></tr>
<tr><td>6</td><td>Energy Meters</td><td>Yes</td></tr>
<tr><td>7</td><td>CT Ring</td><td>Yes</td></tr>
<tr><td>8</td><td>Cable Jointing Kits & Cable Glands</td><td>Yes</td></tr>
<tr><td>9</td><td>Copper Wires</td><td>Yes</td></tr>
<tr><td>10</td><td>Paints</td><td>Yes</td></tr>
<tr><td>11</td><td>Transformer Spare Parts & Line Materials</td><td>Yes</td></tr>
</table>
a)The bid shall be rejected if the Manufacturer's Authorization is not submitted for which the Manufacturer's Authorization is required.

b) The brands (restricted/preferred) are mentioned in the price schedule and bidders are to quote accordingly. No alternative/ substitute brand shall be accepted and shall be considered as non-responsive.</td></tr>
<tr><td>ITB 19 (b)</td><td>After sales maintenance, repair, spare parts stocking and related services "are not" required, and the Bidder therefore "is not" required to be represented by a suitably equipped and able agent in Bhutan.</td></tr>
</table>

ITB 20.2 Guaranteed Technical Particulars (GTP) *is* required as follows:

Sl. No.	Item Description	Remarks
1	ABC & AAAC Conductors	*Yes*
2	ACSR Conductors	*Yes*
3	XLPE Cables	*Yes*
4	PVC Cables	*Yes*
5A	HV ABC Fittings	*Yes*
5B	LV ABC Fittings	*Yes*
6	Energy Meters	*Yes*
7	CT Ring	*Yes*
8	Cable Jointing Kits & Cable Glands	*No*
9	Copper Wires	*No*
10	Paints	*Yes*
11	Transformer Spare Parts & Line Materials	*No*

a) The minimum technical specification (where ever required) as indicated in price schedule are detailed out in respective Annexure for respective items under the lot. Any technical deviation shall be brought out in the GTP forms for the items where GTP forms are provided and for the items where GTP forms are not required, the deviation shall be brought out in the deviation sheet provided. If the deviations are not mentioned in GTP and deviation sheet provided, the specification shall be considered as complied with the requirement.

b) The bid for that item(s)/Lot(s) shall be rejected if the GTP is not submitted as specified in Section V, Schedule of Supply where GTP Forms are provided. The catalogue/brochures of the items shall not be considered as GTP of the item.

d) For the item(s)/Lot(s) of which GTP forms are not provided in Section V, Schedule of Supply of the bidding document, the bidders are requested to submit the catalogue or drawings for individual items. The offered items shall be clearly indicated in the catalogue.

ITB 21.1 The Bid validity period shall be *90 days* (i.e., till 14th December, 2020) from the date of bid opening.

ITB 22.1	The amount and currency of the Bid Security are as follows:

Sl.#	Item Description	Amount (Nu.)
1	ABC & AAAC Conductors	1,868,000.00
2	ACSR Conductors	125,000.00
3	XLPE Cables	230,000.00
4	PVC Cables	317,000.00
5A	HV ABC Fittings	9,000.00
5B	LV ABC Fittings	113,000.00
6	Energy Meters	607.000.00
7	CT Ring	24,000.00
8	Cable Jointing Kits & Cable Glands	48,500.00
9	Copper Wires	21,000.00
10	Paints	50,000.00
11	Transformer Spare Parts & Line Materials	28,000.00

Preferably Bid Security should be submitted for the individual lots. Combined Bid Security would be also accepted, however, if the combined Bid Security is not sufficient in terms of total amount, the offer for the entire quoted lots would be treated as non-responsive as per ITB 22.4 and not considered for further evaluation.

ITB 22.3	The Bid Security validity period shall be *120 days* from the date of bid opening (i.e., 13th January, 2021).
	D. Submission and Opening of Bids
ITB 23.1 and 24.1	In addition to the original of the Bid, the number of copies is: *One copy.*
ITB 24.3 (d)	The identification of this bidding process is: *BPC/PSD/2021 Materials /2020/09 dated August 15, 2020 (Supply and Delivery of Electrical Line and Substation Material – Package - A)*
ITB 25.1	For **Bid submission purposes** only, the Purchaser's address is: Attention: *The General Manager* Address: *Procurement Services Department, Bhutan Power Corporation Limited, Yarden Lam, Post Box No. 580, Thimphu, Bhutan.*
ITB 25.1	The deadline for Bid submission is: *Date: 15th September, 2020* *Time: 12:30 hours*
ITB 29.1	The Bid opening shall take place at: Address: *BPC Conference Hall, Bhutan Power Corporation Limited, Yarden Lam, Post Box No. 580, Thimphu, Bhutan.* *Date: 15th September, 2020* *Time: 14:00 hours*

<table>
<tr><th colspan="2">E. Evaluation and Comparison of Bids</th></tr>
<tr><td>ITB 37.1</td><td>Bid prices expressed in different currencies shall be converted into Ngultrum (BTN).

The source of exchange rates shall be as published by the Royal Monetary Authority of Bhutan.

The date for the exchange rates shall be the date of Bid Opening, as prescribed in ITB 29.1 and the exchange rate shall be TT selling rate.</td></tr>
<tr><td>ITB 38.1</td><td>A margin of five percent (5%) Domestic Preference "shall not" apply.</td></tr>
<tr><td>ITB 39.3 (a)</td><td>Bids will be evaluated on following basis:

<table>
<tr><th>Lot. No.</th><th>Item Description</th><th>Evaluation and award</th></tr>
<tr><td></td><td>ABC & AAAC Conductors</td><td>Lot wise</td></tr>
<tr><td></td><td>ACSR Conductors</td><td>Lot wise</td></tr>
<tr><td></td><td>XLPE Cables</td><td>Lot wise</td></tr>
<tr><td></td><td>PVC Cables</td><td>Lot wise</td></tr>
<tr><td></td><td>HV ABC Fittings</td><td>Lot wise</td></tr>
<tr><td></td><td>LV ABC Fittings</td><td>Lot wise</td></tr>
<tr><td></td><td>Energy Meters</td><td>Lot wise</td></tr>
<tr><td></td><td>CT Ring</td><td>Lot wise</td></tr>
<tr><td></td><td>Cable Jointing Kits & Cable Glands</td><td>Lot wise</td></tr>
<tr><td></td><td>Copper Wires</td><td>Lot wise</td></tr>
<tr><td></td><td>Paints</td><td>Lot wise</td></tr>
<tr><td></td><td>Transformer Spare Parts & Line Materials</td><td>Lot wise</td></tr>
</table>

Bids will be evaluated on lot/item bases as indicated above. A lot with an alternative item price shall be rejected and that lot shall not be considered for further evaluation.

For item wise evaluation, Bids will be evaluated for each item and the Contract will comprise the item(s) awarded to the successful Bidder. Items with alternative item price shall be rejected and that particular item shall not be considered for further evaluation. The bidders are required to quote all the sub- items under the item and missing of any sub-item shall be considered as non-responsive for the particular item.

In case some items are not quoted for a particular lot, the corporation reserves the right to cost load the highest responsive rate of other bidders for the purpose of evaluation of that lot if it was determined that the non-quoted items are not a major component of the lot or do not form an integral element of the lot. Actual order shall however be done based on the lowest rate that has been quoted in that bid package.</td></tr>
<tr><td>ITB 39.3 (e)</td><td>The adjustments shall be determined using the following criteria from amongst those set out in Section III, Evaluation and Qualification Criteria:

(a) Deviation in Delivery schedule: Yes.[Clause 2.2 of Evaluation Criteria (ITB 39.3 (e)]</td></tr>
</table>

	(b) Deviation in payment schedule: *No [Clause 2.3 of Evaluation Criteria (ITB 39.3 (e)]* (c) The cost of major replacement components, mandatory spare parts, and service: *No. The cost of spare components, mandatory spares and services if submitted by the Bidder shall not be taken into consideration during the evaluation.* (d) The availability in Bhutan of spare parts and after-sales services for the equipment offered in the Bid: *No* (e) The projected operating and maintenance costs during the life of the equipment: *No.* (f) The performance and productivity of the equipment offered: *Yes. The performance warranty period for the equipment offered will be 12 months from the date of receipt at the place of destination.*
ITB 39.6	Bidders *"shall not"* be allowed to quote separate prices for one or more items/lots. *[refer to Section III, Evaluation and Qualification Criteria for the evaluation methodology, if appropriate]*
F. Award of Contract	
ITB 45.1	The maximum percentage by which quantities may be increased is *20% percentage of the contract value.* The maximum percentage by which quantities may be decreased is *20% percentage of the contract value.*
ITB 47.1	The signing of Contract Agreement will take place at: Address: *Procurement Services Department, BPC, Yarden Lam, Post Box No. 580, Thimphu, Bhutan.*
ITB 47.2	The letter of acceptance must be accepted on or before: 10 (ten) days after the notification of award.

Section III. Evaluation and Qualification Criteria

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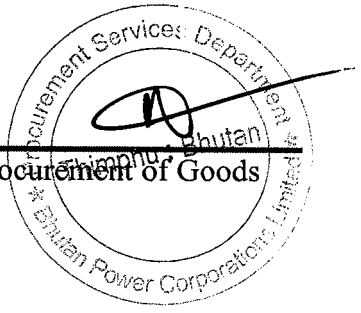
1. Domestic Preference (ITB 38)		
1.1	If the Bidding Data Sheet (BDS) so specifies, in comparing Bids, a margin of preference will be granted to Goods of Bhutanese Origin.	
1.2	For application of domestic preference, all responsive Bids will first be classified into the following three categories:	
	a.	*Category I:* Goods shall be considered to be of Bhutanese Origin based on the percentage of value addition as prescribed by the Ministry of Economic Affairs, Bhutan;
	b.	*Category II:* All other bids offering Goods manufactured in Bhutan;
	c.	*Category III:* Bids offering Goods manufactured outside Bhutan that have been already imported or that will be imported.
1.3	In the first step, all evaluated bids in each group shall be compared to determine the lowest bid in each group. Such lowest evaluated bids shall be compared with each other and if, as a result of this comparison, a bid from Category I or Category II is the lowest, it shall be selected for the award.	
1.4	If as a result of preceding comparison, the lowest evaluated bid is a bid from Category III, for the purpose of further comparison only, an upward five percent (5%) price adjustment will be made to the CIF/CIP/DDP bid prices of Category III bidders. The lowest evaluated bid determined from this last comparison shall be selected for the award.	
1.5	Bidders applying for the preference shall provide all supporting documents to prove that the Goods offered by them are from Category I and Category II respectively.	
2. Evaluation Criteria (ITB 39.3 (e))		
The Purchaser's evaluation of a Bid may take into account, in addition to the Bid Price quoted in accordance with ITB 16.6, one or more of the following factors as specified in ITB 39.3(e) and in the BDS referring to ITB 39.3(e), using the following criteria and methodologies.		
2.1	**Restricted Brands: As per price schedule and Bid Data Sheet [ITB 19(a)]**	
	BPC has adopted the policy of restricting certain Strategic Critical Items (SC-SKU's) as per the provision of the BPC Procurement Manual to ensure high quality, reduce inventory and to sustain long-term smooth operation and maintenance services. Bidders must ensure that for these lots, only the listed brand names are quoted and effort must be made to source this equipment directly from the manufacturers and or their authorized dealers. Preferred Brands/Restricted Brands are specified in Price Schedule.	
2.2	Delivery Schedule *(as per Incoterms specified in BDS)*	
	The Goods are required to be delivered in accordance with and completed as specified in the Section V, Schedule of Supply. No credit will be given to earlier completion. Bids offering late delivery schedules (LDS) will be accepted but the Bids shall be adjusted for the purpose of the bid evaluation only adding at the rate of @one (1) per cent of the bid price for each week of delay to the bid price. Bids offering delivery schedules beyond 1 (one) month of the date specified in Section V, Schedule of Supply shall be rejected.	
2.3	Adjustment for Deviations from the Terms of Payments	
	Deviation from terms of payment as specified in special condition of contract shall not be permitted. All bids deviating from specified terms of payment will be treated	

	as non-responsive.		
2.4	Contractual and Commercial Deviations		
	The cost of all quantifiable deviations and omissions from the contractual and commercial conditions shall be evaluated. The Purchaser will make its own assessment of the cost of any deviations for the purpose of ensuring fair comparison of Bids.		
3. Multiple Contracts (ITB 39.6)			
3.1	The Purchaser shall award multiple contracts to the Bidder that offers the lowest evaluated combination of Bids (one contract per Bid) and meets the post qualification criteria (this Section III, Sub-Section ITB 39.2, Post qualification Requirements)		
3.2	The Purchaser shall:		
	a.	Evaluate only items/lots that include at least the percentages of items per lot and quantity per item as specified in ITB 16.8.	
	b.	Take into account:	
		i.	The lowest-evaluated Bid for each lot; and
		ii.	The price reduction per lot and the methodology for its application as offered by the Bidder in its Bid.
4. Post qualification Requirements (ITB 41.2)			
4.1	After determining the lowest-evaluated Bid in accordance with ITB 40.1, If required, the Purchaser shall carry out the post qualification of the Bidder in accordance with ITB 41, using only the requirements specified. Requirements not included in the text below shall not be used in the evaluation of the Bidder's qualifications.		
	a.	Financial Capability The Bidder shall furnish documentary evidence that it meets the following financial requirement(s): *Not applicable*	
	b.	Experience and Technical Capacity The Bidder shall furnish documentary evidence to demonstrate that it meets the following experience requirement(s): *ISO Certificate; list of previous clients, relevant catalogues, test certificates, list of past performance certificates and manufacturer's profile for all new brands that are introduced in BPC.*	
	c.	The Bidder shall furnish documentary evidence to demonstrate that the Goods it offers meet the following usage requirement(s): *Not applicable*	



Section IV. Bidding Forms

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Bidder Information Form

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

Date: *[insert date of Bid submission: .....]*
Bid No.: *[.....]*

Page _____ of_ _____ pages

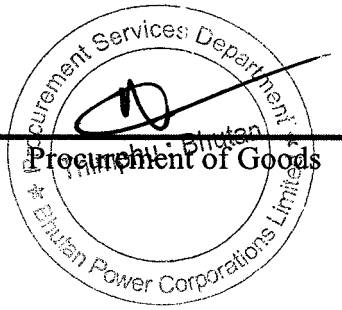
1. Bidder's Legal Name: .....
2. In the case of a Joint Venture, Consortium or Association (JV/C/A) legal name of each party: .....
3. Bidder's actual or intended Country of Registration: .....
4. Bidder's Year of Registration: .....
5. Bidder's Legal Address in Country of Registration: ....
6. Bidder's Authorized Representative Information Name: ..... Address: ..... Telephone/Fax numbers: ..... E-mail Address: .....
7. Attached are copies of the following original documents: *[check the box(es) of the attached original documents]* ☐ Registration of firm named in 1 above, in accordance with ITB 3.1. ☐ In the case of a JV, letter of intent to form the JV, or the JV agreement, in accordance with ITB 6.1 (e). ☐ Power of attorney authorizing the signatory of the Bid to sign on behalf of the Bidder.

Joint Venture (JV) Partner Information Form

[The Bidder shall fill in this Form in accordance with the instructions indicated below].
Date: *[insert date (as day, month and year) of Bid submission]*
Bid No.: *[insert number of bidding process]*

Page _____ of_ _____ pages

1. Bidder's Legal Name: *[insert Bidder's legal name]*
2. JV Party's legal name: *[insert JV Party's legal name]*
3. JV Party's Country of Registration: *[insert JV Party's country of registration]*
4. JV Party's Year of Registration: *[insert JV Party's year of registration]*
5. JV Party's Legal Address in Country of Registration: *[insert JV Party's legal address in country of registration]*
6. JV Party's Authorized Representative Information Name: *[insert name of JV Party's authorized representative]* Address: *[insert address of JV Party's authorized representative]* Telephone/Fax numbers: *[insert telephone/fax numbers of JV Party's authorized representative]* E-mail Address: *[insert e-mail address of JV Party's authorized representative]*
7. Attached are copies of the following original documents: *[check the box(es) of the attached original documents]* ☐ Articles of Incorporation or Registration of firm named in 2 above, in accordance with ITB 3:1. ☐ Copy of Agreement between JV Partners.



Bid 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]*
Invitation for Bid No.:..... *[insert number of IFB]*

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 No.:.....
.....*[insert the number and date of issue of each addendum]*;

(b) We offer to supply in conformity with the Bidding Documents and in accordance with the Delivery Schedules specified in 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 (d) below is:
.....
.....*[insert the Bid Price in words and figures, indicating the various amounts and their respective currencies]*;

(d) The discounts offered and the methodology 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 ***90 days*** from the date fixed for the Bid submission deadline in accordance with ITB (insert Sub-Clause21.1), 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 ITB (insert Clause 48 and GCC Clause 11) for the due performance of the Contract;

(g) We are not participating, as Bidders, in more than one Bid in this bidding process, other than any alternative offers submitted in accordance with ITB (insert Clause 15);

(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/A, and the nationality each subcontractor and supplier]*

(i) We have no conflict of interest pursuant to ITB (Insert Sub-Clause 3.2);

(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, in accordance with ITB (insert Sub-Clause 4.1);

(k) The following commissions, gratuities or fees have been paid or are to be paid with respect to the bidding process or execution of the Contract:..... *[insert complete name of each Recipient, its full address, the reason for which each commission or gratuity was paid and the amount and currency of each such commission or gratuity]*

Name of Recipient	Address	Reason	Amount
_____	_____	_____	_____
_____	_____	_____	_____

(If none has been paid or is to be paid, indicate "none.")

(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.

Signed: .....*[insert signature of person whose name and capacity are shown]*

In the capacity of ..... *[insert legal capacity of person signing the Bid Form]*

Name: .....*[insert complete name of person signing the Bid 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]*

DEVIATION SCHEDULE

The bidder shall specify below, in detail, all deviations from and exceptions to the Bid Document. Any entry shall be referenced to the Bid Document Clause No. To which they refer.

The Bidder shall be deemed to be complaint with the content and intent of the Bid Document except in respect of deviations and exception listed in this Schedule.

No deviation from and exception to the Bid Document shall be made subsequently to the Contract without the written approval of the Employer.

Clause No.	Details of Deviation/ Exception	Reasons for Deviation/ Exception

Declaration: This page and attached.....Pages of deviation from the Bid Document is a complete record of such deviation.
In case of NO DEVIATION is mentioned here and deviation of clauses/specification is mentioned elsewhere, then it will be taken as a deviation.

Signature of Bidder _____

Place & Date _____

Bid Security (Bank Guarantee)

[The Bank shall fill in this Bank Guarantee Form in accordance with the instructions indicated.]

_____

[insert Bank's Name, and Address of Issuing Branch or Office]

Beneficiary: _____ *[Name and Address of Purchaser]*

Date: _____

BID GUARANTEE No.: _____

We have been informed that *[insert name of the Bidder]* (hereinafter called "the Bidder") has submitted to you its Bid dated (hereinafter called "the Bid") for the execution of *[insert name of Tender]* under Invitation for Bids No. *[insert IFB number]* ("the IFB").

Furthermore, we understand that, according to your conditions, Bids must be supported by a Bid Guarantee.

At the request of the Bidder, we *[insert name of Bank]* hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of *[insert amount in figures]* (*[insert amount in words]*) upon receipt by us of your first demand in writing accompanied by a written statement stating that the Bidder is in breach of its obligation(s) under the Bid conditions, because the Bidder:

(a) has withdrawn its Bid during the period of Bid validity specified by the Bidder in the Form of Bid; or

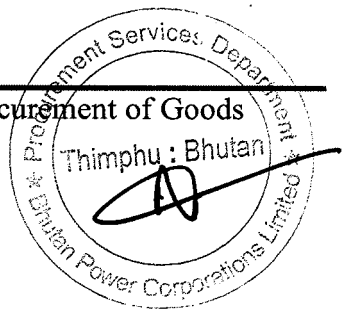
(b) having been notified of the acceptance of its Bid by the Purchaser during the period of Bid validity, (i) fails or refuses to execute the Contract ; or (ii) fails or refuses to furnish the Performance Security, if required, in accordance with the Instructions to Bidders.

This guarantee will expire: (a) if the Bidder is the successful Bidder, upon our receipt of copies of the contract signed by the Bidder and the Performance Security issued to you upon the instruction of the Bidder; or (b) if the Bidder is not the successful Bidder, upon the earlier of (i) our receipt of a copy of your notification to the Bidder of the name of the successful Bidder; or (ii) Thirty days after the expiration of the Bidder's Bid.

Consequently, any demand for payment under this guarantee must be received by us at this office on or before that date.

_____

[signature of authorized representative of the bank]



Manufacturer's Authorization

[The Bidder shall require the Manufacturer to fill in this Form in accordance with the instructions indicated. This letter of authorization should be on the letterhead of the Manufacturer and be signed by a person with the proper authority to sign documents that are binding on the Manufacturer. The Bidder shall include it in its bid, if so indicated in the ***BDS.****]*

Date: *[insert date of Bid Submission]*

Invitation for Bid No.: *[insert IFB number]*
Alternative No.: *[insert identification No if this is a Bid for an alternative]*

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

WHEREAS

We *[insert complete name of the Manufacturer]*, who are official manufacturers of *[insert type of Goods manufactured]*, having factories at *[insert full address(es) of the Manufacturer's factory/ies]*, do hereby authorize *[insert complete name of Bidder]* to submit a Bid in relation to the Invitation for Bids indicated above, the purpose of which is to provide the following Goods, manufactured by us, namely *[insert name and/or brief description of the Goods]*, and subsequently to negotiate and sign the Contract.

We hereby extend our full guarantee and warranty in accordance with the General Conditions of Contract, with respect to the Goods offered by the above firm.

Signed: *[insert signature(s) of authorized representative(s) of the Manufacturer]*

Name: *[insert complete name(s) of the authorized representative(s) of the Manufacturer]*

Title: *[insert title(s) of the authorized representative(s) of the Manufacturer]*

Duly authorized to sign this Authorization for and on behalf of *[insert complete name of the Bidder]*

Dated on the *[insert number]* day of *[insert month], [insert year]*.

INTEGRITY PACT

1 General:

Whereas Nim Dorji, *General Manager, Procurement Services Department* representing the *Bhutan Power Corporation Limited*, Royal Government of Bhutan, hereinafter referred to as the **"Employer"** on one part, and …… representing ……., hereinafter referred to as the **"Bidder"** on the other part hereby execute this agreement as follows:

This agreement shall be a part of the standard bidding document, which shall be signed by both the parties at the time of purchase of bidding documents and submitted along with the tender document. This IP is applicable only to "**large**" scale works, goods and services, the threshold of which will be announced by the government from time to time. The signing of the IP shall not apply to framework contracting such as annual office supplies etc.

2 Objectives:

Whereas, the Employer and the Bidder agree to enter into this agreement, hereinafter referred to as IP, to avoid all forms of corruption or deceptive practice by following a system that is fair, transparent and free from any influence/unprejudiced dealings in the **bidding process**[1] and **contract administration**[2], with a view to:

2.1 Enabling the Employer to obtain the desired contract at a reasonable and competitive price in conformity to the defined specifications of the works or goods or services; and

2.2. Enabling bidders to abstain from bribing or any corrupt practice in order to secure the contract by providing assurance to them that their competitors will also refrain from bribing and other corrupt practices.

3. Scope:

The validity of this IP shall cover the bidding process and contract administration period.

4. Commitments of the Employer:

The Employer Commits itself to the following:-

4.1 The Employer hereby undertakes that no officials of the Employer, connected directly or indirectly with the contract, will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favor or any material or immaterial benefit or any other advantage from the Bidder, either for themselves or for any person,

[1] Bidding process, for the purpose of this IP, shall mean the procedures covering tendering process starting from bid preparation, bid submission, bid processing, and bid evaluation.

[2] Contract administration, for the purpose of this IP, shall mean contract award, contract implementation, un-authorized sub-contracting and contract handing/taking over.

organization or third party related to the contract in exchange for an advantage in the bidding process and contract administration.

4.2 The Employer further confirms that its officials shall not favor any prospective bidder in any form that could afford an undue advantage to that particular bidder in the bidding process and contract administration and will treat all Bidders alike.

4.3 Officials of the Employer, who may have observed or noticed or have reasonable suspicion shall report to the head of the employing agency or an appropriate government office any violation or attempted violation of clauses 4.1 and 4.2.

4.4 Following report on violation of clauses 4.1 and 4.2 by official (s), through any source, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings shall be initiated by the Employer and such a person shall be debarred from further dealings related to the bidding process and contract administration.

5. Commitments of Bidders

The Bidder commits himself/herself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of the bidding process and contract administration in order to secure the contract or in furtherance to secure it and in particular commits himself/herself to the following :-

5.1 The Bidder shall not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the Employer, connected directly or indirectly with the bidding process and contract administration, or to any person, organization or third party related to the contract in exchange for any advantage in the bidding process and contract administration.

5.2 The Bidder shall not collude with other parties interested in the contract to manipulate in whatsoever form or manner, the bidding process and contract administration.

5.3 If the bidder(s) have observed or noticed or have reasonable suspicion that the provisions of the IP have been violated by the procuring agency or other bidders, the bidder shall report such violations to the head of the procuring agency.

6. Sanctions for Violation:

The breach of any of the aforesaid provisions shall result in administrative charges or penal actions as per the relevant rules and laws.

6.1 The breach of the IP or commission of any offence (forgery, providing false information, mis-representation, providing false/fake documents, bid rigging, bid steering or coercion) by the Bidder, or any one employed by him, or acting on his/her behalf (whether with or

without the knowledge of the Bidder), shall be dealt with as per the terms and conditions of the contract and other provisions of the relevant laws, including De-barment Rules.

6.2 The breach of the IP or commission of any offence by the officials of the procuring agency shall be dealt with as per the rules and laws of the land in vogue.

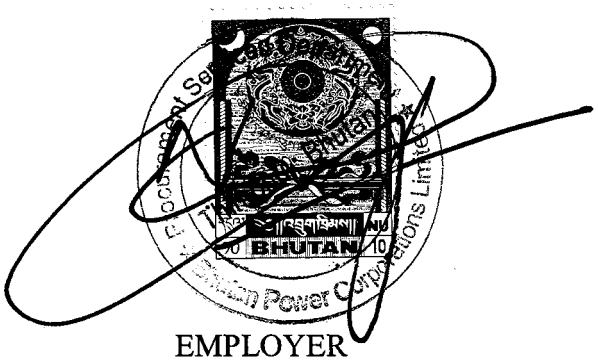
7. Monitoring and Administration:

7.1 The respective procuring agency shall be responsible for administration and monitoring of the IP as per the relevant laws.

7.2 The bidder shall have the right to appeal as per the arbitration mechanism contained in the relevant rules.

We, hereby declare that we have read and understood the clauses of this agreement and shall abide by it.

The parties hereby sign this Integrity Pact at _____ on _____.



Affix Legal Stamp

EMPLOYER

CID : 1 1 9 0 4 0 0 1 6 5 4

Witness: _____

Name: Alka Pradhan

CID : 1 1 2 0 3 0 0 0 3 0 4

BIDDER/REPRESENTATIVE

CID : | | | | | | | | | | | |

Witness: _____

Name:

CID : | | | | | | | | | | | |

VPMS Acceptance 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.]

WHEREAS MESSRS (Insert the name of bidder)_____--_____
(hereinafter called "the Bidder") License No._____ having our registered office at_____ has submitted its bid dated _____.

We hereby agree to abide by the Vendor Performance Management System of BPC or do affirm as follows.

1. We have read and understood all provisions set in the Vendor Performance Management System (VPMS) and we have no reservations to the VPMS document included in the Bidding Documents.

2. We agree to abide by all the provision of VPMS.

3. If our bid is accepted, we agree to be assessed as per the vendor rating methodology adopted by Bhutan Power Corporation Limited.

4. Depending on our performance, we accept the rating of Vendor Performance Index issued and any action taken by Bhutan Power Corporation Limited pursuant to the VPMS.

5. We shall be liable for any breach of this undertaking and non- compliance to the provisions of VPMS.

(Signature of Bidder)

Date:

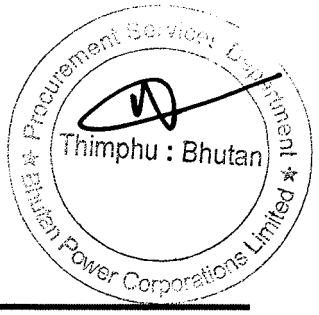
(Signature of witness)

Date:

Address:

Contact No.:

PART 2- Supply Requirement



Section V. Schedule of Supply

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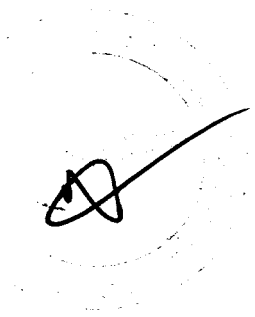
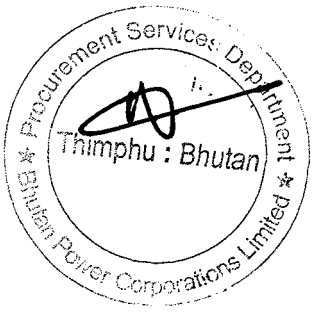


1. Delivery and Completion Schedule

a. The delivery period shall commence from the date of signing contract.

Lot No.	Lot Description	Required Arrival Date of Goods or Completion Date for Related Services
Lot 1	*ABC Conductors*	120 days from the signing of contract
Lot 2	*ACSR Conductors*	120 days from the signing of contract
Lot 3	*XLPE Cables*	120 days from the signing of contract
Lot 4	*PVC Cables*	120 days from the signing of contract
Lot 5A	HV ABC Fittings	120days from the signing of contract
Lot 5B	LV ABC Fittings	120days from the signing of contract
Lot 6	Energy Meter	150 days from the signing of contract
Lot 7	CT Ring	150 days from the signing of contract
Lot 8	Cable Jointing Kits & Cable Glands	120 days from the signing of contract
Lot 9	Copper Wires	90days from the signing of contract
Lot 10	Paints	90 days from the signing of contract
Lot 11	Transformer Spare parts & Line Materials	120 days from the signing of contract

Location / Destination as specified in BDS –Shall be RSD, Stores at Malbase, Pasakha and Phuentsholing



2.Technical Specifications and Drawings

Table of Content

Note: Serial no. 7 (Table of guaranteed technical particulars -Bidders to fill up), and serial no 8 (Price Schedule) are enclosed at the end of the bidding document for convenience.

Section I - Common Technical Requirements

1.1 General

In the following sections, this document describes equipment required for the tender. The common technical specifications are to mainly state the general requirements commonly applied for all the Packages. If there is any discrepancy in the requirements between the General Specifications and the Technical Specifications in this Section, the requirements mentioned in Technical Specifications shall prevail.

1.2 Scope of Work

The supply contract includes the design, manufacture, testing, insurance, delivery in complete form (assembly at warehouse if required) unloading and proper handing over the supplies to the Purchaser's Warehouse at Phuentsholing/Pasakha, Bhutan, of the Equipment as specified in the Price Schedule.

All necessary foundation bolts, rag bolts, nuts and washers, grouting packing and the like required for mounting and securing the equipment/assemblies should be included in the supply.

Bidders shall furnish guaranteed particulars in the Schedules enclosed. Drawings of all components shall be provided together with the equipment type and reference number to ensure their identification.

The unloading of the goods (items) in the purchaser's warehouse shall be in the scope of the suppliers.

1.3 Units of Measurement

Metric units of measurement (System International) shall be used on all Contract documentation. Angular measurement shall be in degrees with 90 degrees comprising one right angle.

1.4 Standards

The design material, construction, manufacture, inspection and testing of all equipment supplied under this Specification shall conform to the latest editions of the International Electro-technical Commission (IEC) Specifications and other international standards where the material is not covered by IEC. Other national or international standards are accepted if they promise to confer equal or superior quality and performance than IEC or the specified standards.

The Supplier shall provide to the Purchaser, English language copies of any Standards and Codes of Practice, which the Supplier wishes to use. The Supplier shall provide English language translations of any Standards and Codes of Practice which the Supplier wishes to use and which are in a language other than English.

1.5 Language

The English language shall be used on all Contract documents, drawings and calculations and in all correspondence between the Supplier and the Purchaser. Any documents and drawings submitted by the Supplier in the language other than English to the Purchaser will be returned to the Supplier without review by the Purchaser.

1.6 Site Conditions

1.6.1 The conditions for the design of the equipment are as follow:

Basic Design Parameters	**Basic Design Value**
Altitude	2400 metres
Ambient Air Temperature : minimum Maximum	-10°C +40°C
Average Annual Isokeraunic Level	75 thunderstorm days
Average Annual Rainfall & Period	1400 mm (May to September)
Climate	Varied (From tropical to severe winters)
Relative Humidity	20 – 100%
Seismic Acceleration : Horizontal Vertical	0.1 g 0.05 g
Snow Incidence and period	150 –300 mm (December to March)
Wind Pressure : Conductors Towers, Supports	45 kg/m^2 195 kg/m^2

1.6.2 Special Conditions

The equipments under this tender shall be designed for 2400m and accordingly shall the equipment/components shall be altitude corrected to 2400m.

1.7 Electrical Design Parameters

The electrical parameters of the equipments in accordance with relevant IEC and IS standards for 33kV and below are shown in following tables.

Medium Voltage

Nominal System Voltage	**kV**	**33**	**11**	**6.6**
Nominal System Frequency Hz		50	50	50
Maximum System Voltage	kV	36	12	7.2
Rated Impulse withstand voltage (Peak)	kV	170	75	60
Rated one minute power frequency withstand voltage (rms)	kV	70	28	20
Rated one second short time current (rms)	kA	16	20	20

Rated short circuit withstand current (peak)	kA	40	50	50
Creepage Distance	(mm/kV)	25	25	25

Low Voltage

Insulation parameters- Low Voltage

Nominal System Voltage	**V**	**400/230**
Nominal System Frequency	Hz	50
Maximum System Voltage	V	424/244[1]
Rated one minute power frequency withstand voltage (rms)	V	3000
Rated impulse withstand voltage (peak)	kA	7500

Note 1: Phase to Phase / Phase to Neutral

System Variation

Parameters permissible at 75 °C		**Variation**
Voltage Regulation of MV System	33,11,6.6 kV	±10%
Voltage Regulation of LV System	400/230 V	±6%
System Frequency	50 Hz	-2%, +1% [1]
Parameters permissible at 75 °C		Variation

Note 1: Maintain the System frequency between 49.0-50.5Hz.

1.7.1De-rating

Since various standards or recommendations enforce validity limits on device characteristics, therefore the values mentioned in this specification are for the normal condition of use i.e. below 1000 m. Beyond these limits, it is necessary to deduce certain values, in other words to de-rate the device. De-rating must be considered;

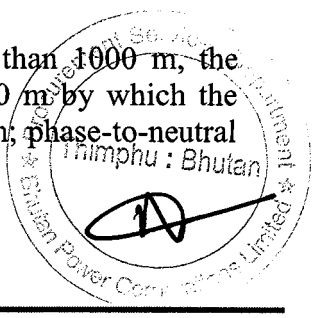
- For insulation level of external insulation.
- For electrical clearances of two conductive parts measured through air.

1.7.2 Basic Insulation Level (BIL) De-rating According to Altitude

For installation at an altitude higher than 1000 m, the correction method recommended in IEC 60694 is convenient to use for purpose of the determination of withstand test voltages.

1.7.3 Electrical Clearance De-rating According to Altitude

If the equipment is specified for operation at an altitude higher than 1000 m, the clearance requirements shall be increased by 1.25% for every 100 m by which the altitude exceeds 1000 m. Requirements are given for phase-to-earth, phase-to-neutral and phase-to-phase clearance.



1.8 Spare Parts, Tools and Appliances

The bidder shall attach the spares, special tools and/ or appliances which are recommended.

The Purchaser may order all, none or any of the recommended items. Those ordered shall be delivered not later than the date of receipt of the last shipment of the associated item of plant. The price of the items shall be subject to the same price conditions as the associated item of plant.

All spares shall be interchangeable with the original parts. They shall be treated and packed for long term storage under the climatic conditions of site.

Each item shall be clearly and permanently labelled on the outside of its container with its description and purpose. When several items are packed in one case, a general description of the contents shall be given on the outside of the case. Spare parts shall not be shipped in the same cases as components, which are used for erection. The cases shall be clearly labelled to indicate that they contain spare parts or tools and each tool or appliance shall be clearly marked with its size and purpose.

All case containers or other packages are liable to be opened for inspection and checking on site.

The cost of recommended spares, special tools (other than those specified in the BOQ) will not be taken into consideration when comparing bids.

1.9 Electrical Power Supplies

a) Power Supplies

Power supplies for plant and equipment shall be:

i. 400 V, 3 phase, 4-wire, 50 Hz for power.
ii. 230 V, 1 phase, 50 Hz for lighting, indication, and anti-condensation heaters.

48/110 V DC for relays, essential indication, CB spring charging, controls/ protection, alarms, CB tripping and closing.

b) Miniature Circuit Breakers

Means shall be provided for protection and isolation of circuits associated with protection, control and instruments. They shall be of approved type and grouped, as far as possible, according to their functions. They shall be clearly labelled both on the panels and the associated wiring diagrams.

Miniature circuit breakers shall be of the thermal and magnetic tripping type, and comply with IEC 60898 and IEC 60947-2.

c) Instruments

All electrical instruments and meters shall comply with IEC 60051 and IEC 61010 and, unless otherwise specified, shall be of industrial grade accuracy. Three-phase power

measuring instruments shall be of the three-phase unbalanced load pattern wherever the current and Voltage references permit. Energy meters shall be three phase four wire having maximum demand indicator, RS485 port and optical port.

All indicating and recording instruments shall be flush mounted in dust proof cases complying with IEC 60068 and dimensions to IEC 61554.

The size of all indicating instruments shall be 96 mm square with long scale and instruments supplied from transducers shall have 4-20 mA movements. Running hour meters shall have 6 digit cyclo-meter type indicators.

Instrument dials shall be white with black markings. A red line shall be drawn on each scale to represent rated conditions. Bezels shall have uniform semi-gloss black high-grade finish.

The movements of all electrically actuated instruments shall be of the deadbeat type. Instruments shall be provided with a readily accessible zero adjustment wherever possible.

d) Terminals

Moulding materials shall be self-extinguishing or resistant to flame propagation, substantially non-hygroscopic and shall not carbonise when tested for tracking. The insulation between any terminal & framework or between adjacent terminals shall withstand a test of 2 kV rms. for one minute. The mouldings shall be mechanically robust to withstand handling while making terminations.

All terminals shall be mounted in accessible positions. Adjacent terminals shall be adequately spaced with respect to each other and to the incoming cable gland plate. Separate terminations shall be provided on each terminal strip for the cores of incoming and outgoing cables including all spare cores.

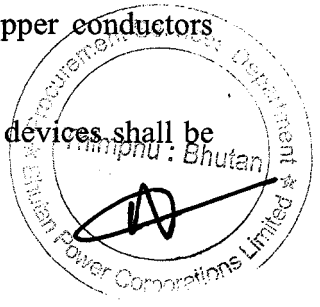
Terminal blocks for CT and VT secondary leads shall be provided with test links and isolating facilities. Terminals provided for current transformers shall incorporate facilities to enable secondary windings to be short-circuited without disturbing fixed wiring and earthing facilities.

Terminations for circuits operating at Voltages greater than 60 V shall be protected by transparent insulating covers marked with the working Voltages.

DC circuit terminals shall be segregated from AC terminals.

Unless otherwise specified, all the terminal blocks except the terminal blocks for CTs shall be suitable for connecting minimum two 2.5 sq.mm copper conductors of the external cables at each connecting point. The terminal blocks for CTs and PTs shall be suitable for connecting minimum of 4.0 sq. mm and 2.5 sq. mm copper conductors respectively.

All spare contacts and terminals of the panel mounted equipment and devices shall be wired to terminal blocks.



The terminal assemblies shall give the required number of ways plus 20% spare with a minimum of 5 terminals. These shall be uniformly distributed on all rows of terminal blocks.

e) Panel Wiring

All wiring shall be carried out with 1100 V grade, single core, stranded copper conductor wires with FRLS PVC insulation and shall be Vermin, rodent proof. The minimum size of the stranded copper conductor used for panel wiring shall be as follows:

a) All circuits except CT circuits : 1.5 mm2 per lead.
b) CT Circuit : 2.5 mm2 per lead.

The minimum number of strands per conductor shall be seven. Extra flexible wires shall be used for wiring of devices mounted on moving parts such as swinging panels and doors.

The wiring shall be bound and supported by clamping, roughing or lacing. Spiral wrapping will not be accepted. Wire ways shall not be more than 50% full. Adequate slack wire shall be provided to allow for one re-stripping and reconnection at the end of each wire. When screened cables or wires are necessary, an insulating sheath shall be included.

Wiring and supports shall be of fire resistant material.

Wiring shall only be jointed or teed at terminals. Terminals of the clamp type shall not have more than two wires connected.

f) Wire Colour Code

Wire colours shall be as follows:

Colour	Purpose
Red	R-phase connections in current and Voltage transformer circuit only
Yellow	Y-phase connections in current and Voltage transformer circuits only
Blue	B-phase connections in current and Voltage transformer circuits only.
Green with Yellow Stripes	Connections to earth
Black	AC neutral connections, earthed or unearthed, connected to the secondary circuits of current and Voltage transformers.
Any other Colours	AC connections other than those above.

Alternatively, where equipment is wired in accordance with a manufacturer's standard diagram, wiring may be carried out in a single colour except that all connections to earth shall be green with yellow stripes.

g) Terminations and Ferrules

The ends of every wire and every cable tail shall be fitted with numbered ferrules of white with alpha numbers clearly engraved in black.

Moisture and oil resisting insulating material shall be used. The ferrules shall be of the interlocking type and shall grip the insulation firmly.

Wires and terminals associated with tripping circuits shall be distinctively marked.

h) Electrical Insulation

Insulating materials shall be finished to prevent deterioration of their qualities under the specified working conditions.

Plastics, elastomers, resin-bonded laminates and inorganic materials shall be of suitable quality selected from the grades or types in the appropriate IEC Standard.

All cut or machined surfaces and edges of resin-bonded laminates shall be cleaned and then sealed with an approved Varnish as soon as possible after cutting.

i) Electronic and Control Equipment

Equipment shall be capable of withstanding randomly phased transient over-voltages of either polarity on the power supply or interruptions of the power supply without damage or impairment to the equipment's subsequent performance. In the case of controls, no mal-operation shall occur.

Where manufacturers require that electronic equipment supplied under this Contract should not be subjected to insulation resistance tests ("Meggering"), suitable warning notices shall be provided and installed in appropriate locations.

No thermionic valves shall be used in the equipment. Wherever possible, integrated circuits shall be used.

It shall be possible to remove/replace card from/to electronic equipment without damage and without interfering with the operation of the rest of the equipment or system. If necessary, consideration should be given to switching off the supplies locally to a card to prevent inadvertent interference to the equipment or system during removing/replacing a card.

j) **Alternating Current Supply Practice**

Double-pole switches shall be used to break single-phase ac mains supplies. For multi-phase supplies, each phase shall be switched simultaneously and the neutral should

preferably not be switched. If it is switched, it shall be opened after and closed before the phase-lines.

All mains circuits shall be protected only in the phase-lines by MCBs of suitable rating or by other suitably approved protective devices. The neutral shall be connected by a removable link located near the protective devices.

All main transformers shall have an electrostatic screen, which shall be earthed.

k) Direct Current Supply Practice

Double pole switches shall be used to break dc supplies, one pole for the positive line and one pole for the negative.

DC circuits shall be protected by MCBs of suitable rating installed in both positive and negative lines.

Measures shall be taken to prevent arcing across switches or relay contacts which are required to break inductive circuits (e.g. bypass diodes or capacitors connected across coils).

Power supply bus bars in cubicles shall be shrouded.

The duplicate auxiliary power supply feeders shall be provided in Control panels. Auto-changeover facility in DC DB shall be provided so that in case of failure of one power source, other shall cut in automatically. The protective relays shall not give a trip signal for momentary loss of control Voltage or during changeover of control Voltage.

l) Batteries

Electronic equipment shall not use local internal batteries unless the approval has been obtained. Where approval is given, batteries used inside equipment shall be of the totally sealed, leak-proof type.

m) Earthing

Provision shall be made for earthing all equipment intended for connection in an ac mains supply.

All structural metal work and metal chassis shall be connected to earth. Earthing conductors shall be at least equal in cross-sectional area to the supply conductors and shall be capable of carrying the fault current for 1 second.

n) Anti-Condensation Heaters

Any items of electrical equipment which are liable to suffer from internal condensation (due to atmospheric or load variations) shall be fitted with heating devices suitable for electrical operation at 230 Volts ac, 1 phase, 50 Hz of sufficient capacity to raise the internal ambient temperature by 5°C. The electrical apparatus so protected shall be designed so that the maximum permitted rise in temperature is not exceeded if the

heaters are energised while the apparatus is in operation. Where fitted, a suitable terminal box and control switch shall be provided and mounted in an accessible position. A thermostat shall be provided in the heater control circuit to cut-off the heater at 45° C.

o) Interior lighting and Receptacles

The panels shall be provided with a compact fluorescent lamp (CFL) lighting fixture (11 W) rated for 240 V, 1 phase, 50 Hz supply for the interior illumination of the panel during maintenance. Switching of the fitting shall be controlled by the respective panel door switch. All CFL lamps shall be with pin type holder.

The panels shall be provided with a 230 V, 1 phase, 50 Hz, 6 Amps, 3 Pin receptacle with switch. The receptacle with switch shall be mounted inside the panel at a convenient location.

1.10 Materials and Finishes

1.10.1 General

Unless otherwise provided for in the Contract, all materials, fixtures, fittings, and supplies furnished (hereafter called "materials") shall be new and of standard first grade quality. All assembly and construction work shall be done in a neat and professional manner. Materials shall be free of defects. Materials shall be brought to site only after inspection and issuance of proper dispatch clearance. The dispatch clearance shall be issued within three working days after the inspection from the BPC head office. The local materials like bricks, sand aggregates shall be tested in the local laboratories before bulk supply.

All of the plant, whether temporary or permanent, shall be in accordance with the Contract with respect to character, type, construction, constituent substances, weight, strength, shape, dimensions, etc.

In choosing materials and their finishes, due regard shall be given to the harsh climatic conditions which can occur in the area. Some relaxation of the following provisions may be permitted where equipment is hermetically sealed, but weatherproof materials should be used wherever possible.

All structural members, nuts and bolts shall be galvanised and shall conform to the requirements.

1.10.2 Surface Coating and Galvanising

All ferrous metalwork shall be provided with an effective galvanised or corrosion resistant paint treatment applied in accordance with the best trade practice. The paint treatment for each application shall be selected from the 'Paint Procedure' described in subsequent paragraphs.

The formulation and application procedure for the paint shall be as recommended by the manufacturer for the appropriate exposure conditions.

Coatings shall not be applied before vessels and chambers have passed any required pressure or vacuum tests. Precautions shall be taken to prevent corrosion occurring in the period of time between cleaning of the steel and commencing the painting.

Adequate amounts of each type and colour of finish coat as applied to the major equipment items shall be provided for "touch-up" purposes.

The colour of equipment shall be painted with RAL 7032 (exterior) and glossy white (interior).

1.10.3 **Paint Procedure**

(a) For Mild Steel Items Exposed to Weather:
  (i) Blast clean.
  (ii) 1st coat - Inorganic zinc primer to give a dry film build of not less than 75 microns.
  (iii) 2nd coat - Chlorinated Rubber to give a dry film build of not less than 100 microns.
  (iv) 3rd coat - Chlorinated Rubber to give a dry film build of not less than 75 microns.

(b) Mild Steel Items Immersed in Oil :
  (i) Blast clean.
  (ii) 1st and 2nd coats - Epoxy paint treatment system in accordance with coating manufacturer's recommendation for oil immersion.
  (iii) Total dry film build thickness shall not be less than 350 microns.

1.10.4 **Galvanising**

Galvanising shall be applied by the hot dipped process generally in accordance with ASTM A 123-78 for structural steel and ASTM A 153-73 for iron and steel hardware.

For structural steel, galvanising shall average not less than 0.61 kg/m^2 (no individual specimen shall show less than 0.55 kg/m^2) except for 6.35 mm and heavier materials in which case galvanising shall average not less than 0.702 kg/m^2 (no individual specimen shall show less than 0.61 kg/m^2).

For iron and steel hardware, galvanising shall be in accordance with Table 1 of ASTM A 153-73.

The zinc coating shall be smooth, clean, of uniform thickness and free from defects. The preparation for galvanising and the galvanising itself shall not adversely affect the mechanical properties of the coated material.

1.10.5 **Castings**

All castings shall be free from blowholes, flaws and cracks as far as is practicable. No welding, filling or plugging of defective parts shall be done under any circumstances. All cast-iron shall be of close-grained quality approved by the Engineer.

1.10.6 **Welding**

All joints shall be bolted joints and welded joints shall not be permitted either during the design stage or the construction stage. However, during erection in case of additional unforeseen requirements by the Employer, if welding needs to be resorted to, the same shall be done with prior approval of the Engineer, and shall conform to BIS specifications. In such a case, the Contractor shall specifically indicate the location and purpose along with the proposed methodology for welding for the Engineers' approval. The wielding shall be carried out by a certified welder who have undergone minimum of certificate level training in this trade.

1.10.7 **Nuts and Bolts**

Nuts and bolts for incorporation in the plant shall conform to ISO Metric. Other sizes or threads may be permitted only for threaded parts not to be disturbed once manufacturing is complete. Each bolt shall have rolled threads, one hexagonal nut and two washers. Thread length shall be 50 percent of bolt length or maximum 150 mm.

All steel bolts and screwed rods shall be galvanised including the threaded portions. All associated nuts shall be galvanised with the exception of the threads which shall be oiled. The thickness of zinc coating shall be not less than 0.45 kg/sq. metre of surface area.

All bolts, nuts and washers shall be of non-corroding material where they are in contact with non-ferrous parts in conductor clamps and fittings and elsewhere where specifically required by the Purchaser.

1.11 Packing and Shipping

1.11.1 Thegoods/materials shall not be shipped/ dispatched unless dispatch clearance from Purchaser/Engineer is issued. The dispatch clearance will be issued from the BPCs office after the inspectors submits its inspection report to BPC, within 4 working days after the submission of the report.

1.11.2 Any items liable to be damaged in transit shall be effectively protected and securely fixed in their cases. All cases of over 2 tonnes shall be marked to show where slings should be placed.

1.11.3 All cases shall be clearly identified giving particulars of manufacturer's name and type of equipment. All identification marks on the outside of cases shall be waterproof and permanent. All electrical equipment shall be adequately sealed and desiccating agents used where necessary to prevent damage from condensation. All equipment shall be packed and protected, bearing in mind that it will be shipped to a harsh environment, that a considerable period may elapse between its arrival on site and it's unpacking and that covered storage may not always be possible.

1.11.4 All wood and other materials used in packing cases shall be insect free. Adequate protection and precautions are to be taken to exclude termites and other vermin, noxious insects, larvae or fungus from the packing materials or plant. All contents are to be clearly marked for easy identification against the packing list.

1.11.5 TheSupplier shall protect all steelwork before shipment, to prevent corrosion and/ or damage. Bundles of steel sections shall be properly tied together by an approved method and care shall be taken to ensure that they are robust and that they can be handled easily during shipment.

1.11.6 Bolts and nuts shall be double bagged and crated for shipment. Crating of dissimilar metals is not acceptable.

1.11.7 Packing cases where used, shall be strongly constructed and in no case shall timber less than 25 mm in thickness be used. The contents of packing cases shall be securely bolted or fastened in position with struts or cross battens. Cross battens supporting weight in any direction shall not rely for their support on nails or screws driven lengthwise into the grain of the wood, but shall be supported by cleats secured from inside.

1.11.8 The following information shall be marked on the containers/cartons as well as boxes:

a) Supplier's name, Project title and Contract reference
b) Identification number
c) Net/Gross weight
d) Purchaser's name with other despatch particulars such as destination.

Sl. No.	Description	Marking
1	Cables	Every 1 meter Consecutively

1.12 Cable / Conductor Drums

1.12.1 HV Cables shall be supplied in a steel drum. The covers with wood is acceptable. LV Cables and bare conductors shall be wound on non-returnable seasoned wooden drums provided with lagging of adequate thickness and treated to an approved international standard by vacuum impregnation with copper-chrome-arsenate (CCA) preservative to resist rotting and termite and fungus attacks. Drums with an outside diameter exceeding 2.0 metres and an outside width exceeding 1.4 metres shall not be used. The central hole of the drums shall be reinforced with a steel plate of thickness not less than 10 mm, or be fitted with suitable steel hub bushing to suit an axle diameter of 95 mm.

1.12.2 The drums shall be new and sturdy in construction so as to withstand several times loading and unloading, transport on rough roads, storage for five (5) years in tropical areas and hauling and handling during field erection etc. In the event that the drums are received at the destination in damaged condition thereby, preventing rolling out of cable, the Supplier shall supply extra drums at his own cost. Also, the cost incurred by the Purchaser in rewinding the cable from the damaged drums onto the new drums will be deducted from the amount due to the Supplier.

1.12.3 Internal and external surfaces of the drum shall be painted with bitumen based paint. A layer of waterproof material shall be provided on the barrel under the cable and on the inner surfaces of the flanges. Another layer of waterproof material shall be provided over the outer layer of cable under lagging.

1.12.4 Drums shall be adequately protected by securely fastening substantial wooden battens around the periphery. These battens shall be secured by means of steel tap bindings.

1.12.5 Cables shall be securely fastened around the periphery of the drum. Cables shall be supplied with both ends properly capped, and protected against damage. Each drum and one of each cable length shall bear a metal label detailing manufacturer's name, specified voltage and type and length of conductor. The leading end of cable on cable drums shall be the 'A' end as defined in BS 6480.

1.12.6 The inner cable end attached to the drum shall be capped and sealed in such a manner that the core screening and sheath can be meggered from the outer cable end without removing the inner end cap.

1.13 Labels

1.13.1 All equipment shall be provided with labels or name plates, giving a description of the equipment, together with information regarding the rating, nominal voltage, nominal current and the like under which the item of plant in question has been designed to operate. The labels shall be provided on packaging to the Purchaser's approval.

1.13.2 Such nameplates or labels are to be of non-corrodible, non-hygroscopic material with lettering of a contrasting colour.

1.13.3 Labels on cable drums shall state the cable details, including the length in metres.

1.14 Locks

Provision shall be made for padlocking of mechanism boxes, isolators and outdoor switchgear as required by the Specification or as necessary to limit access or the safety of personnel. All padlocks will be provided by the Purchaser.

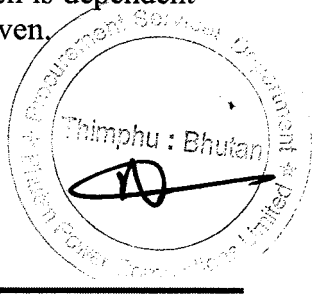
1.15 Supplier Documents and Drawings

1.15.1 **General**

The Supplier shall be responsible for submission, re-submission and obtaining approval as required of all the documents and drawings listed below (but not limited to), so that there shall be no delay to the work due to the absence of such documents and drawings. Any approval by the Purchaser will not relieve the Supplier of any obligations under the Contract.

Any alterations to the documents and drawings which may be required by the Purchaser for approval shall be made by the Supplier at his own expense. All materials and work involved in their manufacture shall be as indicated in such drawings.

No work shall be done on any part of the Goods, the design or construction of which is dependent on the approval of such drawings or data, until such approval has been given.



1.15.2 **Manner of Submission and Approval of Drawings**

The Supplier shall submit three prints of each drawing or document (including all the drawings, documents, calculations, manuals required under the Contract) for approval marked 'For Approval'. One copy will be returned to the Supplier marked up with approval or any proposed alterations or conditions. The Supplier shall provide the same number of further prints for any drawings that are altered. The submission of drawings for approval shall be repeated until 'Approved' or 'Approved with conditions' is given by the Purchaser.

Within fifteen working days after receipt by the Purchaser of any drawing or document requiring the Purchaser's approval, the Purchaser shall either return one copy thereof to the Supplier with its approval endorsed thereon or shall notify the Supplier in writing of its disapproval thereof and the reasons therefore and the modifications that the Purchaser proposes.

All drawings, information, design reports, etc shall be neatly type written and be presented as bound documents. The documents presented shall have neatly drawn title pages that clearly show the name of the Purchaser, identify the project name, the contract number, the date, the revision number, etc, and shall be provided with a table of contents.

Bidder need to submit 3 (three) hard copies of GTP's and drawing for approval after the award of contract.

1.15.3 **Manuals**

The Supplier shall submit the instruction manual for all the goods supplied under the contract. The Supplier shall follow the requirements as mentioned in the relevant clauses in the Technical Specifications.

1.16 Quality Assurance

1.16.1 The manufacturer must operate a quality assurance system that complies with ISO 9000. The Supplier shall provide current certification showing the manufacturers' compliance with ISO 9000 or equivalent national standard. The certificate must be issued by an independent, accredited issuing authority.

1.16.2 In compliance with the proposed quality assurance system of ISO 9000 or equivalent, Bidder shall submit with Bid the quality assurance plan for manufacturing the Goods. Especially, if the Bidder proposes to form a joint-venture or consortium, such a Bidder shall submit with Bid a quality assurance plan, including explanation how to manage the same quality of Goods by the joint-venture partners.

1.17 Tolerance

The variation in quantity to be supplied against confirmed order shall be permissible up to One (1) percent per item per consignee for delivery. However, for the short supply the payment shall be made as per the actual supply and for over supply the payment shall be limited to the ordered quantity.

1.18 Inspection and Testing

The materials will be inspected at the Manufacturer's works by the Purchaser's representative. Tests shall be performed in accordance with the relevant IEC standards. In the absence of IEC recommendations the tests must be equivalent at least to the conditions, provisions and definitions of the above-mentioned standards. The supplier shall give at least one month's notice for readiness of equipment for testing at the manufacturer's works. The tests shall be divided into the categories described below.

1.18.1Routine Tests

All the routine tests specified by the standards shall be carried out. If the tests are not witnessed by the Purchaser's representative, test certificates shall be submitted to the Purchaser for approval. Despatch clearance will be given only if the test results are approved.

1.18.2 Type Tests

Bidder shall include with his bid type test certificates, issued by an approved, reputed, independent testing laboratory. The type tests should have been carried out in the last five years.

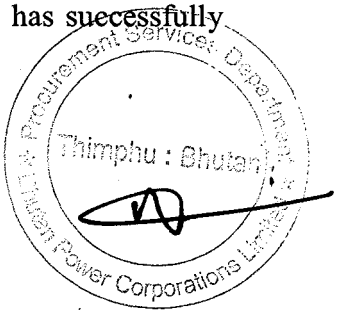
In addition, the Purchaser may call for type tests to be carried out at the Manufacturer's Works and to be witnessed by the Purchaser or his representative. Such tests will be on random samples at the discretion of the Purchaser and failure to meet the conditions of test could result in the rejection of a complete batch of equipment. Type testing shall only be performed if the manufacturer is unable to provide type test certificates issued by an independent test laboratory of international repute.

Inspection

The Supplier shall intimate the Purchaser about the detailed program about the tests and inspection at least one month in advance.

Inspection and tests on all the Goods offered shall be carried out in the presence of Purchaser's representative unless inspection waiver has been given to the Supplier. The inspection shall be carried out as per the test procedure that has been approved by the Purchaser. The Supplier shall assist the work of the Purchaser's inspector by providing copies of all relevant Standards and test procedures, and allowing the inspector full use of the necessary tapes, measures and laboratory equipment, together with ample space and assistance in the handling of Goods for inspection.

The Supplier shall submit all final test and inspection reports to Purchaser's representative (inspector) during his stay at the workshop for the inspection. The inspector shall issue a "Dispatch Clearance" to the Supplier when the tests and inspection has successfully completed in compliance with the Technical Specifications.



1.19 Dispatch Clearance

1.19.1 The Supplier shall submit all final test and inspection reports to Purchaser's representative (inspector) during his stay at the workshop for the inspection. The inspector shall issue a "Dispatch Clearance" to the Supplier when the tests and inspection has successfully completed in compliance with the Technical Specifications.

1.19.2 The goods have to reach to the delivery warehouse within Twenty (20) days from the date of issuance of dispatch clearance (if the goods are supplied/manufactured from India & Nepal).

1.19.3 The goods have to reach to the delivery warehouse within Forty Five (45) days from the date of issuance of dispatch clearance (if the goods are supplied/manufactured from Third Countries).

Section – 2 Technical Requirements -Electrical

The following electrical technical requirements shall also apply to the equipment supplied under this Contract.

2.1 Electrical Supplies for Auxiliary Plant

The equipment provided under this Contract shall be capable of operating reliably at voltages down to 80% of the nominal voltage except where otherwise specified.

2.2 Electric Motors

2.2.1 All motors shall be in accordance with IEC 60034 and 60072 unless otherwise specified, shall be of the totally enclosed fan cooled type, suitable for continuous operation and direct on-line starting.

2.2.2 They shall be suitable in all respects for service in a damp tropical climate. Main conductor and slot insulation shall be non-hygroscopic and in accordance with Class F as per IEC 60085.

2.2.3 Motors to be located outdoor shall be entirely suitable for operation under the climatic conditions at site.

2.2.4 Motors shall be capable of operating continuously at rated output at any frequency between 48 and 51 Hz and at any voltage within ten percent of the nominal value. Motors shall be designed to be operated for a period of not less than five minutes at a voltage of 25% below the nominal value and at normal frequency without injurious overheating. If required by the purchaser, the supplier shall demonstrate that the motors comply with this requirement.

2.2.5 The starting current at full voltage shall not exceed six times the rated full load current.

2.2.6 All bearings shall be fitted with oil or grease lubricators. Vertical shaft motors shall have approved thrust bearings.

2.2.7 All terminals shall be of the stud type of adequate size for the particular duty, marked in accordance with an approved standard and enclosed in a weatherproof box.

2.2.8 All terminal boxes shall be fitted with an approved sealing chamber, conduit entry or adapter plate, as required, together with the necessary fittings to suit the type of cable specified.

2.3 Starters and Contactors

2.3.1 Where starters are to be provided under this Contract, each motor shall be equipped with two or three pole control gear as appropriate and suitable, unless otherwise specified, for direct starting by the switching of full line voltage on to a standing motor. All starters should preferably be supplied by one manufacturer.

2.3.2 Contactors are to be of robust design and are to comply with IEC 60947-4. They shall operate without undue noise or vibration.

2.3.3 Contactors shall be mounted in ventilated metal cubicles. Unless otherwise approved, the metal surface of the cubicle walls adjacent to the contactors shall be protected by fireproof insulating material. Where two or more contactors are contained in the same cubicle, they shall be separated by barriers of fireproof insulating material. The cubicles shall be complete with all locks, cable sealing boxes, busbars, internal wiring, terminal boards and accessories. All bare copper connections shall be taped and all secondary wiring is to be so arranged and protected as to prevent it being damaged due to arcing.

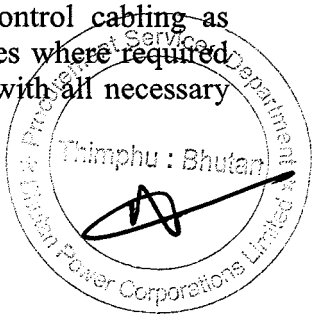
2.3.4 Starters shall be of the electrically held-in type with integral "start" and "stop" push buttons mounted externally on the door, with integral interlocked isolators. Where required, auxiliary switches shall be included for the operation of "red" and "green" indicating lights in remote instrument panels.

2.3.5 All motor contactors and their associated apparatus must be designed to operate for a period of not less than 5 minutes at a voltage of 25% below the nominal value and at normal frequency without injurious overheating.

2.3.6 For circuits controlling motors of 15 kW and above, transformer operated overload and phase failure relays shall be provided. For controlling motors of less than 15 kW, thermal overload trips shall be acceptable.

2.4 Cables, Cable Boxes, Sealing End Chambers and Glands

2.4.1 This Contract includes power, auxiliary power and multi-core control cabling as specified in the appropriate sections of the Specification. All cables where required shall be fitted with approved cable end boxes or glands, complete with all necessary fittings.



2.4.2 Air filled cable boxes shall be of adequate dimensions and designed in such a manner that they can be opened for inspection without disturbing the gland plate or incoming cable. Disconnecting chamber shall be provided for disconnecting and moving away the transformer without unscaling the cables leaving the cable box or chamber.

2.4.3 Phase to phase and phase to ground clearances shall be subject to purchaser's approval.

2.4.4 Provision shall be made for earthing the body of each cable box.

2.4.5 Corrosion protected brass material, compression type glands with armour and bonding clamps for the termination of all solid dielectric multi-core cables designed to secure the armour wires and to provide electrical continuity between the armour and the threaded fixing component of the gland and to provide watertight seals between the cable outer sheath and gland and between the inner sheath and threaded fixing component. The gland shall project above the gland plate to avoid ingress of condensed moisture.

2.4.6 All cable boxes shall have at least IP 54 degree of protection.

2.5 Electronic and Control Equipment

2.5.1 **Component Ratings**

Components and materials shall not be subjected to voltages; currents, temperature stresses, or any other condition outside the operational values given in the manufacturer's published data, over the range of temperature variations and climatic conditions indicated elsewhere.
Where circuits use components, which operate under unusual conditions, the Bidder shall produce documentary evidence that the life, stability and characteristics of the components used will be satisfactory.
Components which in their normal function may have full supply voltage applied shall be capable of withstanding continuous energisation.

2.5.2 **Component Tolerances and Aging**

The design of the circuits used shall be such that initial tolerances and also cyclic and non-cyclic changes in component values and parameters which may occur during the operational life of the equipment are either inconsequential or are compensated for.
Such compensation shall not necessitate the use of adjustable controls without the prior approval of the purchaser.
Standard components only shall be used and any individual selection necessary to obtain particular parameters shall be subject to the approval of the purchaser.
The combined effects of all tolerances, within a single component and between components, shall be allowed for by taking all tolerances in all worst case combinations produced by environmental and operating conditions. Other statistical assumptions that only certain combinations of tolerances will occur shall not be made, unless the relevant parameters involved are invariably interdependent.

2.5.3 Protection

All circuits shall be protected so that in the event of a component fault, no damage occurs to any interconnecting wiring and any other damage that does occur is confined as closely as possible to the fault.

Protective devices shall be so arranged that the risk of fire within the equipment be minimised. The greatest possible protection shall be provided, consistent with reliability and the ability to withstand operational conditions.

Power supply units' with/without stabilisers shall be protected with voltage trip and overload current circuits with an auto recovery feature.

If any protective device, such as MCB, is incorporated in the output circuits of a current-limited power supply unit, the available current under short circuit conditions shall be sufficient to operate them. MCBs shall be in the 'non-common side of the circuit.

Indication of trip of MCBs shall be clearly displaced by monitoring of trip. Circuits shall be grouped so that, following the operation of a protective device, no false operation shall occur as a result of an MCB trips.

The design, location and connections of MCB shall be such that they do not present a danger to the operator when it is in service.

2.5.4 Interference

a) Self-generated Interference

Equipment shall not generate any type of interference at a level which could be detrimental to the performance of any other equipment or which could cause annoyance or discomfort to personnel.The earthing and cabling arrangements shall be such that detrimental interference is not generated.

b) External Interference

In the presence of interference expected in power station and substation environments, the design of the equipment shall be such that no damage occurs and performance is maintained to the requirements of the individual specifications.

c) Spark Quenching

Spark quenching devices shall be fitted wherever necessary to ensure continued satisfactory operation of contacts and prevent mal-operation of electronic devices.

d) Noise and Vibration

The acoustical noise levels and/or vibration produced by the equipment in operation shall be as low as is reasonably practicable for the type of equipment concerned and shall be agreed with the purchaser.

2.5.5 Setting-Up and Maintenance Facilities

All equipment shall be provided with sufficient easily accessible test points to facilitate setting-up and fault location together with maintenance aids such as extension boards, jumper leads and special maintenance tools.

Pin or terminal numbering of all cards in all crates shall be consistently uniform throughout. Power supplies shall use the same pin positions on all cards in an equipment or system.

2.5.6 Loose Equipment

Special connecting leads extension boards and any special item required for calibration or maintenance purposes, together with the mating half of all necessary connectors shall be supplied.

2.5.7 Printed Circuit Boards

Printed circuit boards shall be epoxy glass fabric boards to comply with IEC - 60321 suitable for use in hot humid climates. Printed circuit boards may be single-sided, double-sided or multi-layer.

Printed boards shall, in general, comply with IEC 60326. They shall not bow perceptibly when they are mounted in their shelves or racks. Means shall be provided to prevent boards being plugged into the wrong sockets and the plugging in/out action shall be arranged in a positive manner.

An approved protective coat shall be applied to the printed circuit side of the board to protect against tracking, tarnishing and general deterioration due to moisture and deposition of dust. The coating shall not have any adverse reaction with any other material or components used and shall be suitable for use under tropical conditions. When boards are repaired in the field it shall be possible to apply (or 'touch up') such a finish by simple convenient means.

2.5.8 Component Identification

a. A component reference number shall be marked adjacent to each component. Where this is impossible, components shall be identifiable from the layout drawings provided.

b. The following shall be marked in all instances:

MCBs

The rating and the circuit identification of each MCB shall be marked adjacent to the MCB base.

Control, Protection and Indication Devices

The function of each control, protection and indication device shall be marked. The caption and its arrangement shall be subject to the approval of the purchaser.

Preset Controls

The circuit reference and if possible, the function shall be marked adjacent to each preset control in a position where it will be clearly visible while the adjustment is being made.

Connectors

The diagram reference number shall be marked on or adjacent to each connector.

Test points shall be individually marked with the diagram reference number.

The polarity of any polarised devices (e.g. diodes) shall be marked.

Section – 3 Technical Requirements - Mechanical

The following mechanical general technical requirements shall apply to equipment supplied under this Contract.

3.1 Pipe Supports

3.1.1 The whole of the pipe work and accessories included in this Contract shall be supported and mounted in an approved manner. All necessary saddles, structural steelwork, foundation bolts, fixing bolts and all other attachments shall be supplied.

3.1.2 The number and positions of all intermediate flexible supports between anchor points shall be determined by the weights to be carried and by the steelwork available for the purpose and will be subject to the approval of the purchaser.

3.2 Valves

3.2.1 Valves shall be arranged so that the hand wheel moves in a clockwise direction to close the valve. The face of each hand wheel shall be clearly marked with the works "open" and "shut" and be provided with an arrow to indicate direction for opening and shutting. As far as possible valves shall not be fitted in an inverted position.

3.2.2 It shall be possible to remove and replace, or recondition in situ, the seats and to remove the gates. Valves of 50-mm nominal bore and above shall be provided with valve position indicators showing the amount by which the valve is open or closed in relation to its full travel.

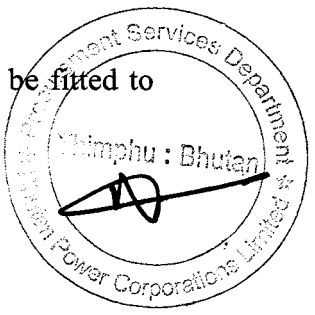
3.2.3 All valve hand wheels shall be fitted with nameplates.

3.2.4 Suitable means shall be provided to protect the operating mechanisms of all valves against mechanical damage and dust or dirt. Adequate provision shall be made for the lubrication of the mechanism and guides and this shall preferably be of the pressure type.

3.2.5 Where it will be necessary to lock valves in the open or closed position, they shall be provided with a non-detachable locking arrangement.

3.3 Oil Level Indicators

3.3.1 Unless otherwise approved, oil level indicators of approved design shall be fitted to all oil containers other than hermetically sealed items.



3.3.2 The indicators shall show the level at all temperatures 'likely to be experience in service, be marked with the normal level at 20°C clearly visible from normal access levels and be easily dismantled for cleaning.

3.4 Pressure Gauges

3.4.1 All pressure gauges shall be fitted with stopcocks immediately adjacent to each gauge and all pressure gauge piping shall be fitted with an isolating valve at each point of connection to the main system. Where pressure gauges are mounted on panels, the stopcocks shall be suitable for the connection of a test gauge.

3.4.2 Where a difference in level exists between the situation of the gauge and the point at which pressure is to be measured, appropriate compensation shall be made in the dial reading and the dial must be marked with the amount of compensation applied. Where the compensation would amount to two percent or less of the total movement indicated under normal conditions, it may be ignored.

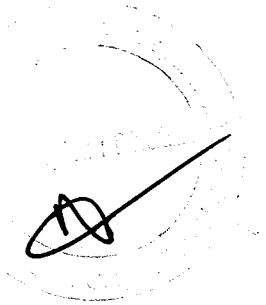
3.4.3 All pressure gauges where practicable shall be mounted on panels in locations approved by the Purchaser. Stopcocks of gauges must be readily accessible. . All pressure gauges shall be clearly identified by means of separate labels of approved type and lettering.

3.4.4 All high pressure gauge piping shall be of rustless steel but other pressure gauge piping may be of copper tube or other material approved by the purchaser.

3.5 Thermometer Pockets

3.5.1 Thermometer pockets and instruments connections of an approved pattern are to be fitted in such a position as may be determined to suit the operation and testing of the plant to the approval of the purchaser. Where necessary, the pocket shall be of approved material suitable for the required service.

3.5.2 All thermometer pockets shall comply with the requirements of BS 2765 or equivalent Indian standard.



2. Test Standards

1. Standards

The design material, construction, manufacture, inspection and testing of all equipment supplied under this Specification shall conform to the latest editions of the International Electro technical Commission (IEC) Specifications and other international standards where the material is not covered by IEC. Other national or international standards are accepted if they promise to confer equal or superior quality and performance than IEC or the specified standards.

2. Testing

The tests shall be divided into the categories described below.

2.1 Routine Tests

All the routine tests specified by the standards shall be carried out. If the tests are not witnessed by the Purchaser's representatives, test certificates shall be submitted to the Purchaser for approval. The test certificates must show the actual values obtained from the tests, in the units used in this Specification, and not merely confirm that the requirements have been met. No materials shall be dispatched until the test certificates have been received by the Purchaser and the Supplier has been informed that they are acceptable.

Despatch clearance will be given only if the test results are approved.

2.2 Type Tests

Bidder shall include with his bid type test certificates, issued by an approved, reputed, independent testing laboratory. The type tests should have been carried out in the last five years. Type tests shall be carried out at an independent testing laboratory or be witnessed by a representative of such laboratory or some other representative acceptable to the Purchaser. Type tests may be dispensed with at the Purchaser's discretion, if the Supplier furnishes evidence to the Purchaser's satisfaction, that the relevant tests have already been performed on identical materials and equipment.

In addition, the Purchaser may call for type tests to be carried out at the Manufacturer's Works and to be witnessed by the Purchaser or his representatives. Type testing shall only be performed if the manufacturer is unable to provide type test certificates issued by an independent test laboratory of international repute.Such tests will be on random samples at the discretion of the Purchaser and failure to meet the conditions of test could result in the rejection of a complete batch of equipment.

Section V- Schedule of Supply

d) The routine tests carried out by the manufacturer shall be backed by test reports signed by the factory'squality control department. They shall include the following:

- Conformity withdrawings and diagrams;
- Measurement of closing and opening speeds;
- Measurement of operating torque;
- Checking of filling pressure;
- Checking of gas-tightness;
- Checking of partial discharges on individual components;
- Dielectrictesting and main circuit resistancemeasurement;

13.1Type test

The Bidder shall provide the above type test certificates in the bid that are done within last five (5) years. In case, if the valid type tests certificates are not available, then the bidder shall carryout the type test without any cost implication to the purchaser. Type Tests shall be as per standards.

11. Inspection and Testing for LV Switchboards

Tests and test reports

The meter shall pass the manufacturer's standard routine tests. The following type tests shall be in accordance with the latest relevant IEC or ANSI:

- Test of insulation properties:
  - impulse voltage test
  - A.C. voltage test
- Influence of short-time over currents
- Influence of heating:
  - windings, if any
  - external surface
- Electromagnetic compatibility (E.M.C.):
  - radio interference measurement
  - fast transient/burst test
  - immunity to electromagnetic HF field test
  - immunity to electrostatic discharge test
- Others according to manufacturer's standard
- Heating (permissible temperature rise) of:
  - windings, if any, in K
  - external surface in K

The acceptance inspection shall be according to the latest relevant IEC or ANSI

Routine factory testing, in accordance with IEC standards, shall be carried out and shall include the following:

- Check of conformity with wiring diagrams and plans.
- Mechanical operation tests and checking of interlocks.

- Low voltage dielectric tests.
- Low voltage functional checking.

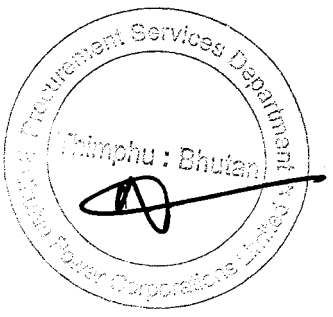
12. Inspection and Testing for Energy Meters

Tests and test reports

The meter shall pass the manufacturer's standard routine tests. The following type tests shall be in accordance with the latest relevant IEC or ANSI:

- Test of insulation properties:
  - impulse voltage test
  - A.C. voltage test
- Influence of short-time over currents
- Influence of heating:
  - windings, if any
  - external surface
- Electromagnetic compatibility (E.M.C.):
  - radio interference measurement
  - fast transient/burst test
  - immunity to electromagnetic HFfield test
  - immunity to electrostatic discharge test
- Others according to manufacturer's standard
- Heating (permissible temperature rise) of:
  - windings, if any, in K
  - external surface in K

The acceptance inspection shall be according to the latest relevant IEC or ANSI



LOT 1(ABC and AAAC Conductors)

1.0 General

1.1 Scope of supply

This section covers the requirements for the design, manufacture, testing, and delivery and unloading at BPC stores of ABC and AAAC conductors.

2.0 Standards

The items to be supplied under this section shall conform to the latest edition of AS: 3599.1-1988 (I &II) or equivalent international standards.

3.0 High Voltage Aerial Bundle Conductor

HV ABC consists of XLPE insulation. It has bearer wire (Messenger wire) which is either of aluminium alloy or steel wire (bare or insulated). The design of ABC shall comprise compacted, stranded, hard drawn aluminium phase conductors with dry cured cross linked polyethylene insulation. The main advantages of HV ABC over bare ACSR conductors are as follows:

- Offers relative resistance to short circuits caused by external forces (wind, fallen branches), unless they abrade the insulation.
- Can stand in close proximity to trees and branches will not generate sparks if it in contact
- Simpler installation, as cross arms and insulators are not required.
- Less cluttered appearance than bare conductors.
- It can be installed in a narrower right-of-way.

However the disadvantages were additional cost for the cable itself and shorter spans and maximum use of poles due to increased weight of the cable. The Insulation of the cable also degrades due to direct exposure to sun. Following HV Aerial Bundled Cable conforming to AS: 3599.1-1988 (I &II) are used:

The Minimum Technical Requirement of the HV ABC

Characteristics	**Unit**	**11kV**	
Applicable Standards	AS: 3599.1-1988 (I & II)		
Rated Voltage	kV	6.35/11(12)	
Conductor			
Nom. Area of core Conductor	mm²	50	95
Conductor Screen Material	Extruded cross-linked semi-conductive		
Min. Thickness of Conductor Screen	mm	0.3	0.3
Insulation			
Insulation material	XLPE		
Min. Thickness of Insulation	mm	3.4	3.4
Min. Thickness of insulation Screen	mm	0.8	0.8
Metallic Screen			

Material	Plain Annealed Copper Wire		
Size for Conductor Screen[1]	No./mm	26/0.85	26/0.85
Sheath			
Material	Black, High Density Polyethylene (HDPE)		
Min. Thickness of sheath	mm	1.8	1.8
Support Catenary			
Support Catenary size	No./mm	19/2	19/2
Material	Aluminium-Clad Steel without insulation		
Max. D.C Resistance of cable at 20°C	Ohm/km	0.641	0.320
Max. A.C Resistance of cable at 90°C	Ohm/km	0.822	0.411
Inductive Reactance of cable at 50Hz	Ohm/km	0.144	0.134
Voltage drop (three phase)	mV/A.m	1.45	0.746
Max. continues current carrying capacity per phase	Amps	200	300
Approximate mass of cable	kg/km	2850	4090
Phase cable diameter (Nominal)	mm	25	29

The conductors shall be marked on the external surface with the following:
- Manufacturer's name
- Year of manufacture
- Length in meters marking in sequential numbers at 1 m intervals, with the lowest number at the inner end of the drum.
- Phase marking.

4.0 LV Aerial Bundled Conductor

4.1 General

The design of aerial bundled conductors shall comprise compacted, stranded, hard drawn aluminium phase conductors with dry cured cross linked polyethylene insulation, 0.6 to 1kV class, having not less than 2% of carbon black, similar to that specified in CENELEC Harmonisation Document 626. ***The Bidder shall submit the XLPE Insulation test results towards test being passed for UV Weathering test with the type test report.***

All of the Aerial Bundled Conductors required shall be Fully Supported Cable, where all the equal-sized phase and neutral cores share the mechanical load. The cable shall be XLPE insulated and rated for 0.6/1kV. The bundle shall have a right-hand lay.

Two core cable shall be used for single phase distribution and 4 core cable for three phase. Typical design parameters for the ABC cable used are given in table below:

The Minimum Technical Requirement of the LV ABC

Cable Size (mm2)	**50**		**95**		**120**
Parameter	**2 core**	**4 core**	**2-core**	**4-core**	**4-core**
Nominal conductor diameter (mm)	8.05		11.40		12.90
Minimum insulation thickness (mm)	1.5		1.7		1.7

Cable Size (mm2)	50		95		120
Nominal overall diameter (mm)	23.8	28.7	31.8	38.4	42.2
Approximate mass (kg/km)	350	700	680	1,350	1660
DC resistance at 20°C (ohms/km)	0.641		0.320		0.253
AC resistance at 50 Hz 80°C (ohms/km)	0.796		0.398		0.315
Inductive reactance at 50 Hz (ohms/km)	0.086	0.093	0.080	0.087	0.0844
Voltage drop at 50 Hz, 80°C (mV/A/m)	1.60	1.39	0.81	0.71	0.564
Continuous current rating in 1m/s wind (A)	150	140	230	215	280
Fault current rating (kA for 1 sec)	4.1		8.3		11.3
Minimum bending radius core (mm)	65		90		102
Minimum bending radius cable (mm)	130	160	270	320	352
Minimum breaking load (kN)	14.0	28.0	26.6	53.2	67.2
Recommended highest everyday tension (kN)	2.52	5.04	4.79	9.58	12.10
Recommended maximum working tension (kN)	3.92	7.84	7.45	14.90	18.82

The characteristics of the required Aerial Bundled Conductors are set out hereunder.

a. Fully supported LV ABC 660/1100 Volt grade, 4 core, 120, 95 & 50 sq.mm XLPE insulation with Al conductor.
b. Fully supported LV ABC 660/1100 Volt grade, 2 core, 95 &50 sq.mm XLPE insulation with Al conductor.

4.2 Construction

The cores shall form a bundle, which comprise four (and two) single cores of insulated aluminium twisted together, for phase and neutral conductors. All conductors shall conform to IEC 1089 or equivalent international standards. The total pull of the line shall be distributed among the four (and two) conductors.

Each core shall be insulated with extruded cross linked polyethylene (XLPE) conforming to IEC 502 or equivalent international standards. The three phase conductors shall be indelibly marked with one, two or three, as appropriate or longitudinal ridges formed from the insulation material. The cores shall be twisted together with a right hand lay. The pitch of laying shall be such as to allow easy separation of conductors when making connection but also maintain the bundle cohesion at the angle points on the line route. The cable shall be rated for 600/1000V.Cables shall be supplied on drums, in one continuous length.

The conductors shall be marked on the external surface with the following:
- Manufacturer's name
- Year of manufacture
- Length in meters marking in sequential numbers at 1 m intervals, with the lowest number at the inner end of the drum.
- Phase marking.

5.0 AAAC covered overhead conductor

The water blocked covered conductor (CC) should have AAA Conductor material (Alloy 1120) suitable for overhead lines for working voltages 6.35/11 kV and 19/33 kV, 50 Hz., AC system. The cover insulation shall be UV stabilized XLPE insulation. The covered conductors shall be marked on the external surface with the following:

(a) Manufacturer's name, registered trade name or registered mark
(b) Year of manufacture
(c) Length in metres marking in sequential numbers at 1 m intervals, with the lowest number at the inner end of the drum. Any drum length can be started at any integral number with starting metre length is allowed.
(d) Covered conductor type CC
(e) Conductor material AAAC, Alloy 1120

The Minimum Technical Requirement of the AAAC Covered

	Units	**Conductor size and type.**	
Applicable Standard	AS 3675-1993, IEC 60502		
Rated Voltage	kV	6.35/11 kV up to and including 19/33 kV	
Nominal cross-sectional area	mm^2	49.5	111
Stranding and nominal wire diameter	No./mm	7/3.00 (Fluorine)	7/4.5 (Hydrogen)
Conductor Material	Aluminium Alloy 1120		
Cover insulation material	UV stabilized XLPE		
Approximate conductor diameter	mm	9	13.5
Minimum thickness of XLPE cover	mm	3.4	3.4
Approx. overall diaof cable	mm	12.4-14	16.9-18.5
Continuous current rating	Amps	215	290

The Bidder shall submit the UV weathering test for XLPE Insulation result with the bid.

LOT 2: ASCR Conductors

6.0 General

6.1 Scope of Supply

This section covers the requirements for the design, manufacture, testing, delivery and unloading at BPC stores of overhead ACSR conductors.

6.2 Standards

The latest edition of the international standards shall apply, in particular:

- BS 215 Aluminium conductors steel reinforced for overhead power transmission
- IEC 888 Zinc coated steel wires for stranded conductors

- IEC 889 Hard drawn aluminium wire for overhead line conductors
- IEC 1089 Round wire concentric lay overhead electrical stranded conductors

6.3 ACSR Conductor

6.3.1 General

Bare aluminium conductors, steel reinforced (ACSR) are proposed to be used for MV overhead distribution lines.ACSR conductor consists of seven or more aluminium and galvanized steel wires built upin concentric layers. The centre wire is of galvanized steel and the outer layer is of aluminium as per IS: 398 (Part II).

6.3.2 Construction

Construction of conductors shall be as per BS 215. The sizes and properties of the ACSR conductors shall be as given in the table below. The code names given are only for the purpose of easy identification. Conductors with equivalent or superior parameters to those specified herein will be considered acceptable. However, no credit will be given for the same.

Table 1: Characteristics of Bare Overhead Line Conductors

Parameter	WOLF	DOG	RABBIT
Conductor Type	ACSR		
Nominal area (mm^2)	150	100	50
Aluminium area (mm^2)	158	105	53
Equivalent copper area (mm^2)	96	64	32
Stranding and wire dia (mm)	30/2.59 Al.	6/4.72 Al.	6/3.35 Al.
	7/2.59 Steel	7/1.57 Steel	1/3.35 Steel
Conductor diameter (mm)	18.1	14.2	10.1
Approximate mass (kg/km)	730	390	210
Minimum breaking load (kN)	69.2	32.7	18.4
DC resistance at 20°C (ohms/km)	0.1831	0.2745	0.5449
AC resistance at 75°C (ohms/km)	0.22	0.33	0.66
Approx inductive reactance (ohms/km)	0.257	0.276	0.397
Approximate voltage drop (mV/A/m)[1]	0.586	0.745	1.334
Full load current - winter (A)[2]	659	455	307
Full load current - summer (A)[2]	481	334	228

Note:
1. Phase to phase voltage drop on a balance three phase circuit.
2. Ambient temperature 10°C, conductor temperature of 75°C and wind speed of 1m/sec.
3. Ambient temperature 35°C, conductor temperature of 75°C and wind speed of 1m/sec.

While it is noted that all the above details such as conductor code names, sizes and other parameters given may not be covered by IEC standards, all other requirements applicable to individual wire/strand and the whole conductor shall conform to these standards.

6.3.3 Galvanizing

The zinc content in the slab zinc and the method of zinc coating shall be as per IEC standards.

The mass of zinc coating shall correspond to Class 1 of IEC 888.

6.3.4 Greasing

The steel cores and the inner layers of aluminium wires (where more than one aluminium layer exists) shall be protected with special grease in order to provide additional protection against corrosion. The grease shall fill the whole space between wires within circumscribed cylinder at inner aluminium layer or at steel core, if the conductor has only one aluminium layer. The application of grease shall correspond to Case 1 of IEC 1089.

The grease shall be chemically neutral with respect to aluminium, zinc and steel. It shall withstand severe weather conditions prevailing in Bhutan and a temperature of 85°C continuously without alteration of its properties. It shall have a drop point of not less than 120°C.

6.3.5 Conductor Drums

Conductors shall be supplied on drums in one continuous length. Maximum length of conductor on each drum shall be 4500 m for Rabbit and 2500 m for Dog and 2000 m for Wolf conductor.

The conductor shall be supplied on non-returnable wooden drum generally conforming to IS: 1778-1961 except where otherwise specified hereafter.

After reeling the conductor, the exposed surface of the outer layer of the conductor shall be wrapped with plastic sheet to protect the conductor from dirt, grit and damaged during transport and handling.

The wooden drums should be treated to an approved international standard by vacuum impregnation with copper-chrome-arsenate (CCA) preservative to resist rotting and termite and fungus attacks. The interior of the drums shall be lined with bituminous paper to prevent the conductor from being in contact with the timber. Drums shall be adequately protected by securely fastening substantial wooden battens around the periphery. These battens shall be secured by means of steel tap bindings. The drums shall be of seasonal hardwood strong enough and provided with lagging of adequate thickness and strength constructed to protect the conductor against all damages and displacement during transit, storage and subsequent handling at site. Spindle plates to be mounted/fixed on all the conductor drums offered. The conductor ends shall be properly sealed and secured with the help of U-nails or bolts on side of the flanges to avoid loosening of the conductors during transit handling. Each drum shall have the following information stencilled on it in indelible ink:

a. Contract/specification No.
b. Name and address of the consignee
c. Makers name and address
d. Drum No.
e. Size of conductor, code name and length of conductor in mtr.
f. Gross weight of the drum with protective lagging including conductor.
g. Weight of the empty drum with protective lagging.
h. Net weight of the conductor.
i. Arrow marking of unwinding position of the conductor end, lot number.

Lot 3-XLPE Cables and Lot 4- PVC Cables.

1.0 Scope

This specification covers the design, manufacture, testing at manufacture's work before dispatch, packing and transportation to BPC stores.

2.0 Design Criteria

2.1 Standards

The cables under this specification shall comply with the requirements of latest edition of the following standards including amendments:
IEC: 60183, 60227,60502, 60885, 50480 IS (Indian standards): 1554 (Part-I) IS: 1753 IS: 3961 Part-II IS: 3975IS: 4905, IS:5831, IS: 7098 (Part- III), IS: 7098 (Part- II), IS: 7098 (Part-I), IS: 8130, IS: 10418, IS: 10810, ASTMD 2863, IEEE-383, IEC-332 (Part-I), IEC-754 (Part-I), ASTMD – 2843, SS-4241475, (Swedish standard)

2.2 Cable Design

i) The cables shall be suitable for installation in a monsoon area having 100% relative humidity and low temperature which is likely to accelerate rusting in steel. However for the reference ambient temperature may be taken as 40^0 C with the relative of 100%. The galvanizing of steel armour has to be of the highest quantity for such an ambient condition.

ii) The cable shall operate with the following requirements.

a) Maximum continuous conductor temperature and allowable conductor temperature during short circuit shall be taken as 70°C and 160°C respectively for PVC insulated and 90°C and 250°C respectively in case of XLPE insulated cable.

b) Frequency variation ± 5%, voltage variation ± 10% and combined frequency and voltage variation of ± 10%.

iii) Amongst the various standards given above, for design, stringent conditions specified in the above standards shall be applicable.

2.3 General Technical Requirement

i) The cables shall be suitable for laying in racks, ducts, covered trenches, conduits and underground buried installation with chances of flooding by water.

ii) Cables shall be designed to withstand mechanical, electrical and thermal stresses developed under steady state and transient operating conditions.

iii) The aluminium/copper wires used for manufacturing the cables shall be true circular in shape before stranding and shall be of uniformly good quality free from defects. All aluminium used in the cables shall be of H2 grade.

iv) Aluminium conductor used in power cables shall have tensile strength of more than 100N/sq mm. The conductor of control cables shall be manufactured from plain annealed copper. All the conductors shall be multi-stranded.

v) PVC insulation shall be suitable for continuous conductor temperature of 70°C and short circuit conductor temperature of 160°C. XLPE insulation shall be suitable for continuous conductor temperature of 90°C and short circuit conductor temperature of 250°C.

vi) The cable cores shall be laid up with fillers between the cores wherever necessary. It should not stick to insulation and inner sheath. All the cables, other than single core un-armoured cable shall have distinct extruded PVC inner sheath black in colour as per IS 5831.

vii) The fillers and inner sheath shall be of non-hygroscopic flame retardant material shall be softer than insulation and outer sheath shall be suitable for the operation temperature of the cable.

viii) The armouring shall be of galvanized steel as follows:

Calculated nominal size & diameter of cable under armour	Type of armour
a) Upto 13 mm	1.4 mm dia GS wire
b) Above 13 up-to 25 mm	0.8 mm thick GS strip/1.6 mm dia GS wire
c) Above 25 up-to 40 mm	0.8 mm thick GS strip/2.0 mm dia GS wire
d) Above 40 up-to 55 mm	1.4 mm thick GS strip/2.5 mm dia GS wire
e) Above 55 up-to 70 mm	1.4 mm thick GS strip/3.15 mm dia GS wire
f) Above 70 mm	1.4 mm thick GS strip/4 mm dia GS wire

The gap between armour wire/strip shall not exceed one armour wire/strip space and there shall be no cross over/over-riding of armour wire/strip. The minimum area of coverage of armouring shall be 90%. The breaking load of armour joint shall not be less than 95% of that of armour wire/strip. Zinc rich paint shall be applied on armour joint surface.

ix) Suitable chemicals shall be added to the outer sheaths of all cables to protect them from rodent and termite attack. These chemicals shall not have any harmful effect on the human being.

x) The normal current rating of all PVC insulated cables shall be as per IS-3961 and should suit the duty requirements for which it is intended.

xi) Outer sheath shall be of PVC black in colour for power cables and grey in colour for control cables.

xii) Cores of the cables of up-to 5 cores shall be identified by colouring of insulation. Following colour scheme shall be adopted:

1	core -	Red, Black, Yellow & Blue
2	core -	Red & Black
3	core -	Red, Yellow & Blue
4	core -	Red, Yellow, Blue & Black
5	core -	Red, Yellow, Blue, Black & Grey

xiii) For reduced neutral conductors the core shall be black.

xiv) For cables having more than 5 cores, core identification shall be done by numbering insulation of core sequentially, starting by number 1 in the inner layer (e.g. say for 10 core cable, core numbering shall be from 1 to 10). All the numbers shall be of same colour, which shall contrast with the colour of insulation. The colour of the insulation for all the cores shall be grey only. The numerals shall be legible and indelible. The numbers shall be repeated at regular intervals along the core, consecutive numbers being inverted in relation to each other. When number is a single numeral, a dash shall be placed underneath it. If the number consists of two numerals, these shall be disposed one below the other and a dash placed below the lower numeral. The spacing between consecutive numbers shall not exceed 50 mm.

xv) In addition to manufacturer's identification on cables as per IS/IEC, following marking shall also be embossed over outer sheath.

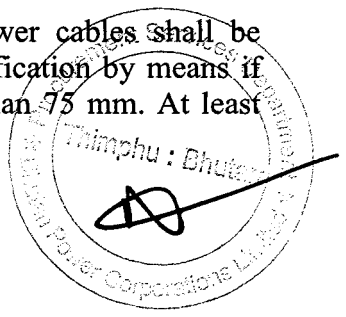
a) Cable size and voltage grade.

b) Sequential marking of length of the cable in meters at every one meter.
The embossing shall be progressive, automatic, on line and marking shall be legible and indelible.

xvi) Allowable tolerance on the overall diameter of the cables shall be $\pm$ 2 mm maximum, over the declared value in the technical data sheets.

xvii) In plant repairs to the cables shall not be accepted.

xviii) Identification of cores - the insulated cores of HT and LT power cables shall be identified by coloured code. The control cables shall have identification by means if indelible printing of numbers on its cores at intervals not more than 75 mm. At least 20% cores shall be kept as spares in the multi core control cables.



3.0 General Constructional Requirements

3.1 General

The power cables, control cables, PVC cables are required for the power supply, control and protection of various equipment.

3.2 Type Of Cable

The cable shall be multi core/single core (XLPE), PVC and any polymeric/elastomeric insulation type as specified in the Price Schedule.

3.3 Conductor

The cable conductor shall be made from stranded copper/aluminium to form compact conductor having a resistance within the limits specified in IS: 8130.
All the cables of size 25mm^2 and above shall have sector shaped conductors. The minimum no. of strands in conductor shall be 7 (seven) except as otherwise specified. Power cables shall be of stranded aluminium conductor with a minimum size 6 mm^2 and the control cables shall be stranded copper (electrolytic) conductor with a minimum size of 2.5 mm^2.

3.4 Conductor (Shield)

The conductor having a semi-conducting screen shall ensure perfectly smooth profile and avoid stress concentration. The conductor screen shall be extruded in the same operation as the insulation; the semi-conducting polymer shall be cross-linked for XLPE cables.

3.5 Insulation

The insulation of the cable shall be extruded type and shall be designed and manufactured for the specified system voltage. The manufacturing process shall ensure that insulation shall be free from voids. The insulation shall withstand mechanical and thermal stresses under steady state and transient operating conditions. The extrusion method should give very smooth interface between semi-conducting screen and insulation. The insulation of the cables shall be of high standard quality. The minimum volume resistivity of the PVC insulation of all the PVC insulated cables shall be 1 x 10^{14} ohm cm at 27^0 C and 1 x 10^{11} ohm cm at 70^0 C.

3.6 Insulation Shield

In cables to confine electrical field to the insulation, a non-magnetic semi-conducting shield shall be put over the insulation. The insulation shield shall be extruded in the same operation as the conductor shield and the insulation by triple extrusion/process. The cable insulation shield shall be strippable. Metallic screening of appropriate size as per the cable fault level given in this specification shall be provided. Copper tape shall be wrapped helically with 100% coverage. Appropriate shall be 0.04mm.

3.7 Sheath

The sheath shall be suitable to withstand the site conditions and the desired temperature. It shall be of adequate thickness and applied by a continuous process to produce a sheath of consistent quality free from all defects. PVC sheath shall be extruded.

i) The conductor screen, XLPE insulation and insulation screen shall all be extruded in one operation by 'Triple Extrusion' process to ensure perfect bonding between the layers. The core identification shall be by coloured strips or by printed numerals.

ii) The inner sheath shall be applied over the laid up cores by extrusion and shall conform to the requirements of type ST2 compound of IS: 5831. The extruded inner sheath shall be of uniform thickness.

iii) The outer sheath of the cables shall be applied by extrusion over the armouring and shall be of PVC compound conforming to the requirements of type ST2 compound of IS: 5831. The thickness of outer sheath shall be as per amendment no.1 of table 5 of IS: 7098 Part-2 (Column 3 & 5 for both armoured and un-armoured cables).

iv) The dimensions of the insulation, inner sheath and armour materials shall be governed by values given in Tables 2, 3 & 4 (Method 3) of IS: 7098 Part-II.

3.8 Armour

Hard drawn aluminium wire armouring/galvanized steel tape/wire armouring shall be used for single core and multi core cable, respectively. The hard drawn aluminium wire for armour shall be of H4 grade, as per IS: 8130 (having tensile strength above 150 N/mm^2). The diameter of the aluminium wire shall be as per the table for the dimensions of the galvanized steel wire armour given in the relevant standard.

3.9 Serving/Cutter Sheath

Extruded PVC serving as per IS: 5831 or as specified otherwise shall be applied over the armouring with suitable additives to prevent attack by rodent and termites. All serving must be given anti-termite treatment.

3.10 Construction

Cable shall have suitable fillers laid up with the conductors to provide a substantially circular cross section before the sheath is applied. Fillers shall be suitable for the operating temperature of the cable and compatible with the insulating material. All materials shall be now, unused and of finest quality. Workmanship shall be neat, clean and of highest grade.

(a) 33kV and 11 kV System – Power Cable
The cable shall be 33 kV and 11 kV (earthed system) grade, heavy duty, stranded aluminium conductor, XLPE insulated, provided with conductor screening and insulation screening, galvanized steel wire/strip armoured, extruded PVC of Type ST2 outer sheathed, as per system requirement, wherever these cables are needed. The cables shall conform to IS: 7098 (Part II).

(b) 415V System

The cable shall be 1.1 kV, grade, heavy duty, stranded aluminium conductor, PVC Type-A Insulated galvanized steel, wire/strip armoured, extruded PVC type STI outer sheathed.

(c) Control Cables

The cable shall be 1.1 kV grade, heavy duty, multi core stranded (7 wires) tinned copper (annealed) conductor, PVC Type-A insulated, galvanized steel wire/strip armoured, flame retardant low smoke (FPLS) extruded PVC of type-ST1 outer sheathed. The following sizes shall be used.

4.0 Cable Drums

4.1 LV and control cables shall be supplied in non-returnable wooden drums. HV cables shall be supplied in a steel drum. The covers with wood is acceptable. The wood used for construction for the drum shall made from hard wood, be properly seasoned, sound and free from defects. Wood preservative shall be applied to the entire drum.

4.2 Bidder shall indicate in the offer the standard length for each size of power and control cable which can be furnished on one drum. The cable length per drum shall be subject to tolerance of $\pm$ 0.5% of the standard drums length. The bidders shall take into consideration the wastages in the pricing and quote accordingly. IS tolerance shall not be applicable.

However the cable drums shall be selected so those through joints are eliminated. Typical drum lengths shall be as follows:

a)	33/11kV grade Power Cables up to 300 sq.mm	250 m
b)	1.1 kV grade cables:	
--	Including and above 240 mm^2	250 m
--	Below 240 mm^2 size and up to 150 sq.mm	500 m
--	Below 150 mm^2 size and up to 50 sq.mm	1000 m
--	Below 35 mm^2 sizes	2000 m

4.3 A layer of PVC sheet shall be applied to the surfaces of the drums and over the outer most cables layer. A clear space of at least 40 mm shall be left between the cables and the logging.

4.4 Each drum shall have the following information stencilled on it in indelible ink:

i. Contract/specification No.
ii. Name and address of the consignee
iii. Makers name and address
iv. Drum No.
v. Size of cable, code name and length of cable in meter
vi. Gross weight of the drum with protective lagging including cable
vii. Weight of the empty drum with protective lagging.
viii. Net weight of the cable.
ix. Arrow marking of unwinding position of the cable end, lot number.

4.5 Packing shall be sturdy and adequate to protect the cables from any injury due to mishandling or other conditions encountered during transportation handling and storage. Both cable ends shall be sealed with PVC/Rubber caps so as to eliminate ingress of water during transportation, storage and erection.

5.0Minimum Technical Requirements.

5.1 Underground Distribution Cable

The standard 33 kV & 11 kV cable for underground distribution is cross-linked polyethylene insulated, PVC sheathed, cable manufactured to IS 7098. Cables shall be steel wire or steel tape armoured for more than 1 core whereas for single core, armouring shall be aluminium wire or aluminium tape. Cable manufactured to IEC 60502 is also acceptable.
The current carrying capacity of buried cables depends on the installation conditions, such as the thermal resistance of the soil and the presence of other cables. Manufacturers provide cable ratings for cable installed under defined conditions, which may not reflect the actual installation conditions in a particular situation. In order to provide for these uncertainties, the maximum design current for any underground cable should generally be limited to 90% of the ratings.

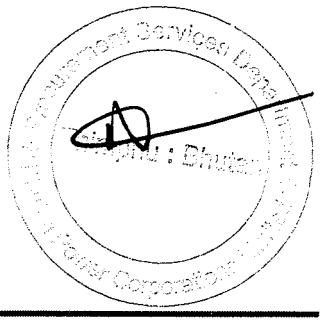
5.2 400 V Cable

BPC's standard 400 V underground cable is aluminium conductor, PVC insulated, PVC sheathed, manufactured to IS 1554. Cables are four or two core with the neutral conductor having the same cross sectional area as the phase conductors. Cables shall be steel wire or steel tape armoured for more than 1 core whereas for single core, armouring shall be aluminium wire or aluminium tape.

5.3 Low Voltage Overhead Service Cable

Low voltage overhead service cable shall be 650/1100 V two core or four core stranded copper conductor, PVC insulated, with high conductivity hard drawn copper conductors. The cable shall have an extruded PVC sheath in accordance with IEC 60502-1.

Single core copper cable with a neutral screen is an acceptable alternative to the twin conductor cable currently used. For three phase supplies three core plus neutral screen cable may be used. Neutral screen cable is considered safer for overhead service drops because the neutral conductor completely surrounds the phase conductor.



LOA -5 (ABC CONDUCTOR ACCESSORIES)

1.0 HV ABC Accessories

1.1 Pole Accessories

The following accessories are required for the installation of the HV aerial bundled cables.

a) Pole Bracket assembly
b) Suspension assembly
c) Strain Clamp/Dead end assembly
d) GI Support Hook
e) Bundled Restraint assembly
f) Jointing Sleeves

Each assembly shall be delivered complete with all necessary devices suitable for attachment to round steel poles by stainless steel strap. All metal fitting shall be of good quality galvanized mild steel or cast aluminium alloy. Each of the suspension/angle/dead end assemblies shall be supplied with a 1.75 m of stainless steel trap with two buckles.

Bundled end protection shall be provided for protecting cable dead ends and shall comprise a set of heat shrinkable polymeric terminal caps for fitting on each conductor, together with protective black PVC sleeve of 500 mm length.

1.2 HV ABC Connectors

The following connectors are required for the connection of HV aerial bundled conductors.

a) Insulated tension jointing sleeve
b) XLPE Cable Termination Push On Type

The connections shall be insulated and suitable for use on live lines. The teeth of the contact plates shall penetrate the bundled conductor insulation to establish contact with ABC cable without the need to strip the bundled conductor insulation. The connector shall be suitable for copper or aluminium tee-off conductor. The Tee-off shall be capable of removal and subsequent re-installation.

Insulated tension jointing sleeves shall be provided for the bundled conductors. These shall be of the compression type, but compression shall not damage or displace the sleeve insulation. The sleeve connectors shall be designed to have the full rate breaking strength of the Aluminium or Aluminium alloy cable on which they are fitted.

2.0 LV ABC Accessories

2.1 Pole Accessories

The following accessories are required for the installation of the LV aerial bundled cables.

a) Suspension assembly (including angles up to 30 deg)
b) Large angle assembly (angles over 30deg.)
c) Dead end assembly
d) End caps

Each assembly shall be delivered complete with all necessary devices suitable for attachment to round steel poles by stainless steel strap. All metal fitting shall be of good quality galvanized mild steel or cast aluminium alloy. Each of the suspension/angle/dead end assemblies shall be supplied with a 1.75 m of stainless steel trap with two buckles.

Bundled end protection shall be provided for protecting cable dead ends and shall comprise a set of heat shrinkable polymeric terminal caps for fitting on each conductor, together with protective black PVC sleeve of 500mm length.

2.2 LV ABC Connectors

The following connectors are required for the connection of LV aerial bundled conductors.

(a) Insulated service/tee-off connection (IPC Connector)
(b) Insulated tension jointing sleeve
(c) Insulated connectors between ABC and PVC cables

Bundled conductor connectors are required for connection of service cables to bundled conductors, for tee-offs of bundled conductors and for connection to PVC cables. The connections shall be insulated and suitable for use on live lines. The teeth of the contact plates shall penetrate the bundled conductor insulation to establish contact with ABC cable without the need to strip the bundled conductor insulation. The connector shall be suitable for copper or aluminium tee-off conductor. Bidder shall describe the method used to ensure that the contact plates make adequate contact with the main conductor. The Tee-off shall be capable of removal and subsequent re-installation.
The range of connector for ABC to ABC and for ABC to service cable shall be as follows:

Main conductor size(mm^2)	Tee-off Conductor Size (mm^2)
120	95, 50
95	95
95	50, 16, 10, 6, 4
50	50
50	10, 6 & 4

The range of connector for ABC to PVC cable shall be as follows;

LV ABC Cable	LV PVC Cable
$50mm^2$ XLPE	4C x $16mm^2$
	4Cx $50mm^2$

Insulated tension jointing sleeves shall be provided for the bundled conductors and service cables. These shall be of the compression type, but compression shall not damage or displace the sleeve insulation. The sleeve connectors shall design to have the full rate breaking strength of the aluminium or aluminium alloy cable on which they are fitted.

2.3 LV service dead-end Clamps

An open sided stainless steel wedge clamp or similar dead-end be supplied for dead ending two core service conductor cables at the pole and the consumer premises. The clamp shall be suitable for the LV service cables. Above and shall have a pull out tension of not less than 16 kN.

LOT 6 (Energy Meters)

1.0 AC Single Phase, 2 Wire Static Fully Electronic Meter, Accuracy Class 1.0 & Current Rating 10-60 Amp with Backlit LCD display for 240 Volt System

1.1 SCOPE

a) This specification covers design, engineering, manufacturer, testing, inspection & supply of A.C Single phase, two wire solid state (static) fully electronic energy meters of accuracy class 1.0 & current rating 10-60 A, with backlit LCD display for 240 Volt systems as per requirement in this specification. The meter should be capable of recording & displaying energy in kWh & demand in any kW for single phase two wire A.C load respectively for power factor range of Zero lag-unity-Zero lead. Meters should have facility/capability of recording probable tamper information.

b) It is not the intent to specify completely here in all the details of the design and construction of meter. However, the meter shall conform in all respect to high standards of engineering, design and workmanship shall be capable of performing commercial operation continuously in a manner Bhutan Power Corporation Limited, who will interpret the meanings of drawing & specification and shall have the right to reject any work or material which in its judgment is not in accordance therewith. The offered meters shall be complete with all components, accessories necessary for their effective and trouble free operation of the system for the purpose mentioned above. Such components shall be deemed to be within the scope of bidders supply irrespective of whether those are specifically brought out in this specification and/ or the commercial order or not.

1.2 STANDARDS APPLICABLE

Unless specified elsewhere in this specification, the performance & testing of the meters should conform to the following International standards, to be read with up to date and latest amendments/revisions thereof as on 90 days prior to floating of tender.

Sl. No.	Standard No.	Title
1	IEC 62052-11:2003	Electricity Metering Equipment (AC)-General Requirements, tests and test conditions
2	IEC 62053-21:2003	Class 1 and 2 alternating current watt hour meter
3	IS 13779:1999	ac STATIC WATIHOUR METERS, CLASS 1AND 2 - SPECIFICATION
4	CBIP 325	Standardization of AC Static Electrical Energy Meter
5	IS 14434 (1998)	Polycarbonate Moulding and Extrusion Materials.

1.3 CLIMATIC CONDITION

The meters to be supplied against this specification should be suitable for satisfactory continuous operation under the following tropical conditions. Meters should be capable of maintaining required accuracy under cold, hot 7tropical and dusty climatic conditions.

i)	Maximum Ambient Air Temperature in shade	:	45^0C
ii)	Minimum Ambient Air Temperature	:	(-) 10^0C
iii	Maximum Relative Humidity	:	95% (non-condensing)
iv)	Minimum Relative Humidity	:	10%
v)	Height above mean sea level	:	Upto 4000 meters
vi)	Average number of tropical monsoon per	:	5 months
vii)	Annual Rainfall	:	100 mm to1500 mm

1.4 SUPPLY SYSTEM

System	1 Phase2Wire
Rated voltage(Vref)	240V–Phaseto Neutral
Rated Current	Basic current 10Amps(lb), Maximum current 60Amps(I_{max})
Rated Frequency	50Hz

1.5 POWER FACTOR RANGE

The meter should be suitable for full power factor range from zero (lagging) through to Unity to zero (leading).

1.6 POWER SUPPLY VARIATION

The meter should be suitable for working with following supply system variations.

System	1 Phase 2Wire
Specified range of operation	60% to 120% of reference Voltage i.e. 240
Frequency	50 Hz±5%

1.7 ACCURACY

1.7.1 Classofaccuracyofthemetershouldbe1.0.Theaccuracyshouldnotdriftwithtime.

1.7.2 Maximumerrorlimitat1%I_b, UPF should preferably be within+/-2%.

1.8 POWER CONSUMPTION

1.8.1 Voltage Circuit: The active and apparent power consumption in the voltage circuit including the power supply of meter at reference voltage, reference temperature and reference frequency should not exceed1.5Wattand4 VA respectively.

1.8.2 Current Circuit: The apparent power taken by each current circuit at basic current, reference frequency and reference temperature should not exceed 1.0VA.

1.9 STARTING CURRENT

The meter should start registering energy at 0.2 of basic current at unity power factor.

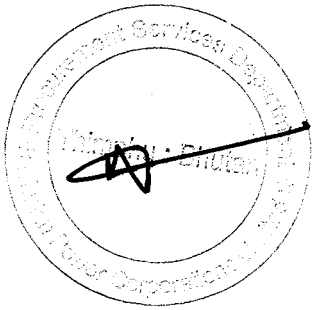
1.10 MAXIMUM CONTINUOUS CURRENT

The maximum continuous current in meters should be the current at which the meter purports to meet the accuracy requirement of the specification. The same is indicated in table in clause 4 above.

1.11 GENERAL & CONSTRUCTIONAL REQUIREMENTS

1.11.1 Meters should be designed and constructed in such a way so as to avoid causing any danger during use and under normal conditions. However, the following should be ensured.

a) Personal safety against electric shock
b) Personal safety against effects of excessive temperature.
c) Protection against spread of fire
d) Protection against penetration of solid objects, dust & water



1.11.2 The meter should be designed with ASIC (application specific integrated circuit) and should be manufactured using SMT (Surface Mount Technology) components. Power supply and voltage divider circuits may be of PTH (Pin Through Hole) technology.

1.11.3 The meter should be housed in a safe, high grade, unbreakable, fire resistant, UV stabilized, virgin Polycarbonate casing of projection mounting type. The meter cover should be transparent, for easy reading of displayed parameters, and observation of operation indicators. The meter casing should not change in shape, colour, size, and dimensions when subjected to 200 hrs on UV test as per ASTMD 53. It should withstand 650 deg.C. glow wire test and heat deflection test as per ISO75.

The meter cover should be sealable to the meter base with at least 1 nos. seal.

1.11.4 The meter should be supplied with a transparent extended terminal block cover (ETBC).The ETBC should not be easily detachable from the base and be secured to the base using a hinge/without hinge arrangement. ETBC should have cut at the bottom for wire termination. The terminal block should be made of high grade non- hygroscopic, fire retardant, fire resistant, glass reinforced poly-carbonate with terminal holes of minimum dia 9.5 mm and should be suitable to accommodate the conductor. The minimum center-to-center distance clearance between adjacent terminals should be 13 mm. Terminal cover should have provision for sealing with at least one seal.

The polycarbonate material of only the following manufacturers shall be used:

a)	G.E. Plastics/SABIC	LEXAN 943A or equivalent for cover & Terminal cover /LEXAN 50R or equivalent for terminal block.
b)	BAYER	Grade corresponding to above
c)	DOW Chemicals	- DO -
d)	MITSUIECHI	- DO -
e)	TEJIN	- DO -
f)	DUPONT	- DO -

1.11.5 All insulating material used in the construction of meters should be non-hygroscopic, non-ageing and of tested quality. All parts that are likely to develop corrosion should be effectively protected against corrosion during operating life by providing suitable protective coating.

1.11.6 The meter should conform to the degree of protection IP51 for protection against ingress of dust, moisture and vermin.

1.11.7 The meter should be capable of providing phase to neutral protection up to 415V for 4hours.

1.11.8 The manner of fixing the cables to the terminal block should ensure adequate and durable contact such that there is no risk of loosening or undue heating. Meter should have 2 screws in each terminal for effective clamping of cables. The screws shall not have pointed ends at the end of the thread. Screw connections transmitting contact force and screw fixing which may be loosened and tightened several times during the life of the meter should be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections should be so designed that contact pressure is not transmitted through insulating material. All terminals and connecting screws and washers should be of nickel plated brass material.

The terminals and all connecting screws will be of suitable material capable of withstanding a current of 150% of Imax for two hours, continuously.

1.11.9 The meter should be compact in design. The entire construction should be capable of withstanding stresses likely to occur in actual service and rough handling during transportation. The meter should be convenient to transport and immune to shock and vibration during transportation and handling.

1.11.10 The meter should have fixing holes, at least one at top and one at bottom. The top hole should be such that the holding screw is not accessible after fixing the meters. The lower fixing screws should be provided under the sealable terminal cover.

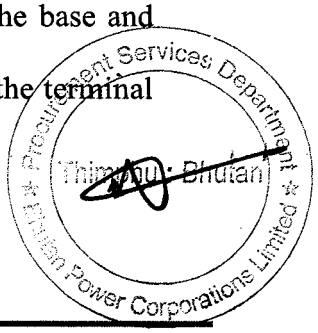
1.11.11 The meter should be fitted with Shunt and C.T. for measuring current in the phase and neutral element with proper isolation.

The C.T. and Shunt used in current circuit must be of high quality having high thermal stability and temperature co-efficient. The shunts should be E-Beam/ Spot welded.

1.11.12 The meter cover should be permanently fixed to the meter base by using ultrasonic welding or any other technology which is either equally or more efficacious in such a way that the meter cover cannot be opened without breaking the same, i.e. the meter should be break-to-open type. In case any attempt is made to separate the meter cover from the base by using any tools/ implements/ device, there should be visible evidence of tampering or attempt to open. However, sealing with commonly available adhesives will not be accepted.

1.11.13 Meter should have an indication in its display if top cover is removed even in power off condition and it should not disappear even if cover is fitted.

1.11.14 Sealing Arrangement: The sealing screws used for the meter cover shall be fixed upside down
so that these are tightened from there or screw less design for fixing the base and cover but
provision for sealing arrangement must be there. The sealing screws of the terminal cover
should be Tinned Brass.



Meters must be supplied with 1 no. manufacture's seal between meter base & cover at either side.

1.11.15 Meter should have load survey for **35** days, **15** minutes interval period for Active energy, voltage, Metering Current, Power Factor.

1.12 ANTI-TAMPERFEATURES

The meter should have the following anti-tamper features and should record & register forward energy accurately under the following conditions:

i) Input phase and neutral connections are interchanged.

ii) Tamper events like 35 kV tamper shall be included

iii) Incoming mains is connected to outgoing terminals and load is connected to incoming terminals.

iv) A combination of conditions (i) and (ii) occurs.

v) Load return is connected to a local earth and not returned to the meter as well as the phase and neutral at supply side are reversed.

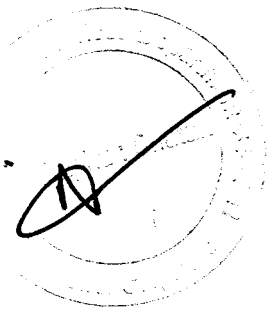
vi) A combination of ` (ii) and (iv)" or (iii)" and (iv) occurs.

vii) The meter should accurately measure energy in case of partial bypass of either phase or neutral current.

viii) A part of the load is. "Earth load indication "should appear in display if difference of current between phase and neutral lies more than6%.

ix) Meter should record energy with maximum error of (+) 6 % to (-) 4% on Injection of DC (+) ve &DC (-) ve in neutral having magnitude up to 400V & injection of chopped AC in neutral. Tests in this respect will be conducted by using a device available with us for chopped AC injection (60V to 300V) & steady DC injection. DC voltage will be rectified from a three phase power supply.

x) Meter should record energy with maximum error of +/-4% even in absence of neutral wire not connected at incoming & outgoing, i.e. single wire operation. In such condition Meter should start recording energy at 1.0 Amps. However, meters, which are immune or maintain better accuracy, will be preferred. Both elements should record energy under single wire mode if same phase is given in both elements and load is driven through earth.



The meter should be immune to tamper using external magnets as per CBIP 325 or record tamper at Imax, Vref, UPF with logging in BCS.

The meter should offer a link less design i.e. there is no isolation link provided between the current and voltage circuits and hence there would not be any

possibility of tampering with the same. The meter should be capable of recording the following tamper events in memory, minimum 25 events with date and time stamp preferably along with snapshots of V, I, PF and kWh. The logging will be on FIFO basis.

- Current reversal
- Neutral Disturbance
- Magnetic Tamper
- Single Wire

1.13 DISPLAY

1.13.1 The measured value(s) should be displayed on a Liquid Crystal display (LCD) register. The height x width of the digit should be minimum 8x 5mm. The kWh energy registration should take place **with 6 integers.** The display should have backlit capability for easy reading. Under de-energized/ storage condition, it should not get deformed.

The LCD should be of TN (Twisted Pneumatic) type with display size area of at least 40 x15mm. The display should have wide viewing angle of at least 70 deg. Dot Matrix type LCD will not be acceptable. Display should have viewing angle 35degree up & down from eye level.

1.13.2 The data should be stored in non-volatile memory (NVM). The non-volatile memory should retain data for a period of not less than10 years under un-powered condition. Battery back-up memory will not be considered as NVM.

1.13.3 In addition to provide serial number of the meter on the display plate, the meter serial number should also be programmed into meter memory for identification through communication port for CMRI/ Laptop/meter reading print out.

1.13.5 It should be possible to read the meter during power–off condition. It should also be possible to read the meter with CMRI/ Laptop in this condition. If battery is used for the same, it should be a separate battery and not the one used for RTC. The battery should be of high quality Lithium/ Lithium –ion battery, with life of at least10years. Display should be auto off type in battery mode.

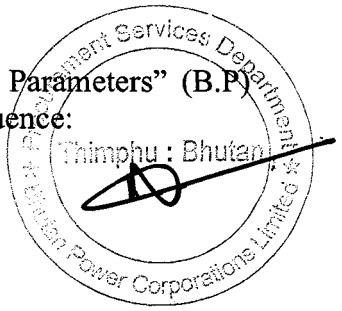
1.14 DISPLAY SEQUENCE

The meter should display the required parameters in two different modes as per the sequence given below.

A) Auto Display Mode:

The following parameters herein after referred to as "Billing Parameters" (B.P) should be displayed in an auto-cycle mode, in the following sequence:

1. LCD test
2. Total Cumulative Active Forwarded Energy (up to date)



3. Meter serial number
4. Real Date (dd mm yy)
5. Real Time (hh mm ss)
6. Present Month MD in KW and KVA since last MD reset with date and time.

Each parameter should be on meter display for 10 seconds and the time gap between two auto- cycles should be 60 seconds.

B) Push Button Mode:

The following parameters should be displayed on pressing the push button in the form of Spring loaded/ Rubber elastomer.

1. LCD test
2. Total Cumulative Active Forwarded Energy (up to date)
3. Meter serial number
4. Real Date (dd mm yy)
5. Real Time (hh mm ss)
6. Present Month MD in KW and KVA since last MD reset with date and time.
7. Previous 3 months (at least) cumulative KWh, KVAh and Maximum Demand in KVA at 24.00 hrs. of last date of the month.
8. Instantaneous Phase Voltages
9. Instantaneous Phase Currents
10. Instantaneous Neutral Current* i.e. Actual Current flowing through the Neutral
11. Instantaneous Power Factor
12. Average Power Factor (Previous Month)
13. Instantaneous Active Power
14. Instantaneous Apparent Power
15. Instantaneous Frequency
16. High resolution display for KWh and KVAH (minimum 2+4 i.e. 4 digit after decimal
17. Self-Diagnosis

1.15 MAXIMUM DEMAND REGISTRATION & RESET

Meter should continuously monitor & calculate the maximum demand for each demand interval time of 15 minutes and maximum of these in a calendar month should be stored along with date and time when it occurred. The maximum demand should automatically reset at 00:00 hrs. of the first date of each calendar month and the corresponding value along with date/ time stamp shall be transferred to Billing (History)registers.

The billing purpose parameters (active forwarded energy, maximum demand in kW should be recorded and should be available in Bill (History) for a minimum period of last 12 months.

1.16 TIME OF USE/ Time of Day MONITORING

The meter should offer the capability of time of use monitoring for energy. Sufficient numbers of registers should be capable of being configured for TOD monitoring for Peak/ off peak hours. TOD timing will be confirmed before placement of order.

1.17 SELF-DIAGNOSTICFEATURE

The meter should be capable of performing complete self-diagnostic check to monitor integrity of data memory location at all time. The meter should have indication for unsatisfactory /non-functioning/ malfunctioning of the following:

a) Time and date on meter display
b) All display segments on meter display
c) Real Time Clock (RTC) status in meter reading prints out at BC Send
d) Non-volatile Memory (NVM) status in meter reading prints out at BC Send

1.18 COMMUNICATION PORTS AND PROTOCOL:

The meter should have a galvanically isolated optical communication port for data communication with CMRI/ Laptop. The port should be compatible with IEC1107/ PACT/ ANSI. Adequate sealing provision should be provided.

1.19 CMRI/ Laptop/ BCS REQUIREMENTS

The Common Meter Reading Instrument (CMRI/Laptop) should be capable of being loaded with user- friendly software (MS-DOS5.0 or higher version compatible) for reading/ downloading meter data. Windows based Base Computer Software (BCS) should be provided for receiving data from CMRI/ Laptop and downloading instructions from base computer software to CMRI/Laptop. The BCS should be compatible WIN7 or higher operating system and should be copyrighted. The data stored in the meters memory should be available on the BCS.

This BCS should have, amongst other requirements, features and facilities described later in this specification, the facility to convert meter reading data into user definable ASCII file format so that it may be possible for the user to integrate the same with the user's billing data and process the selected data in desired manner. All the data available in the meter including energy, MD, and history data should be convertible to user defined ASCII file format for integration with third party software. The vendor should supply necessary base computer software for reading/ viewing of meter data and converting to user defined ASCII files formats. The user should have the flexibility to select the parameters to be converted into ASCII file. The vendor should also supply the necessary CMRI/ Laptop software.

The bidder has to supply the Meter Reading protocol (API) free of cost. The protocol should not be complicated & should be easily understandable to introduce compatibility between meters, BCS and CMRI of other makes. The bidder shall indicate the relevant standard to which the protocol complies.

The compatibility of transferring data from the meter to CMRI & then to the BCS should be easily established. Any change or up gradation of CMRI software or BCS in future, required for any reason, has to be done by the supplier at his own cost.

It should not be possible to alter date in the meter by-passing commands from the CMRI or Laptop. For alteration of RTC time and change of TOD timing. It should be possible to perform these functions through CMRI but only through authenticated commands sets by BCS after scheduling for particular meter Sl.nos. No alternation, change should be possible through authenticated commands sets by BCS without scheduling of meters. Moreover, no alternation, change should be possible using CMRI only, i.e. the control has to be with the BCS.

The supplier shall provide at least 10 numbers of meter Reading optical USB probes without any cost.

1.20 DISPLAY POWER UP IN ABSENCE OF MAINS SUPPLY

The meter should have the provision of providing the display parameters in absence of main supply. Press of push button should activate the display to facilitate hands free meter reading with auto-off provision. All the parameters available in the push button mode should be available in power off mode.

It should be possible to read the meter using CMRI during power-off condition using this facility.

1.21 MARKING OF THE METER

The basic marking on the meter name plate should be as follows:

a) Manufacturer's name & trade mark
b) Type Designation
c) No. of phases & wires
d) Serial number (Size not less than 5mm)
e) Month & Year of manufacture
f) Reference Voltage
g) Rated Current
h) Operating Frequency
i) Principal unit(s) of measurement
j) Meter Constant (impulse/kWh)
k) Class index of meter
l) Property of BPC
m) Purchase Order No. & Date
n) Guarantee (Guaranteed for a period of 1 and half Yrs. From date of delivery)
p) Place of manufacture
q) Meter Sl. No. in numerical form, Dt. of manufacturer, Current rating of the meter and P.O. reference should be bar coded. Bar Code may be extended up to two layer but Readable by single layer Bar code reader.

r) Meter Sl. No. Should be of seven digits and its should start serially corresponding to the quantity of meter ordered.

1.22 CONNECTION DIAGRAM & TERMINAL MARKINGS:

The connection diagram of the meter should be clearly shown on terminal cover.

1.23 OUTPUT DEVICE

The meter should have a test output accessible from the front and capable of being monitored with suitable testing equipment while in operation at site. The test output device should be provided in the form of LED output. There should be adequate clearance of the test output from other outputs so that there is no interference of other outputs while performing accuracy test with standard scanners.

The relation between test output and the indication on display should comply with the marking on the name plate (imp/kWh)

1.24 ELECTRO-MAGNETIC-COMPATIBILITY & INTERFERENCE REQUIREMENT

The meter should meet EMI/ EMC requirements as specified in the relevant standards described in Clause2.0 of this specification.

1.25 SEALS:

The manufacturer of meter will be responsible for sealing of the meters at his works with his own no. Poly carbonate seal with manufacturer's logo & sequential numbers.

General Requirements

1. GUARANTEED TECHNICAL PARTICULARS:

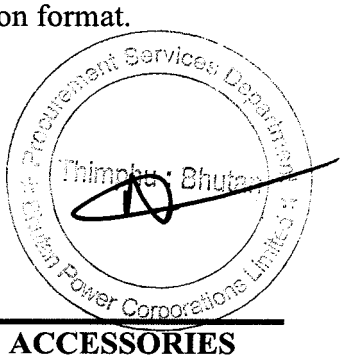
The bidder shall furnish all the necessary information as per technical specification.

2. TECHNICAL DEVIATIONS:

Any deviation in Technical Specification as specified in the Specification shall be specifically and clearly indicated in the Schedule of deviation format.

3. TESTS:

i) Type Testing of Meter:



The offered meters should be type tested at an independent laboratory accredited by International Accreditation Corporation (ILAC) or International Accreditation Forum (IAF) or NABL in accordance with relevant IEC/IS Standard with latest amendments. The type test report should not be more than5 (five) years old. A copy of the Type Test results should be enclosed with the offer. If there is any modification in the design/ parameters of the specifications or use of constituent materials in the offered meters submitted with the offer, from the meter which was submitted type tested, which may affect the characteristics as well as parameters of the meter, revised type test certificates as per the design, parameters and constituent material used in the offered meter, shall have to be submitted failing which the offer maybe liable to be rejected.

ii) Acceptance tests

A) The acceptance tests as stipulated in CBIP / IS (with latest amendments) shall be carried out by the supplier in presence of purchaser's representative at manufacturer premises.

B) Also the following additional tests are to be carried out on one meter randomly selected from each lot offered for inspection / acceptance testing.

i. Magnetic induction of external origin (AC & DC)
ii. Tamper & Fraud protection, as per Clause of 12 of this specification.
iii. Test of endurance upto 120% of Imax, for two hours, followed by verification of limits of error.
iv. Verification of internal components.
v. Dry Heat Test as per IS 13779 / 99, Clause 12.6.1, of one meter from the offered lot is to be arranged by the supplier at any NABL accredited laboratory, at his cost.
vi. The Supplier shall manufacture one extra number of meter from PO quantity for Dry Heat Test at its own cost.

In case of failure of Meters as specified in Annexure – H of IS-13779 (For A above) the entire lot will be treated as rejected.

In case of failure of any single meter (as per B above) the entire lot will be rejected.

iii) Test Facilities:

The tests for equipment/ instrument shall be carried out as per relevant Standards and test certificates shall be furnished for scrutiny. The Bidder shall indicate the details of the equipment available with him for carrying out the various tests as per relevant Standards.

NOTE: The standard meters used for conducting tests shall be calibrated periodically and test certificates shall be available at Works for verification by purchasers representative.

The manufacturer shall have the following testing facilities to ensure accurate calibration:

AC high voltage test

Insulation test
Test of no load condition
Test of Starting condition
Test on Limits of error
Power loss in voltage and current circuit
Test of Repeatability of error
Test of meter constant
Test of magnetic influence

4. INSPECTION:

All acceptance tests and inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the Bidder and purchaser at the time of purchase.

The supplier shall keep the purchaser informed in advance, about the manufacturing program for each lot so that arrangement can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance /routine testing of the bought out items.

The purchaser reserves the right for type testing of any meter & meter casing etc. from any of the offered lots, received at any destination stores.

6. QUALITY ASSURANCE PLAN:

- The factory shall be completely dust proof.
- The testing rooms shall be temperature and humidity controlled as per relevant standards.
- The testing and calibrating equipments should be automatic and all test equipment shall have their valid calibration certificates.
- Power supplies used in testing equipment shall be distortion free with sinusoidal wave-forms and maintaining constant voltage, current and frequency as per the relevant standards.

The manufacturer laboratory must be well equipped for testing of the meters. They must have computerized standard power source and standard equipment calibrated not later than a year (or as per standard practice).The details of testing facilities available for conducting

i. The routine tests.
ii. Acceptance tests.

7. MANUFACTURING ACTIVITIES

All the materials, electronics and power components, ICs used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy.

The manufacturer should use Application Specific Integrated Circuit (ASIC) or Micro controller for metering functions.

The electronic components shall be mounted on the printed circuit board using latest Surface Mounted Technology (SMT) except power components by deploying automatic SMT pick and place machine and reflow solder process. The electronic components used in the meter shall be of high quality and there shall be no drift in the accuracy of the meter at least up to 10 years. Further, the Bidder should own or have assured access (through hire, lease or sub-contract) of the mentioned facilities. The PCB material should be of glass epoxy FR-4 grade conforming to relevant standards.

All insulating materials used in the construction of meters shall be non-hygroscopic, non-aging and of tested quality. All parts that likely to develop corrosion shall be effectively protected against corrosion by providing suitable protective coating.

Quality should be ensured at the following stages:

At PCB manufacturing stage, each board shall be subjected to bare board testing.

At insertion stage, all components should undergo testing for conforming to design parameters and orientation.

Complete assembled and soldered PCB should undergo functional testing using test equipments.

The calibration of meters shall be done in-house.

The bidder should submit the list of components used in the meter along with the offer.

A detailed list of bought-out items, which are used in the manufacture of the meter, should be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought-out items.

The details of testing facilities available for conducting the routine and acceptance tests and other special tests on the meter shall be furnished with the bid. The facility available if any for conducting type test may also be furnished.

The acceptance test certificates in case pre-dispatch inspection or a routine test certificate in cases where inspection is waived has to be approved by the purchaser.

8. GUARANTEE:

The meters should be guaranteed against any manufacturing defects arising out of faulty design or bad workmanship or component failure for a period of **Five and half years** from the date of supply.

Life of RTC battery used for the meter should be guaranteed for 10 years.

The meter/ battery found defective within the above guarantee period shall be replaced by the supplier free of cost within 6 months of the receipt of intimation of failure/ defect.

9. REPLACEMENT OF DEFECTIVE METERS:

The meters declared defective by the BPCL shall be replaced by the supplier up to the full satisfaction of the BPC at the cost of supplier.

10. PACKING & FORWARDING:

The equipment shall be packed in cartons/ crates suitable for vertical/ horizontal transport as the case may be, and suitable to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and in adequate packing.

The easily damageable material shall be carefully packed and marked with the appropriate caution symbol. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc., shall be provided. Supplier without any extra cost shall supply any material found short inside the packing cases immediately.

Component Specifications

The meters shall be designed and manufactured using SMT (Surface Mount Technology) components, except for power supply components, LED/ LCD etc., which are PTH type.

All the material and electronic power components used in the manufacture of the meter shall be of highest quality and reputed makes so as to ensure higher reliability, longer life and sustained accuracy.

Sl. no.	Component Function/Feature	Requirement	Make/origin
1.	Current Element	E-beam/spot welded shunts shall be provided in the phase element and C.T. in the neutral. Alternatively, both the current elements (phase & neutral) shall have Shunts with proper isolation.	Any make or origin Conforming to IEC
2.	Measurement/ Computing chips	The Measurement/ computing chips used in the meter should be with the Surface mount type along with the ASICs.	Renesas, Texas Instruments, Teridian, Maxim
3.	Memory chips	The memory computing chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	Atmel, National Semiconductors, Microchip, Texas Instruments, Phillips, Hitachi, Teridian, ST
4.	Display modules	The display modules should be well protected from the external UV radiations. The display should be clearly visible over an angle of at least a cone of70^{o}.The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. The display should be TN type industrial grade with extended temperature	Haijing, Holtek, Bonafied Technologies, Advantek, Truly Semiconductor, Hitachi, SONY
5.	Communication Modules	Communication modules should be compatible for any of the following ports: RS232, RS485, RJ45, USB	National Semiconductors, Hitachi, Texas Instruments, Philips, HP, Agilent, Everlight, Fairchild
6.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	National Semiconductors, Hitachi, Texas Instruments, Siemens, Agilent, Philips, Hp, Everlight, Siemens

Sl. no.	Component Function/Feature	Requirement	Make/origin
7.	Power Supply	The power supply should be with the capabilities as per the relevant standards. The power supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	As specified.
8.	Electronic Components	The active& passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	Philips, Toshiba, Fairchild, Murata, Rohm, Siemens. National semiconductors, ATMEL, Texas Instruments, Hitachi. Ligitec, OKI, EPCOS, Incap
9.	Mechanical parts	The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. The other mechanical components should be protected from rust, corrosion etc. by suitable plating/ painting methods.	
10.	Battery	Lithium/ Lithium-ion/NiMh with guaranteed life of 10years	Renata, Panasonic, Varta, Tedrium, Sanyo, National, Teridian Duracell, Maxell, Elegance, EVE
11.	R RTC/Micro Controller	The accuracy of RTC shall be as per relevant IEC standards	Philips, Dallas, Atmel, Motorola, NEC, Renesas, Hitachi, Xicor, Texas Instruments, NEC or OKI, ST, Mitsubishi

2.0 Technical Specification for A.C. 3-Phase 4-Wire L.T. Solid State (Static) Whole Current DLMS Compliant Energy Meter of 1.0 Class Accuracy and Current Rating (5-30) Amp and (10-80) Amp

2.1 SCOPE

(a) This specification covers design, engineering, manufacture, testing, inspection and supply of solid state (Static) Whole Current lag only energy meter with backlit LCD display use for balanced unbalanced load in urban / rural area. The meter should be capable of recording and displaying energy in KWh & demand in KW, KVA, power

factor range of Zero lag-unity-Zero lead. Meter should have facility/capability of recording tamper information & load survey in active energy, apparent energy, reactive energy, phase currents, Phase Voltages & Other parameters with non-volatile memory.

(b) It is not the intent to specify completely herein all the design and construction of meter however the meter shall conform in all respect to high standard of engineering, design and workmanship shall be capable of performing in continuous commercial operation in a manner acceptable to Bhutan Power Corporation Limited, who will interpret the meanings of drawings and specification shall have the right to reject any work or material which in its judgment is not in accordance herewith. The offered meter shall be complete with all components, accessories necessary for their effective and trouble free operation of the system for the purpose mentioned above. Such components shall be deemed to be within the scope of bidders supply irrespective of whether those are specifically brought out in this specification and or the commercial order or not.

The meter should be flexible enough to accommodate changing requirements in future and design for minimum maintenance.

2.2 STANDARDS APPLICABLE:

Unless specified elsewhere in this specification, the performance & testing of the meters should conform to the following Indian / International standards, to be read with up to date and latest amendments / revisions thereof as on 90 days prior to floating of tender.

Sl. No.	Standard No.	Title
1	IEC 62052-11:2003	Electricity Metering Equipment (AC)-General Requirements, tests and test conditions
2	IEC 62053-21:2003	Class 1 and 2 alternating current watt hour meter
3	IS 13779:1999	ac STATIC WATIHOUR METERS, CLASS 1AND 2 - SPECIFICATION
4	CBIP 325	Standardization of AC Static Electrical Energy Meter
5	IS 14434 (1998)	Polycarbonate Molding and Extrusion Materials.

Meters matching with requirements of other national or international standards that ensure equal or better performance than the above mentioned standards should also be considered. When the equipment offered by the bidder conforms to standards other than those specified above, salient points of difference between standards adopted and the standards specified in this specification shall be clearly brought out in the relevant schedule. A copy of such standards along with their English translation shall invariably be furnished along with the offer.

2.3 CLIMATIC CONDITIONS:

The meters to be supplied against this specification should be suitable for satisfactory continuous operation under the following tropical conditions. Meters should be capable of maintaining required accuracy under hot, tropical and dusty climatic conditions.

i)	Maximum Ambient Air Temperature in shade	: 55 °C
ii)	Minimum Ambient Air Temperature	: (-) 10 °C
iii)	Maximum Relative Humidity	: 95% (Non-condensing)
iv)	Minimum Relative Humidity	: 10%
v)	Height above mean sea level	: Upto 4000 meters
vi)	Average number of tropical monsoon per Annum	: 5 months
vii)	Annual Rainfall	: 100 mm to 1500 mm

2.4 TROPICAL TREATMENT :

The meters shall be suitably designed and treated for normal life and satisfactory operation under hot and hazardous tropical climate conditions and shall be dust and vermin proof. All the parts and surface, which are subject to corrosion, shall either be made of such material or shall be provided with such protective finish which provides suitable protection to them from any injurious effect of excessive humidity.

2.5 MAXIMUM CONTINUOUS CURRENT:

The maximum continuous current in meters should be the current at which the meter purports to meet the accuracy requirement of the specification.

2.6 CONSTRUCTION:

The case, winding, voltage circuit, sealing arrangements, registers, terminal block, terminal cover & name plate etc. shall be in accordance with the relevant standards. The meter should be compact & reliable in design, easy to transport & immune to vibration & shock involved in the transportation & handling. The construction of the meter should ensure consistence performance under all conditions especially during heavy / heavy rains / very hot weathers. The insulating materials used in the meter should be non-hygroscopic, non-ageing & have tested quality. The meter should be sealed in such a way that the internal parts of the meter becomes inaccessible and attempts to open the meter shall result in viable damage to the meter cover. **This is to be achieved by using continuous Ultrasonic welding on all the four sides of the Meter base and cover or any other technology which is either equally or more efficacious.**

The meter should comply latest technology such as Microcircuit or Application Specific Integrated Circuit (ASIC) to ensure reliable performance. The mounting of the components on the PCB should compulsorily be Surface Mounted Technology (SMT) type. Power supply component may be of PTH type. The electronic components used in the meter should be of high quality and there should be no drift in the accuracy of the meter for at least ten years. The circuitry of the meter should be compatible with 16 Bit (or better) ASIC with compatible processor and meter should be based on Digital measuring and sampling technique.

The meter should be housed in a safe, high grade, unbreakable, fire resistant, UV stabilized, virgin Polycarbonate casing of projection mounting type. The meter cover should be transparent / translucent. But the viewing portion should be transparent for easy reading of displayed parameters, and observation of operation indicators. The meter base may not be transparent, but it should not be black in colour." The meter casing should not change in shape, colour, size and dimensions when subjected to 72 hrs on UV test as per ASTMD 53." It should withstand 650 deg. C. glow wire test and heat deflection test as per ISO 75 or as per IEC 60068 -2-5.

In addition to the above, the meter cover should be sealable to the meter base with at least 2 nos. bar coded seals bearing the identification marks of the Manufacturer. Suitable arrangement should be made for fitting/fixing of utility seal at two sides of meter terminal cover in such a manner that any access to the terminal cannot be possible without removing the seal. There should also be provision for sealing at the optical port.

The bidder shall submit relevant documents regarding the source of procurement of polycarbonate material. The polycarbonate material procured from the following manufacturers should be used.

a)	G.E. Plastics	LEXAN 943A, or equivalent like 143, 123R for Top cover & Terminal cover/ LEXAN 503R or equivalent like 143R, 500R for Base & Terminal Block
b)	BAYER	Grade corresponding to above
c)	DOW Chemicals	-Do-
d)	MITSUBISHI	-Do-
e)	TEJIN	-Do-
f)	DUPONT	-Do-

2.7 METER CASE AND COVER:

The meter should have a case, which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the seal and cover. This is to be achieved by use of **Ultrasonic Welding** (Ultrasonically continuously welded at three sides so that the cover cannot be separated from the base without breaking/damaging the case and cover) i.e. break to open type or any other technology which is either equally or more efficacious. In case, ultrasonic welding using plate / strip is used, the material of plate / strip should be same as that of cover and base and the strip. The manufacturer's logo should be embossed on the strip / plate. The material of the meter body (case and cover) shall be of Engineering Plastic.
The meter cover should be fixed to the meter base (case) with Unidirectional Screws, so that the same cannot be opened by use of screwdrivers. These unidirectional screws should be covered with transparent caps, ultrasonically welded with the meter body and the screw covers should be embedded in the meter body in a groove. The meter shall withstand external magnetic influence as per latest amendments of CBIP Technical Report No.325.

2.8 TERMINAL BLOCK AND COVER:

The terminals may be grouped in a terminal block having adequate insulating properties and mechanical strength. The terminal block should be made from best quality non-hygroscopic, flame retardant material (capable of passing the flammability tests) with nickel plated brass inserts / alloy inserts for connecting terminals. It should be rigidly fixed to the base of the meter so that it cannot be separated from the meter base without breaking either the meter base or the terminal block and this fixing arrangement should be in parallel to the meter base in such a way that it cannot be viewed or approached from any part of the meter without breaking the meter.

The terminals in the terminal block shall be of adequate length in order to have proper grip of conductor. **The screws shall not have pointed ends at the end of threads.** All terminals and connecting screws and washers should be of tinned / nickel plated brass material. The terminal should withstand glow wire test at 960 + 15 °C and the terminal should withstand at least 135 °C.as per IS.

The internal diameter of terminal hole should be minimum 5.5 mm for (5 -30A) & 9.5mm for (10 –80A) meters and center to center distance is 13 mm. The holes in the insulating material shall be of sufficient size to accommodate the insulation of conductor also.

The terminal cover shall be transparent re-enforced Polycarbonate, Engineering Plastic with minimum thickness 2.0 mm and the terminal cover shall be of extended type completely covering the terminal block and fixing holes. The space inside the terminal cover should be sufficient to accommodate adequate length of external cables.The bottom of the terminal cover should be cut through inside 25 mm to accommodate the cables while closing the terminal cover.

2.9 MARKING OF THE METER:

The marking on the meter should be in accordance with relevant clauses of IS 13779. The basic marking on the meter nameplate should be as follows (all other markings as per IS shall also be there):-

a) Manufacturer's name & trade mark
b) Type Designation
c) No. of phases & wires
d) Serial number (Size not less than 5mm)
e) Month & Year of manufacture
f) Reference Voltage
g) Rated Current
h) Operating Frequency
i) Principal unit(s) of measurement
j) Meter Constant (impulse/kWh)
k) Class index of meter
l) Property of BPC
m) Purchase Order No. & Date
n) Guarantee (Guaranteed for a period of 1 and half Yrs. From date of delivery)
p) Place of manufacture
q) Meter Sl. No. in numerical form, Dt. of manufacturer, Current rating of the meter.

and P.O. reference should be bar coded. Bar Code may be extended up to two layers but Readable by single layer Bar code reader.

r) Meter Sl. No. Should be of seven digits and its should start serially corresponding to the quantity of meter ordered.

2.10 DISPLAY OF MEASURED VALUES:

The meter shall have numeric display with at **least 6 full digit** and with LCD backlit display, having minimum character height of 10 mm. The data should be stored in non-volatile memory. The non-volatile memory should retain data for a period of not less than 10 years under unpowered condition. Battery back-up memory will not be considered as NVM.

It should be possible to easily identify the single or multiple displayed parameters through symbols / legend on the meter display itself or through display annunciation which should be self-explanatory and symmetric.

The register shall be able to record and display energy register starting from zero, for a minimum of 2500 hours. The energy corresponding to rated maximum current at reference voltage and unity power factor. The register should not roll over in between this duration.
In addition to provide Serial Number of the meter on the display plate, the meter serial no. should also be programmed into meter memory for identification through communication port for CMRI / laptop / meter reading printout.

Visibility of display in poor light conditions is an important criterion. STN or TN or any better type of advanced LCD to be used. Proper legends for the displayed parameters to be provided (Factory programmable). Back lit provided for clear visibility should be uniform throughout all part of the LCD.

The meters should have auto-display mode for pre-selected parameters. Push-Button mode of display should display all parameters and it should have priority over auto mode. The meter should give clear message on display to indicate that the meter has experienced tampers and the nature of tamper with date and time of first occurrence, last occurrence and last restoration, if the Last tamper status is not restored, then meter will indicate first occurrence, penultimate restoration and last occurrence. Connection check, Phase sequence and self-diagnostic should give clear message on display.

The meter shall have a test output (blinking **LED)** accessible from the front and be capable of being monitored with suitable testing equipment. The operation indicator must be visible from the front. Test output device should be provided in the form of one common LED for active and reactive energy with the provision of selecting the parameter being tested (separate LED may also be used with proper separation).

2.11 DISPLAY SEQUENCE:

The meter should display the required parameters in two different modes as follows:
(Display sequence for both auto and Push button must be maintained, no interchange in sequence or display parameter will be accepted. All the display should have proper legend to identify the same.)

A. Auto Display Mode:
The following parameters should be displayed in auto cycle mode, in the following sequence. Each parameter should be on meter display for 10 seconds and the time between two auto cycles should be at 60 seconds gap.

7. LCD test
8. Total Cumulative Active Forwarded Energy (up to date)
9. Meter serial number
10. Real Date (dd mm yy)
11. Real Time (hh mm ss)
12. Present Month MD in KW and KVA since last MD reset with date and time.

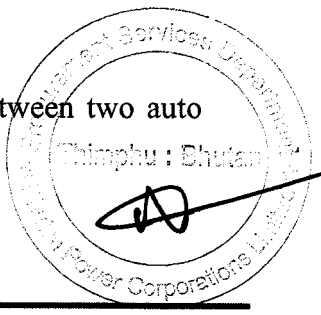
Each parameter should be on meter display for 10 seconds and the time between two auto cycles should be at 60 seconds gap.

B. Push Button mode:

The following parameters should be displayed on pressing the push button

18. LCD test
19. Total Cumulative Active Forwarded Energy (up to date)
20. Meter serial number
21. Real Date (dd mm yy)
22. Real Time (hh mm ss)
23. Present Month MD in KW and KVA since last MD reset with date and time.
24. Previous 3 months (at least) cumulative KWh, KVAh and Maximum Demand in KVA at 24.00 hrs. of last date of the month.
25. Instantaneous Phase Voltages
26. Instantaneous Phase Currents
27. Instantaneous Neutral Current* i.e. Actual Current flowing through the Neutral
28. Instantaneous Average Power Factor
29. Inst. Power Factor – Phase Wise
30. Average Power Factor (Previous Month)
31. Instantaneous Active Power
32. Instantaneous Apparent Power
33. Instantaneous Frequency
34. High resolution display for KWh, KVARH and KVAH (minimum 2+4 i.e. 4 digit after decimal)
35. Phase Sequence
36. Connection check (For CT Reversal Connection Not OK)
37. Self-Diagnosis

Display for Auto and manual mode must be listed by two headers
A) Auto Display Mode and
B) Push Button Mode (Parameters should be pasted in front of the PP Box
Each parameter should be on meter display for 10 seconds and the time between two auto cycles should be at least 60 seconds gap).



2.12 ANTI TAMPER FEATURES:

The meter should have the following anti-tamper features:

i) ***Current Reversal:*** The meter shall be capable of recording energy correctly even if the input and output terminals are interchanged in one, two or all the three phases including logging of tamper.

ii) The meter shall work correctly irrespective of phase sequence of supply (there must be an indication in display & downloaded data). Tamper alerts is not required. But it must be shown in instantaneous parameters both in tabular as well as in phasor diagram.

iii) The meter shall work correctly even in absence of neutral as per IS13779. Accuracy in between 70% Vref to 50 % Vref must be maintained within + 4%.

iv) Meter should record energy within maximum error of + 4% on injection of DC, pulsating DC (7-10 Hz), Chopped AC in Neutral. Maximum chopping for AC injection will be 25% to 30% at peak end.

v) The registration shall not be affected more than + 4% if high frequency (60-100Hz) A.C. Voltage w.r.t. earth is applied to the meter neutral.

vi) Meter will be tested at Low Frequency (30-40 Hz) and High Frequency (60 – 80 Hz). Meter should be immune on these tests.

vii) High Frequency Jammer Circuit Test – Meter should be immune on this test.

viii) The meter should be immune to Electro Static Discharge or Sparks of 35 KV (approx) induced by using frequency-generating devices having very high output voltage.

N.B.:- Tests in this respect will be conducted by using commonly available devices and during spark discharge test, spark will be applied directly at all vulnerable points of the meter for a period of 10 to 20 minutes and meter should record ±4 % w.r.t. Master Meter under this condition. After application of spark discharge meter should record correctly within the specified limits of errors. Beyond 35 KVp meter should record as tamper if not immune. It should record the event under Indian Event Reference of others type with Event ID's 249 for Occurrence and 250 for Restoration with OBIS (0.0.99.98.4.255). Other details are applicable as per "Others Tamper Profile of IS 15959.

The meter shall be capable of recording; occurrences and restoration with date and time i.r.o. the following tamper conditions:

a. Missing Potential for all phases (phase wise).
b. Voltage unbalance
c. Current reversal for all phases (phase wise). (It must not be restored without threshold current).
d. All potential missing or Power failure (This should not be considered in tamper events. Minimum 20 events need to be given separately)
e. Magnetic Disturbances (As per IS 13779 & CBIP 325 including 0.5 T Permanent Magnet along with latest amendments)
f. Neutral Disturbances (if it logged).
g. C.T. open
h. C.T. Bypass/ C.T. Short.
i. C.T. Unbalance (should occur only on activation of neutral C.T.)
j. Over Current (during existence of this tamper current unbalance tamper should not

log).
k. Low power factor.

Snapshot values of Phase Voltage, Phase Current & Phase wise Power Factor, Active Energy value during occurrence & restoration to be provided in all the above mentioned tamper conditions in BCS with date and time. (In Event logging Snapshots should be considered when the actual phenomenon occurred)

The occurrence and restoration of tamper should be equal to 5 min. (Except Magnetic and Neutral Disturbances tampers) *Magnetic tamper should appear instantaneously, ND within 3 min.*

All authenticated commands should be Base Computer Software controlled. All transactions with meter should be date and time logged, in the downloaded data minimum last 12 such transactions need to be provided.

Properly designed meter tamper logic should be provided and clearly explained in the bid. The tamper logic should be capable of discriminating the system abnormalities from source side and load side and it should not log/record tamper due to any source side abnormalities. More than one tamper *CT related/ PT related/ others* should not be logged at a time. A minimum of 300 events (one event means either occurrence or restoration) of all types of tamper with date & time stamping should be available in meter memory compartment wise. The logging will be on FIFO basis. The events will be divided into three compartments like *CT related (148 Events), PT related (88Events) and others (64 Events).*

- **Meter should have a continuous and clear indication in its display if top cover is removed / opened and even re-fixed (non rollover) and only cover open must be logged in BCS without any restoration. Auto scroll display may be sacrificed for that COVER OPEN.**

2.13 Measurement of Harmonics:

The meter should be capable of measuring fundamental energy as well total energy i.e., fundamental plus Harmonics energy. Total energy shall be made available on meter display and the same shall be used for billing purpose. Provision for measuring Fundamental energy should be kept for utilization in future.

The total energy and Fundamental energy shall be logged in the meter memory and be capable of downloading to the BCS through the CMRI and be available for viewing at the BCS end.

2.14 RESETTING OF MAX. DEMAND:

The meter should be capable of recording the Apparent MD with integration period of 15 minutes (programmable).
MD reset should be through each of the three means:
1) Automatic resetting at present date & time (at present it will be at 00.00 hrs of the first day of the month).
2) Manually i.e., by push button.

3) Through authenticated command from MRI or through Remote Communication.
The means by which the reset has been done should be made available to downloaded data.
Facility to invoke any of the above through authenticated MRI command should be provided at BCS.
MD reset button should have proper sealing arrangement.

There should be separate Push button for scrolling display (up and down) and MD reset.

2.15 LOAD SURVEY:

The meter should be capable of recording load survey for the following parameters for a period of minimum 60 days - subject to availability of all parameters listed below with 15 minutes integration period.

i) Energy in KWh,
ii) Demand in KVA and KW,
iii) Current – phase-wise
iv) Voltage – phase-wise

The NVM shall not require any additional battery backup to retain the data in case of power failure, for up to 10 years and the data storage shall be independent of battery backup unit.
The life of the RTC battery in circuit condition should be minimum 6 years in case of power failure.
It should be possible to transfer this data to base computer software through MRI/Lap top or RMR. **The data so obtained should be displayed in both graphical &numeric form in the BCS**. The BCS with all details is to be provided by the supplier at no extra cost.

2.16 METER READING DURING POWER OFF:

It should be possible to read the meter-display visually and with MRI/Lap top in absence of input voltages with the help of internal battery backup (through optical port only).
In case of external battery the arrangements should be such that hands free operation is possible. In case of external battery 10 years guarantee must be given for external battery/power pack. **Separate battery should be used for this purpose** (Not RTC or processor battery).

2.17 SELF DIAGNOSTIC FEATURES:

The meter shall be capable of performing complete self-diagnostic check to monitor the circuits for any malfunctioning to ensure integrity of data memory location all the time.
If possible, the details of malfunctioning should be recorded in the meter memory.

The bidder should furnish the details of self-diagnostic capability feature, viz Memory status (NVM) and Battery status, RTC Status etc. and clear indication should be in display and BCS.

a. IMMUNITY TO ELECTRO MAGNETIC DISTURBANCE:

The meter should be designed in such a way so that external electromagnetic field or electrostatic discharges do not influence the performance of the meter as per IS 13779.

2.18 TECHNICAL SUPPORT, MANUALS &TRAINING:

Extensive technical support, detailed technical literature (should supply with each meter at the time of packing) & training is to be provided by the manufacturer. Supply of External Battery Packs if required to be provided by the manufacturer and should be clearly offered in their bids.

2.19 INFLUENCE QUANTITIES:

The meter shall work satisfactory with guaranteed accuracy as per limit of IS: 13779 (clause No.9.2.1 and 11.2) under presence of the following quantities:

i) Electromagnetic field
ii) External magnetic field
iii) Radio frequency interference
iv) Vibration
v) Voltage variation (70% - 120% of Vref.) in 0.5 lag and upf both in 5% and 100% of Ib.
vi) Frequency variation (+/-) 5% of 50 Hz in 0.5 lag and upf both in 5% and 100% of Ib.

2.20 POWER CONSUMPTION BY METER :

Voltage Circuit: The active and apparent power consumption in the voltage circuit including the power supply of meter at reference voltage. Reference temperature and reference frequency should not exceed 1.5 Watt and 8 VA per phase respectively.

Current Circuit: The apparent power taken by each current circuit at basic current, reference frequency and reference temperature should not exceed 4 VA per phase in power up condition.

2.21 STARTING CURRENT:

The meter should start registering energy at 0.2 % of basic current at unity power factor and should be fully functional within five seconds after the rated voltage is applied.

2.21.1 RUNNING AT NO LOAD:

When 70% & 120% voltage is applied and no current flows in the current circuit, the test output of the meter should not produce more than one pulse.

2.22 COMMUNICATION CAPABILITY:

The meter shall have a galvanically isolated optical communication port as per IEC 1107/ANSI/PACT so that it can be easily connected to a hand-held common meter reading

instrument (CMRI) for data transfer. The billing data & the tamper data downloading time should be less than 5 minutes. The optical port should be provided with proper sealing arrangement so that the optical cover should not be opened without breaking the seal. The stored data in the meter should be available through CMRI even when the display of the meter is not available.

The above ports suitable for interface of the meter with appropriate protocol to Common Meter Reading Instrument (CMRI) / LAPTOP / PC.

A separate suitable serial port (RS-232/RJ-11) capable of being hooked (into a remote metering device such as modem, etc. should be provided inside the terminal cover to enable future Automatic meter reading) in such a way that the same cannot be accessed without interfering the Terminal cover and seal.

It should not be possible to alter date in the meter by-passing commands from the CMRI or Laptop. For correction of RTC time, change of TOD timing, etc. it should be possible to perform this functions through CMRI/Laptop but only through authenticated commands sets by BCS after scheduling for particular meter Sl nos.(Which is possible as per DLMS protocol). Billing parameters should be factory programmable. No alteration, change should be possible through authenticated commands sets by the BCS without scheduling the meters. Moreover, no alternation change should be possible using CMRI only, i.e. the control has to be with the BCS (Which is possible as per DLMS protocol).

The BCS shall have multi-level password for data protection & security. Bidder has to submit CMRI software (.exe format) also at the time of sample meter testing.
Seal tracking software should be submitted and installed at PC/ Laptop of the Purchaser before commencement of supply of the meters i.e. it must be supplied before / at the time of offering first lot inspection.

2.23 BASE COMPUTER SYSTEM & SOFTWARE REQUIREMENTS:

The Common Meter reading Instrument (CMRI/Laptop) should be capable of being loaded with user-friendly software (MS-DOS 5.0 or higher version compatible) for reading / downloading meter data. Windows based Base Computer Software (BCS) should be provided for receiving data from CMRI / Laptop and downloading instructions from base computer software to CMRI / Laptop.

The BCS should be compatible at Windows 7/8/8.1/10 (both 32 bit and 64 bit) operating systems and copy righted. The data stored in the meters memory including defrauded energy should be available on the BCS. **Only one BCS should be provided for downloading data and authenticated command from CMRI/ Laptop**. So that at the time of reading meter should get the authenticated command.

This BCS should have, amongst other requirements, features and facilities described later in this specification, the facility to convert meter-reading data into user definable ASCII file format so that it may be possible for the user to integrate the same with the user's billing data and process the selected data in desired manner. All the data available in the meter including energy, MD, all Transaction data with date and time, New TOD time Zones and history data should be available in BCS after down loading, more over convertible to user defined ASCII

file format for integration with third party software. The vendor should supply necessary base computer software for reading / viewing of meter data and converting to user defined ASCII files formats. The user should have the flexibility to select the parameters to be converted into ASCII file. The vendor should also supply the necessary CMRI / Laptop software (during sample testing also).

The bidder has to supply the Meter Reading protocol (API), free of cost. The protocol should not be complicated & should be easily understandable to introduced compatibility between meters, BCS and CMRI of other makes. The bidder shall indicate the relevant standard to which the protocol complies. The compatibility of transferring data from the meter to CMRI & then to the BCS should be easily established. Any change or up gradation of CMRI software of CMRI software or BCS in future, required for any reason, has to be done by the supplier at his own cost.
All transactions should be made at the time of reading. No extra operations will be allowed for transactions. All transactions should be available in downloaded data with date and time stamping.

The same software should be capable of preparing CMRI to read the meter information or to reconfigure the meter for change of TOD timings and / or time setting of the meter etc. The exhaustive on-line help should be available with the software so that user can use all the features of the software by just reading the help contents.
Test for automated Meter reading will be conducted by downloading Meter data through Modem at our system through third party software also.
In BCS 12 months data back-up data for KWh, KVAh, MD & KVA (total & TOD wise), Average load factor, average power factor must be available.

The supplier shall provide at least 10 numbers of meter Reading optical USB probes without any cost.

2.24 ACCURACY:

There shall be no drift in accuracy, for a period of ten years from the date of supply. In case any drift is noticed which is beyond the permissible limits, the bidder shall replace by a new meter without any extra cost.

General Requirements:-

1.0 GUARANTEED TECHNICAL PARTICULARS :

The bidder shall furnish all the necessary information as desired in the Schedule of Guaranteed
Technical Particulars and data, appended with this Specification. If the bidder desire to furnish any other information in addition to the details as asked for, the same may be furnished against the last item of this Annexure. – I

2.0 TECHNICAL DEVIATIONS:
Any deviation in Technical Specification as specified in the Specification shall be specifically and clearly indicated in the Schedule of deviation format.

3.0 TESTS:

3.1 Type Testing of Meter

The offered meters should be type tested at any NABL accredited laboratory in accordance with IS i3779 with latest amendments, CBIP Report 325 with latest amendments. The type test report should not be more than 3 (three) years old. A copy of the Type Test results should be enclosed with the offer. If there is any modification in the design / parameters of the specifications or use of constituent materials in the offered meters submitted with the offer, from the meter which was submitted type tested, which may affect the characteristics as well as parameters of the meter, revised type test certificates as per the design, parameters and constituent material used in the offered meter, shall have to be submitted failing which the offer may be liable to be rejected.

Type Test Certificate from any NABL accredited Lab. shall only be considered.
Type test certificate should contain the following information clearly:

1) Type of display or LCD.
2) Class of accuracy.
3) Meter constant.
4) Type of meter.

3.2 Acceptance tests

C) The acceptance tests as stipulated in CBIP / IS (with latest amendments) shall be carried out by the supplier in presence of purchaser's representative at manufacturer premises.

D) Also the following additional tests are to be carried out on one meter randomly selected from each lot offered for inspection / acceptance testing.

vii. Magnetic induction of external origin (AC & DC)
viii. Tamper & Fraud protection, as per Clause of 12 of this specification.
ix. Test of endurance upto 120% of Imax, for two hours, followed by verification of limits of error.
x. Verification of internal components.
xi. Dry Heat Test as per IS 13779 / 99, Clause 12.6.1, of one meter from the offered lot is to be arranged by the supplier at any NABL accredited laboratory, at his cost.
xii. The supplier shall manufacture one extra number of meter from the PO quantity for Dry Heat Test at its own cost.

In case of failure of Meters as specified in Annexure – H of IS-13779 (For A above) the entire lot will be treated as rejected.
In case of failure of any single meter (as per B above) the entire lot will be rejected.

3.3 Routine Tests:

Each and every meter of the offered lot shall undergo the routine tests as well as functional tests as per IS: 13779/1999, CBIP Report 325 and after sealing the meters, the manufacturers will have to submit the routine test report of all the meters as well as a statement showing seal

Sl. Nos. against each meter Sl.No. of offered lot in soft copy (MS WORD or EXCEL format), to

(a) The General Manager (Procurement Services Department)
(b) The General Manager (Distribution & Customer Services Department), along with offer letter for acceptance test.

4.0. TEST FACILITIES:

The tests for equipment / instrument shall be carried out as per relevant Standards and test certificates shall be furnished for scrutiny. The Bidder shall indicate the details of the equipment available with him for carrying out the various tests as per relevant Standards. The bidder shall indicate the sources of all equipment's / instruments.

NOTE: The standard meters used for conducting tests shall be calibrated periodically at any NABL Accredited Test Laboratories and test certificates shall be available at Works for verification by purchaser's representative.

The manufacturer shall have at least the following testing facilities to ensure accurate calibration:-

- AC high voltage test
- Insulation test
- Test of no load condition
- Test of Starting condition
- Test on Limits of error (Automatic Testing facility with ICT)
- Power loss in voltage and current circuit
- Test of Repeatability of Error (at 100% Ib UPF and 5% Ib UPF. Deviation of Errors should be within 0.1).
- Test of meter constant
- Test of magnetic influence (As per CBIP 325 & 0.5 T Permanent Magnet)

5.0 INSPECTION:

The purchaser may carry out the inspection at any stage of manufacture. The manufacturer shall grant free access to the purchaser's representative at a reasonable time when the work is in progress. Inspection and acceptance of any equipment under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing the equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found to be defective.

All acceptance tests and inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the Bidder and purchaser at the time of purchase. The Bidder shall provide all reasonable facilities without charge to the inspector, to satisfy him that the equipment is being furnished in accordance with this specification.

The supplier shall keep the purchaser informed in advance, about the manufacturing programme for each lot so that arrangement can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance / routine testing of the bought out items. The supplier shall give 15 days for local supply / 30 days in case of foreign supply advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine tests.

The purchaser reserves the right to get type test any meter, for meter casing etc. from any of the offered lots, reserve at any destination stores.

7.0 QUALITY ASSURANCE PLAN:

The design life of the meter shall be minimum 20 years and to prove the design life the firm shall have at least the following quality Assurance Plan: -

- The factory shall be completely dust proof.
- The testing rooms shall be temperature and humidity controlled as per relevant standards.
- The testing and calibrating equipments should be automatic and all test equipment shall have their valid calibration certificates.
- Meter will be tested (in case of lot test) in fully automatic test bench with ICT. No human intervention will be allowed during testing.
- Power supplies used in testing equipment shall be distortion free with sinusoidal wave- forms and maintaining constant voltage, current and frequency as per the relevant standards.

During the manufacturing of the meters the following checks shall be carried out.

i) Meter frame dimensions tolerances shall be minimum.
ii) The assembly of parts shall be done with the help of jigs and fixtures so that human errors are eliminated.
iii) The meters shall be batch tested on automatic, computerized test bench and the results shall be printed directly without any human errors.

The Bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

- Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw materials.
- Information and copies of test certificates in respect of bought out accessories.
- List of manufacturing facilities available.
- Level of automation achieved and lists of areas where manual processing exists.
- List of areas in manufacturing process, where stage inspections are normally carried out of quality control and details of such tests and inspections.
- List of testing equipment available with the bidder for final testing of equipment specified and test-plant limitations, if any, vis-à-vis type, special acceptance and routine tests specified in the relevant standards and this specification. These limitations shall be very clearly brought out in schedule of deviations.

- The laboratory of manufacturer must be well equipped for testing of the meters. They must have computerized standard power source and standard equipment calibrated not later than a year (or as per standard practice). The details of testing facilities available for conducting shall be furnished with the bid.

  1. The routine tests
  2. Acceptance tests

8.0. MANUFACTURING ACTIVITIES:

All the materials, electronics and power components, ICs used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy.

The manufacturer should use Application Specific Integrated Circuit (ASIC) or Micro controller for metering functions.

The electronic components shall be mounted on the printed circuit board using latest Surface Mounted Technology (SMT) except power components by deploying automatic SMT pick and place machine and re flow solder process. The electronic components used in the meter shall be of high quality **and there shall be no drift in the accuracy of the meter at least up to 10years.**
Further, the Bidder should own or have assured access (through hire, lease or sub-contract) of the mentioned facilities. The PCB material should be of glass epoxy FR-4 grade conforming to relevant standards.

All insulating materials used in the construction of meters shall be non-hygroscopic, non-aging and tested quality. All parts that likely to develop corrosion shall be effectively protected against corrosion by providing suitable protective coating.

Quality should be ensured at the following stages:

At PCB manufacturing stage, each board shall be subjected to bare board testing. At insertion stage, all components should undergo testing for conforming to design parameters and orientation. Complete assembled and soldered PCB should undergo functional testing using test equipment's (testing jig).

The calibration of meters shall be done in-house.

The bidder should submit the list of components used in the meter along with the offer. A detailed list of bought-out items, which are used in the manufacture of the meter, should be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought-out items.

The details of testing facilities available for conducting the routine and acceptance tests and other special tests on the meter shall be furnished with the bid. The facility available if any for conducting type test may also be furnished.

9.0 DOCUMENTATION:

Seventy-five sets of operating manuals shall be supplied to the office of the General Manager (Procurement Services) for distribution at sites.

One set of routine test certificates shall accompany each dispatch consignment.

The acceptance test certificates in case pre-dispatch inspection or a routine test certificate in cases where inspection is waived has to be approved by the purchaser.

10.0 GUARANTEE:

a) The Meters and Pilfer Proof Meter Boxes shall be guaranteed arising out of faulty design, materials, and bad workmanship for a period of **1 and Half years** from the date of supply. The meters found defective within the above guarantee period should be replaced by the supplier free of cost within one month on receipt of intimation. If the defective meters are not replaced within the above specified period, BPC will recover twice the cost of meters from the supplier.
Life of battery used for the meter should be guaranteed for **10 years**.
b) Name plate of the meter is to be marked with "Guarantee of the Meter": "1 and half years from the date of supply".

11.0 REPLACEMENT OF DEFECTIVE METERS:

The meters declared defective by the BPC shall be replaced by the supplier up to the full satisfaction of the BPC at the cost of supplier. Failure to do so within the time limit prescribed shall lead to **imposition of penalty of twice the cost of meter**. The same may lead to black listing even, as decided by BPC. In this connection the decision of BPC shall be final.

12.0 PACKING &FORWARDING:

The equipment shall be packed in cartons / crates suitable for vertical / horizontal transport as the case may be, and suitable to withstand handling during transport and outdoor storage during transit.

The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbol. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc., shall be provided. Supplier without any extra cost shall supply any material found short inside the packing cases immediately.

The packing shall be done as per the standard practice as mentioned in IS 15707: 2006. Each package shall clearly indicate the marking details (for e.g, manufacturer's name, Sl. Nos. of meters in the package, quantity of meter, and other details as per supply order). However, he should ensure the packing is such that, the material should not get damaged during transit by Rail / Road.

Component Specifications:

The meters shall be designed and manufactured using SMT (Surface Mount Technology) components, except for power supply components, LED / LCD etc., which are PTH type.
All the material and electronic power components used in the manufacture of the meter shall be of highest quality and reputed makes so as to ensure higher reliability, longer life and sustained accuracy.

Sl. No	Component Function / Feature	Requirement	Make / origin
1	Current Element	E-beam /spot welded C.T. shall be provided in the phase element and in the neutral with proper isolation.	Any make or origin conforming to IS-2705
2.	Measurement / computing chips	The Measurement / computing chips used in the meter should be with the Surface mount type along with the ASICs.	Analog Devices, AMS, Cyrus Logic, Atmel, SAMES, NEC, Texas Instruments, Phillips, Teridian, Freescale, Renesas.
3.	Memory chips	The memory computing chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	Atmel, National Semiconductors, Microchip, Texas Instruments, Phillips, Hitachi, Teridian ,ST, Renesas.
4.	Display modules	The display modules should be well protected from the external UV radiations. The display should be clearly visible over an angle of at least a cone of 70^0.The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. The display should be TN type industrial grade with extended temperature range.	Haijing, Holtek, Bonafied Technologies, Advantek, Truly Semiconductor, Hitachi, SONY, Tianma.
5.	Communicati -on modules	Communication modules should be compatible for any of the following ports: RS232, RS485, RJ45, USB	National Semiconductors, Hitachi, Texas Instrument, Philips,HP, Agilent, Everlight, Fairchild, Avago.
6.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be	National Semiconductors, Hitachi, Texas

		such to facilitate the data transfer easily.	Instrument, Siemens, Philips,HP, Agilent, Everlight, Avago.
7	Power Supply	The power supply should be with the capabilities as per the relevant standards. The power supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	As specified.
8	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	Philips, Toshiba, Fairchild, Murata, Rohm, Siemens. National Semiconductors, ATMEL, Texas Instruments, Hitachi. Ligitec, OKI, EPCOS
9	Mechanical parts	The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. The other mechanical components should be protected from rust, corrosion etc. by suitable plating / painting methods.	N.A.
10	Battery	Lithium-ion with guaranteed life of 10 years	Renata, Panasonic, Varta, Tedrium, Sanyo, National, Teridian, Duracell, Maxell, Elegance,TekCell, Mitsubishi,Tadiran, EVE.
11	RTC / Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	Philips, Dallas, Atmel, Motorola, NEC, Renesas, Hitachi, Xicor, Texas Instruments, NEC or OKI, ST,Mitsubishi, Epson, Teridian, Freescale.

3.0 Technical Specification for A.C. 3-Phase 4-Wire L.T. CT Operated DLMS Compliant Energy Meter of 0.5 Class Accuracy and Current Rating -/5A

3.1 SCOPE

This Specification covers the design, engineering, manufacture, assembly, inspection and testing before dispatch and supply of 3 phase 4 wire, Class 0.5 accuracy, 3 X 240V and -/5 Amps static meter for outdoor use.

3.2 APPLICABLE STANDARDS

Sl. No.	Standard No.	Title
1	IEC 62052-11:2003	Electricity Metering Equipment (AC)-General Requirements, tests and test conditions
2	IEC 62053-22:2003	Class 0.5 alternating current watt hour meter
3	IS 14697	ac STATIC WATIHOUR METERS, CLASS 0.5 AND 0.2 - SPECIFICATION
4	CBIP 325	Standardization of AC Static Electrical Energy Meter
5	IS 14434 (1998)	Polycarbonate Molding and Extrusion Materials.

3.3 CLIMATIC CONDITIONS :

The meters to be supplied against this specification should be suitable for satisfactory continuous operation under the following tropical conditions. Meters should be capable of maintaining required accuracy under hot, tropical and dusty climatic conditions.

viii) Maximum Ambient Air Temperature in shade : 55 °C
ix) Minimum Ambient Air Temperature : (-) 10 °C
x) Maximum Relative Humidity :95%(Noncondensing)
xi) Minimum Relative Humidity :10%
xii) Height above mean sea level : Upto 4000 meters
xiii) Average number of tropical monsoon per Annum : 5 months
xiv) Annual Rainfall : 100 mm to 1500 mm

3.4 TROPICAL TREATMENT :

The meters shall be suitably designed and treated for normal life and satisfactory operation under hot and hazardous tropical climate conditions and shall be dust and vermin proof. All the parts and surface, which are subject to corrosion, shall either be made of such material or shall be provided with such protective finish which provides suitable protection to them from any injurious effect of excessive humidity.

3.5 MAXIMUM CONTINUOUS CURRENT :

The maximum continuous current in meters should be the current at which the meter purports to meet the accuracy requirement of the specification.

3.6 CONSTRUCTION :

The case, winding, voltage circuit, sealing arrangements, registers, terminal block, terminal cover & name plate etc. shall be in accordance with the relevant standards. The meter should be compact & reliable in design, easy to transport & immune to vibration & shock involved in the transportation & handling. The construction of the meter should ensure consistence performance under all conditions especially during heavy / heavy rains / very hot weathers. The insulating materials used in the meter should be non-hygroscopic, non-ageing & have tested quality. The meter should be sealed in such a way that the internal parts of the meter becomes inaccessible and attempts to open the meter shall result in viable damage to the meter cover. **This is tobe achieved by using continuous Ultrasonic welding on all the four sides of theMeter base and cover or any other technology which is either equally or moreefficacious.**

The meter should comply latest technology such as Microcircuit or Application Specific Integrated Circuit (ASIC) to ensure reliable performance. The mounting of the components on the PCB should compulsorily be Surface Mounted Technology (SMT) type. Power supply component may be of PTH type. The electronic components used in the meter should be of high quality and there should be no drift in the accuracy of the meter for at least ten years. The circuitry of the meter should be compatible with 16 Bit (or better) ASIC with compatible processor and meter should be based on Digital measuring and sampling technique.

The meter should be housed in a safe, high grade, unbreakable, fire resistant, UV stabilized, virgin Polycarbonate casing of projection mounting type. The meter cover should be transparent / translucent. But the viewing portion should be transparent for easy reading of displayed parameters, and observation of operation indicators. The meter base may not be transparent, but it should not be black in colour." The meter casing should not change in shape, colour, size and dimensions when subjected to 72 hrs on UV test as per ASTMD 53." It should withstand 650 deg. C. glow wire test and heat deflection test as per ISO 75 or as per IEC 60068 -2-5.

In addition to the above, the meter cover should be sealable to the meter base with at least 2 nos. bar coded seals bearing the identification marks of the Manufacturer. Suitable arrangement should be made for fitting/fixing of utility seal at two sides of meter terminal cover in such a manner that any access to the terminal cannot be possible without removing the seal. There should also be provision for sealing at the optical port.

The bidder shall submit relevant documents regarding the source of procurement of polycarbonate material. The polycarbonate material procured from the following manufacturers should be used.

a)	G.E. Plastics	LEXAN 943A, or equivalent like 143, 123R for Top cover & Terminal cover/ LEXAN 503R or equivalent like 143R, 500R for Base & Terminal Block
b)	BAYER	Grade corresponding to above
c)	DOW Chemicals	-Do-
d)	MITSUBISHI	-Do-
e)	TEJIN	-Do-
f)	DUPONT	-Do-

3.7 METER CASE AND COVER:

The meter should have a case, which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the seal and cover. This is to be achieved by use of **Ultrasonic Welding** (Ultrasonically continuously welded at three sides so that the cover cannot be separated from the base without breaking/damaging the case and cover) i.e. break to open type or any other technology which is either equally or more efficacious. In case, ultrasonic welding using plate / strip is used, the material of plate / strip should be same as that of cover and base and the strip. The manufacturer's logo should be embossed on the strip / plate. The material of the meter body (case and cover) shall be of Engineering Plastic.

The meter cover should be fixed to the meter base (case) with Unidirectional Screws, so that the same cannot be opened by use of screwdrivers. These unidirectional screws should be covered with transparent caps, ultrasonically welded with the meter body and the screw covers should be embedded in the meter body in a groove. The meter shall withstand external magnetic influence as per latest amendments of CBIP Technical Report No.325.

3.8 TERMINAL BLOCK AND COVER:

The terminals may be grouped in a terminal block having adequate insulating properties and mechanical strength. The terminal block should be made from best quality non-hygroscopic, flame retardant material (capable of passing the flammability tests) with nickel plated brass inserts / alloy inserts for connecting terminals. It should be rigidly fixed to the base of the meter so that it cannot be separated from the meter base without breaking either the meter base or the terminal block and this fixing arrangement should be in parallel to the meter base in such a way that it cannot be viewed or approached from any part of the meter without breaking the meter.

The terminals in the terminal block shall be of adequate length in order to have proper grip of conductor. **The screws shall not have pointed ends at the end of threads.** All terminals and connecting screws and washers should be of tinned / nickel plated brass material. The terminal should withstand glow wire test at 960 + 15 °C and the terminal should withstand at least 135 °C.as per IS.

The internal diameter of terminal hole should be minimum 5 mm and center to center distance is 13 mm. The holes in the insulating material shall be of sufficient size to accommodate the insulation of conductor also.

The terminal cover shall be transparent re-enforced Polycarbonate, Engineering Plastic with minimum thickness 2.0 mm and the terminal cover shall be of extended type completely covering the terminal block and fixing holes. The space inside the terminal cover should be sufficient to accommodate adequate length of external cables. The bottom of the terminal cover should be cut through inside 25 mm to accommodate the cables while closing the terminal cover.

3.9. MARKING OF THE METER:

The marking on the meter should be in accordance with relevant clauses of IS 13779. The basic marking on the meter nameplate should be as follows (all other markings as per IS shall also be there):-

a) Manufacturer's name & trade mark
b) Type Designation
c) No. of phases & wires
d) Serial number (Size not less than 5mm)
e) Month & Year of manufacture
f) Reference Voltage
g) Rated Current
h) Operating Frequency
i) Principal unit(s) of measurement
j) Meter Constant (impulse/kWh)
k) Class index of meter
l) Property of BPC
m) Purchase Order No. & Date
n) Guarantee (Guaranteed for a period of 1 and half Yrs. From date of delivery)
p) Place of manufacture
q) Meter Sl. No. in numerical form, Dt. of manufacturer, Current rating of the meter and P.O. reference should be bar coded. Bar Code may be extended up to two layers
but Readable by single layer Bar code reader.
r) Meter Sl. No. Should be of seven digits and its should start serially corresponding to the quantity of meter ordered.

3.10 DISPLAY OF MEASURED VALUES:

The meter shall have Alphanumeric display with at **least 6 full digit** and with LCD backlit display, having minimum character height of 10 mm. The data should be stored in non-volatile memory. The non-volatile memory should retain data for a period of not less than 10 years under unpowered condition. Battery back-up memory will not be considered as NVM.

It should be possible to easily identify the single or multiple displayed parameters through symbols / legend on the meter display itself or through display annunciation which should be self-explanatory and symmetric.

The register shall be able to record and display energy register starting from zero, for a minimum of 2500 hours. The energy corresponding to rated maximum current at reference voltage and unity power factor. The register should not roll over in between this duration.
In addition to provide Serial Number of the meter on the display plate, the meter serial no. should also be programmed into meter memory for identification through communication port for CMRI / laptop / meter reading printout.

Visibility of display in poor light conditions is an important criterion. STN or TN or any better type of advanced LCD to be used. Proper legends for the displayed parameters to be provided (Factory programmable). Back lit provided for clear visibility should be uniform throughout all part of the LCD.

The meters should have auto-display mode for pre-selected parameters. Push-Button mode of display should display all parameters and it should have priority over auto mode. The meter should give clear message on display to indicate that the meter has experienced tampers and the nature of tamper with date and time of first occurrence, last occurrence and last

restoration, if the Last tamper status is not restored, then meter will indicate first occurrence, penultimate restoration and last occurrence. Connection check, Phase sequence and self-diagnostic should give clear message on display.

The meter shall have a test output (blinking **LED)** accessible from the front and be capable of being monitored with suitable testing equipment. The operation indicator must be visible from the front. Test output device should be provided in the form of one common LED for active and reactive energy with the provision of selecting the parameter being tested (separate LED may also be used with proper separation).

3.11 DISPLAY SEQUENCE:

The meter should display the required parameters in two different modes as follows:
(Display sequence for both auto and Push button must be maintained, no interchange in sequence or display parameter will be accepted. All the display should have proper legend to identify the same.)

A. Auto Display Mode:
The following parameters should be displayed in auto cycle mode, in the following sequence. Each parameter should be on meter display for 10 seconds and the time between two auto cycles should be at 60 seconds gap.

13. LCD test
14. Total Cumulative Active Forwarded Energy (up to date)
15. Meter serial number
16. Real Date (dd mm yy)
17. Real Time (hh mm ss)
18. Present Month MD in KW and KVA since last MD reset with date and time.

Each parameter should be on meter display for 10 seconds and the time between two auto cycles should be at 60 seconds gap.

B. Push Button mode:

The following parameters should be displayed on pressing the push button

38. LCD test
39. Total Cumulative Active Forwarded Energy (up to date)
40. Meter serial number
41. Real Date (dd mm yy)
42. Real Time (hh mm ss)
43. Present Month MD in KW and KVA since last MD reset with date and time.
44. Previous 3 months (at least) cumulative KWh, KVAh and Maximum Demand in KVA at 24.00 hrs. of last date of the month.
45. Instantaneous Phase Voltages
46. Instantaneous Phase Currents
47. Instantaneous Neutral Current* i.e. Actual Current flowing through the Neutral
48. Instantaneous Power Factor
49. Inst. Power Factor – Phase Wise
50. Average Power Factor (Previous Month)

51. Instantaneous Active Power
52. Instantaneous Apparent Power
53. Instantaneous Frequency
54. High resolution display for KWh, KVARH and KVAH (minimum 2+4 i.e. 4 digit after decimal
55. Phase Sequence
56. Connection check (For CT Reversal Connection Not OK)
57. Self Diagnosis

Display for Auto and manual mode must be listed by two headers
A) Auto Display Mode and
B) Push Button Mode (Parameters should be pasted in front of the PP Box
Each parameter should be on meter display for 10 seconds and the time between two auto cycles should be at least 60 seconds gap).

3.12 ANTI TAMPER FEATURES:

Total no of tamper events logged by meter shall be at least 200 nos., compartment wise division of each event and their persistence time shall be indicated at the time of finalizing GTP.

The meter shall not get affected by any remote control devices and shall continue recording energy under any one or combinations of the following conditions. Meter shall log all three-phase voltage, current, power factor, **neutral current** etc. at the time of tamper attempt for all such occurrences:

1.1 **Phase sequence reversal**: The meters shall work accurately irrespective of the phase sequence of the supply.

1.2 **Detection of missing potential**: In case someone intentionally takes out a potential lead, the meter shall record the date and time of such occurrence. The last restoration of normal supply shall also be similarly recorded. The threshold value of voltage should be agreed before delivery.

1.3 **Reversal of C.C. Polarity**: Meter shall record the reversal of C.C. polarity with time and date, and also the time of restoration. Meter shall, however, register the energy consumed correctly with any one, two or all three-phase C.C. reversal.

1.4 **C.C. Shorting/ Bypass**: Meter shall record C.C. terminal shorting/ bypass with time and date and time of restoration. The threshold value of currents should be programmable. Logging of neural current is most important.

1.5 **Unbalance voltage:** Meter shall record all events when the difference between two phase voltage is more than 20V.

1.6 **Low voltage:** Meter shall record all events, if all the three voltages are beyond 20% of Vref.

1.7 **Power On/Off**: Meter shall detect power OFF (minimum power off period 5 mins) if any of phase voltages are not present. This event shall be recorded at the time of each power OFF. At the same time power ON event shall be recorded. **Meter should have provision to record last 30 such events.**

1.8 **Snap Shots:** Meter shall log all three-phase voltage, current, power factor, neutral current etc. at the time of tamper attempt for all such occurrences.

1.9 **Neutral Disturbance**: Meter shall record correctly in case of any AC, DC high frequency signal injected in the neutral circuit of meter. Meter should log the event. Meter shall record correctly in case of missing neutral connection.

1.10 **External Magnetic tampers:** Meter should log on the events of attempt of tampering by external magnetic field as mentioned in the relevant IS. The Meter shall record as per actual load once the external abnormal magnetic field is removed. In such conditions the Meter shall log the event for presence of abnormal external magnetic field and its restoration.
1.11 Protection against HV spark/ ESD: Meter shall continue to record energy or log the event, incase it is disturbed externally using a spark gun/ ignition coil. Upto 35 KV meter should be immune.

1.12 Over Load: Meter shall record Over Load as an event, in case the current in any phase persist >120 % of Imax or Ib.

1.13 Abnormal voltage/ load: meter shall record abnormal voltage and / or abnormal current if either the angle between two phases is beyond 120 +/- 20deg or angle between two current is less than 30deg.

1.14 Top Cover open: The meter shall have top cover opening detection mechanism. The top cover opening event shall be indicated display continuously in auto scroll mode with kWh or through additional LED and shall be logged in memory. The detection and logging mechanism shall work even when meter is not energized. In case of indication of display, meter display shall get reset in 150 days.

1.15Manufacturing Detail in memory :- Meter shall have manufacturing month and year in the memory and should come in data downloading

1.16Wiring connection Display: In case of abnormal wiring like sequence error. Phase association error, CT reversal, Phase- CT mismatch, one/two phase no voltage- An indication, clearly indicating type of fault should appear and get logged in meter.

Note:

- Vendor has to define Tamper Logic, Occurrence and restoration time before supply.
- Tamper and fraud protection test shall be part of acceptance test.

3.13 RESETTING OF MAX. DEMAND:

The meter should be capable of recording the Apparent MD with integration period of 15 minutes (programmable).

MD reset should be through each of the three means:
1) Automatic resetting at preset date & time (at present it will be at 00.00 hrs of the first day of the month).
2) Manually i.e., by push button.
3) Through authenticated command from MRI or through Remote Communication.
The means by which the reset has been done should be made available to downloaded data.
Facility to invoke any of the above through authenticated MRI command should be provided at BCS.
MD reset button should have proper sealing arrangement.

There should be separate Push button for scrolling display (up and down) and MD reset.

3.14 LOAD SURVEY:

The meter should be capable of recording load survey for the following parameters for a period of minimum 60 days - subject to availability of all parameters listed below with 15 minutes integration period.

v) Energy in KWh,
vi) Demand in KVA and KW,
vii) Current – phase-wise
viii) Voltage – phase-wise

The NVM shall not require any additional battery backup to retain the data in case of power failure, for up to 10 years and the data storage shall be independent of battery backup unit.
The life of the RTC battery in circuit condition should be minimum 6 years in case of power failure.
It should be possible to transfer this data to base computer software through MRI/Lap top or RMR. **The data so obtained should be displayed in both graphical &numeric form in the BCS**. The BCS with all details is to be provided by the supplier at no extra cost.

3.15 METER READING DURING POWER OFF:

It should be possible to read the meter-display visually and with MRI/Lap top in absence of input voltages with the help of internal battery backup (through optical port only).
In case of external battery the arrangements should be such that hands free operation is possible. In case of external battery 10 years guarantee must be given for external battery/power pack. **Separate battery should be used for this purpose** (Not RTC or processor battery).

3.16 SELF DIAGNOSTIC FEATURES:

The meter shall be capable of performing complete self-diagnostic check to monitor the circuits for any malfunctioning to ensure integrity of data memory location all the time.
If possible, the details of malfunctioning should be recorded in the meter memory.

The bidder should furnish the details of self-diagnostic capability feature, viz Memory status (NVM) and Battery status, RTC Status etc. and clear indication should be in display and BCS.\

A. IMMUNITY TO ELECTRO MAGNETIC DISTURBANCE:

The meter should be designed in such a way so that external electromagnetic field or electrostatic discharges do not influence the performance of the meter as per IS 13779.

3.17 TECHNICAL SUPPORT, MANUALS:

Extensive technical support, detailed technical literature (should supply with each meter at the time of packing) is to be provided by the manufacturer. Supply of External Battery Packs if required to be provided by the manufacturer and should be clearly offered in their bids.

3.18 INFLUENCE QUANTITIES:

The meter shall work satisfactorily with guaranteed accuracy limit under the presence of the following influence quantities as per IEC-1036 and CBIP Technical Report no.88 with latest amendment.
The influence quantities are:

- External Magnetic field – 0.2 tesla (with log on feature)
- Electromagnetic field induction,
- Radio frequency interference,
- Unbalanced load,
- Vibration etc,
- Wave form 10% of 3rd harmonics,
- Phase sequence,
- Voltage unbalance,
- Electro Magnetic H.F. Field, and

3.19 POWER CONSUMPTION BY METER:

Voltage Circuit: The active and apparent power consumption in the voltage circuit including the power supply of meter at reference voltage. Reference temperature and reference frequency should not exceed 1.5 Watt and 8 VA per phase respectively.

Current Circuit: The apparent power taken by each current circuit at basic current, reference frequency and reference temperature should not exceed 4 VA per phase in power up condition.

3.20 STARTING CURRENT:

The meter should start registering energy at 0.1 % of basic current at unity power factor and should be fully functional within five seconds after the rated voltage is applied.

3.20.1 RUNNING AT NO LOAD:

Meter shall not record any energy under no-load condition.

3.21 COMMUNICATION CAPABILITY:

The meter shall have a galvanically isolated optical communication port as per IEC 1107/ANSI/PACT so that it can be easily connected to a hand-held common meter reading instrument (CMRI) for data transfer. The billing data & the tamper data downloading time should be less than 5 minutes. The optical port should be provided with proper sealing arrangement so that the optical cover should not be opened without breaking the seal. The stored data in the meter should be available through CMRI even when the display of the meter is not available.

The above ports suitable for interface of the meter with appropriate protocol to Common Meter Reading Instrument (CMRI) / LAPTOP / PC.

A separate suitable serial port (RS-232/RJ-11) capable of being hooked (into a remote metering device such as modem, etc. should be provided inside the terminal cover to enable future Automatic meter reading) in such a way that the same cannot be accessed without interfering the Terminal cover and seal.

It should not be possible to alter date in the meter by-passing commands from the CMRI or Laptop. For correction of RTC time, change of TOD timing, etc. it should be possible to perform this functions through CMRI/Laptop but only through authenticated commands sets by BCS after scheduling for particular meter Sl nos.(Which is possible as per DLMS protocol). Billing parameters should be factory programmable. No alteration, change should be possible through authenticated commands sets by the BCS without scheduling the meters. Moreover, no alternation change should be possible using CMRI only, i.e. the control has to be with the BCS (Which is possible as per DLMS protocol).
The BCS shall have multi-level password for data protection & security. Bidder has to submit CMRI software (.exe format) also at the time of sample meter testing.
Seal tracking software should be submitted and installed at PC/ Laptop of the Purchaser before commencement of supply of the meters i.e. it must be supplied before / at the time of offering first lot inspection.

3.22 BASE COMPUTER SYSTEM & SOFTWARE REQUIREMENTS:

The Common Meter reading Instrument (CMRI/Laptop) should be capable of being loaded with user-friendly software (MS-DOS 5.0 or higher version compatible) for reading / downloading meter data. Windows based Base Computer Software (BCS) should be provided for receiving data from CMRI / Laptop and downloading instructions from base computer software to CMRI / Laptop.

The BCS should be compatible at Windows 7/8/8.1/10 (both 32 bit and 64 bit) operating systems and copy righted. The data stored in the meters memory including defrauded energy should be available on the BCS. **Only one BCS should be provided for downloading data and authenticated command from CMRI/ Laptop**. So that at the time of reading meter should get the authenticated command.

This BCS should have, amongst other requirements, features and facilities described later in this specification, the facility to convert meter-reading data into user definable ASCII file format so that it may be possible for the user to integrate the same with the user's billing data and process the selected data in desired manner. All the data available in the meter including energy, MD, all Transaction data with date and time, New TOD time Zones and history data should be available in BCS after down loading, more over convertible to user defined ASCII file format for integration with third party software. The vendor should supply necessary base computer software for reading / viewing of meter data and converting to user defined ASCII files formats. The user should have the flexibility to select the parameters to be converted into ASCII file. The vendor should also supply the necessary CMRI / Laptop software (during sample testing also).

The bidder has to supply the Meter Reading protocol (API), free of cost. The protocol should not be complicated & should be easily understandable to introduced compatibility between meters, BCS and CMRI of other makes. The bidder shall indicate the relevant standard to which the protocol complies. The compatibility of transferring data from the meter to CMRI & then to the BCS should be easily established. Any change or up gradation of CMRI software of CMRI software or BCS in future, required for any reason, has to be done by the supplier at his own cost.

All transactions should be made at the time of reading. No extra operations will be allowed for transactions. All transactions should be available in downloaded data with date and time stamping.

The same software should be capable of preparing CMRI to read the meter information or to reconfigure the meter for change of TOD timings and / or time setting of the meter etc. The exhaustive on-line help should be available with the software so that user can use all the features of the software by just reading the help contents.
Test for automated Meter reading will be conducted by downloading Meter data through Modem at our system through third party software also.
In BCS 12 months data back-up data for KWh, KVAh, MD & KVA (total & TOD wise), Average load factor, average power factor must be available.
The supplier shall provide at least 10 numbers of meter Reading optical USB probes without any cost.

3.23 ACCURACY:

There shall be no drift in accuracy, for a period of ten years from the date of supply. In case any drift is noticed which is beyond the permissible limits, the bidder shall replace by a new meter without any extra cost.

General Requirements:-

1. GUARANTEED TECHNICAL PARTICULARS :

The bidder shall furnish all the necessary information as desired in the Schedule of Guaranteed
Technical Particulars and data, appended with this Specification. If the bidder desire to furnish any other information in addition to the details as asked for, the same may be furnished against the last item of this Annexure. – I

2. TECHNICAL DEVIATIONS :

Any deviation in Technical Specification as specified in the Specification shall be specifically and clearly indicated in the Schedule of deviation format.

3. TESTS :

3.1 Type Testing of Meter

The offered meters should be type tested at any NABL accredited laboratory in accordance with IS i3779 with latest amendments, CBIP Report 325 with latest amendments. The type test report should not be more than 3 (three) years old. A copy of the Type Test results should be enclosed with the offer. If there is any modification in the design / parameters of the specifications or use of constituent materials in the offered meters submitted with the offer, from the meter which was submitted type tested, which may affect the characteristics as well as parameters of the meter, revised type test certificates as per the design, parameters and constituent material used in the offered meter, shall have to be submitted failing which the offer may be liable to be rejected.

Type Test Certificate from any NABL accredited Lab. shall only be considered.
Type test certificate should contain the following information clearly:

1) Type of display or LCD.
2) Class of accuracy.
3) Meter constant.
4) Type of meter.

3.2 Acceptance tests

E) The acceptance tests as stipulated in CBIP / IS (with latest amendments) shall be carried out by the supplier in presence of purchaser's representative at manufacturer premises.

F) Also the following additional tests are to be carried out on one meter randomly selected from each lot offered for inspection / acceptance testing.

xiii. Magnetic induction of external origin (AC & DC)
xiv. Tamper & Fraud protection, as per Clause of 12 of this specification.
xv. Test of endurance upto 120% of Imax, for two hours, followed by verification of limits of error.
xvi. Verification of internal components.
xvii. Dry Heat Test as per IS 13779 / 99, Clause 12.6.1, of one meter from the offered lot is to be arranged by the supplier at any NABL accredited laboratory, at his cost.
xviii. The supplier shall manufacture one extra number of meter from PO Quantity for Dry Heat Test at its own cost.

In case of failure of Meters as specified in Annexure – H of IS-13779 (For A above) the entire lot will be treated as rejected.
In case of failure of any single meter (as per B above) the entire lot will be rejected.

3.3 Routine Tests :

Each and every meter of the offered lot shall undergo the routine tests as well as functional tests as per IS: 13779/1999, CBIP Report 325 and after sealing the meters, the manufacturers will have to submit the routine test report of all the meters as well as a statement showing seal Sl. Nos. against each meter Sl.No. of offered lot in soft copy (MS WORD or EXCEL format), to

(a) The General Manager (Procurement Services Department)
(b) The General Manager (Distribution & Customer Services Department), along with offer letter for acceptance test.

4. TEST FACILITIES :

The tests for equipment / instrument shall be carried out as per relevant Standards and test certificates shall be furnished for scrutiny. The Bidder shall indicate the details of the equipment available with him for carrying out the various tests as per relevant Standards. The bidder shall indicate the sources of all equipments / instruments.

NOTE : The standard meters used for conducting tests shall be calibrated periodically at any NABL Accredited Test Laboratories and test certificates shall be available at Works for verification by purchasers representative.

The manufacturer shall have at least the following testing facilities to ensure accurate calibration:-

- AC high voltage test
- Insulation test
- Test of no load condition
- Test of Starting condition
- Test on Limits of error (Automatic Testing facility with ICT)
- Power loss in voltage and current circuit
- Test of Repeatability of Error (at 100% Ib UPF and 5% Ib UPF. Deviation of Errors should be with in 0.1).
- Test of meter constant
- Test of magnetic influence (As per CBIP 325 & 0.5 T Permanent Magnet)

5. INSPECTION:

The purchaser may carry out the inspection at any stage of manufacture. The manufacturer shall grant free access to the purchaser's representative at a reasonable time when the work is in progress. Inspection and acceptance of any equipment under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing the equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found to be defective.

All acceptance tests and inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the Bidder and purchaser at the time of purchase. The

Bidder shall provide all reasonable facilities without charge to the inspector, to satisfy him that the equipment is being furnished in accordance with this specification.

The supplier shall keep the purchaser informed in advance, about the manufacturing programme for each lot so that arrangement can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance / routine testing of the bought out items. The supplier shall give 15 days for local supply / 30 days in case of foreign supply advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine tests.

The purchaser reserves the right to get type test any meter, for meter casing etc. from any of the offered lots, reserve at any destination stores.

6. QUALITY ASSURANCE PLAN :

The design life of the meter shall be minimum 20 years and to prove the design life the firm shall have at least the following quality Assurance Plan: -

- The factory shall be completely dust proof.
- The testing rooms shall be temperature and humidity controlled as per relevant standards.
- The testing and calibrating equipments should be automatic and all test equipment shall have their valid calibration certificates.
- Meter will be tested (in case of lot test) in fully automatic test bench with ICT. No human intervention will be allowed during testing.
- Power supplies used in testing equipment shall be distortion free with sinusoidal wave- forms and maintaining constant voltage, current and frequency as per the relevant standards.

During the manufacturing of the meters the following checks shall be carried out.

iv) Meter frame dimensions tolerances shall be minimum.

v) The assembly of parts shall be done with the help of jigs and fixtures so that human errors are eliminated.

vi) The meters shall be batch tested on automatic, computerized test bench and the results shall be printed directly without any human errors.

The Bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

- Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw materials.
- Information and copies of test certificates in respect of bought out accessories.
- List of manufacturing facilities available.
- Level of automation achieved and lists of areas where manual processing exists.
- List of areas in manufacturing process, where stage inspections are normally carried out of quality control and details of such tests and inspections.

- List of testing equipment available with the bidder for final testing of equipment specified and test-plant limitations, if any, vis-à-vis type, special acceptance and routine tests specified in the relevant standards and this specification. These limitations shall be very clearly brought out in schedule of deviations.

The laboratory of manufacturer must be well equipped for testing of the meters. They must have computerized standard power source and standard equipment calibrated not later than a year (or as per standard practice). The details of testing facilities available for conductingshall be furnished with the bid.

1. The routine tests
2. Acceptance tests

7. MANUFACTURING ACTIVITIES:

All the materials, electronics and power components, ICs used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy.

The manufacturer should use Application Specific Integrated Circuit (ASIC) or Micro controller for metering functions.

The electronic components shall be mounted on the printed circuit board using latest Surface Mounted Technology (SMT) except power components by deploying automatic SMT pick and place machine and re flow solder process. The electronic components used in the meter shall be of high quality **and there shall be no drift in the accuracy of the meter at least up to 10years.**
Further, the Bidder should own or have assured access (through hire, lease or sub-contract) of the mentioned facilities. The PCB material should be of glass epoxy FR-4 grade conforming to relevant standards.

All insulating materials used in the construction of meters shall be non-hygroscopic, non-aging and tested quality. All parts that likely to develop corrosion shall be effectively protected against corrosion by providing suitable protective coating.

Quality should be ensured at the following stages:

At PCB manufacturing stage, each board shall be subjected to bare board testing. At insertion stage, all components should undergo testing for conforming to design parameters and orientation. Complete assembled and soldered PCB should undergo functional testing using test equipment's (testing jig).

The calibration of meters shall be done in-house.

The bidder should submit the list of components used in the meter along with the offer. A detailed list of bought-out items, which are used in the manufacture of the meter, should be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought-out items.

The details of testing facilities available for conducting the routine and acceptance tests and other special tests on the meter shall be furnished with the bid. The facility available if any for conducting type test may also be furnished.

8. DOCUMENTATION:

Seventy-five sets of operating manuals shall be supplied to the office of the General Manager (Procurement Services) for distribution at sites.

One set of routine test certificates shall accompany each dispatch consignment.

The acceptance test certificates in case pre-dispatch inspection or a routine test certificate in cases where inspection is waived has to be approved by the purchaser.

9. GUARANTEE:

a) The Meters and Pilfer Proof Meter Boxes shall be guaranteed arising out of faulty design, materials, bad workmanship for a period of **1 and half years** from the date of supply. The meters found defective within the above guarantee period should be replaced by the supplier free of cost within one month on receipt of intimation. If the defective meters are not replaced within the above specified period, BPC will recover twice the cost of meters from the supplier.
Life of battery used for the meter should be guaranteed for **10 years**.
b) Name plate of the meter is to be marked with "Guarantee of the Meter": "1 and half years from the date of supply".

10. REPLACEMENT OF DEFECTIVE METERS :

The meters declared defective by the BPC shall be replaced by the supplier up to the full satisfaction of the BPC at the cost of supplier. Failure to do so within the time limit prescribed shall lead to **imposition of penalty of twice the cost of meter**. The same may lead to black listing even, as decided by BPC. In this connection the decision of BPC shall be final.

11. PACKING & FORWARDING :

The equipment shall be packed in cartons / crates suitable for vertical / horizontal transport as the case may be, and suitable to withstand handling during transport and outdoor storage during transit.

The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbol. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc., shall be provided. Supplier without any extra cost shall supply any material found short inside the packing cases immediately.

The packing shall be done as per the standard practice as mentioned in IS 15707: 2006. Each package shall clearly indicate the marking details (for e.g, manufacturer's name, Sl. Nos. of meters in the package, quantity of meter, and other details as per supply order). However, he

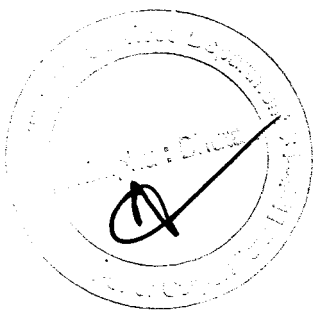
should ensure the packing is such that, the material should not get damaged during transit by Rail / Road.

Component Specifications:

The meters shall be designed and manufactured using SMT (Surface Mount Technology) components, except for power supply components, LED / LCD etc., which are PTH type.
All the material and electronic power components used in the manufacture of the meter shall be of highest quality and reputed makes so as to ensure higher reliability, longer life and sustained accuracy.

Sl. No	Component Function / Feature	Requirement	Make / origin
1.	Current Element	E-beam /spot welded C.T. shall be provided in the phase element and in the neutral with proper isolation.	Any make or origin conforming to IS-2705
2	Measurement / computing chips	The Measurement / computing chips used in the meter should be with the Surface mount type along with the ASICs.	Analog Devices, AMS, Cyrus Logic, Atmel, SAMES, NEC, Texas Instruments, Phillips, Teridian, Freescale, Renesas.
3.	Memory chips	The memory computing chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	Atmel, National Semiconductors, Microchip, Texas Instruments, Phillips, Hitachi, Teridian ,ST, Renesas.
4.	Display modules	The display modules should be well protected from the external UV radiations. The display should be clearly visible over an angle of at least a cone of 70^0.The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. The display should be TN type industrial grade with extended temperature range.	Haijing, Holtek, Bonafied Technologies, Advantek, Truly Semiconductor, Hitachi, SONY, Tianma.
5.	Communication modules	Communication modules should be compatible for the RS 232 ports	National Semiconductors, Hitachi, Texas Instrument, Philips,HP, Agilent, Everlight, Fairchild, Avago.
6.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	National Semiconductors, Hitachi, Texas Instrument, Siemens,

			Philips,HP, Agilent, Everlight, Avago.
7	Power Supply	The power supply should be with the capabilities as per the relevant standards. The power supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	As specified.
8	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	Philips, Toshiba, Fairchild, Murata, Rohm, Siemens. National Semiconductors, ATMEL, Texas Instruments, Hitachi. Ligitec, OKI, EPCOS
9	Mechanical parts	The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. The other mechanical components should be protected from rust, corrosion etc. by suitable plating / painting methods.	N.A.
10	Battery	Lithium-ion with guaranteed life of 10 years	Renata, Panasonic, Varta, Tedrium, Sanyo, National, Teridian, Duracell, Maxell, Elegance,TekCell, Mitsubishi,Tadiran, EVE.
11	RTC / Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	Philips, Dallas, Atmel, Motorola, NEC, Renesas, Hitachi, Xicor, Texas Instruments, NEC or OKI, ST,Mitsubishi, Epson, Teridian, Freescale.



LOT 7: CT Rings

4.1 SCOPE

4.1.1 This specification covers manufacture, test, & supply of LT Current transformers of class 0.5s accuracy.

4.1.2 The CTs shall be suitable for metering purpose.

4.2 TYPE:

4.2.1 The CTs shall be of tape wound ring type (bar type or bus-bar type CT's shall not be accepted).

4.2.3 The secondary leads shall be terminated with Tinned Cooper rose contact terminals.

4.2.4 Polarity (both for primary and second leads) shall be marked.

4.2.5 Unless otherwise modified in this specification the LT CTs shall comply with the Indian Standard Specification IS: 2705/1992 (Part- I & II) and the latest version thereof. Equipment's conforming to other internationally accepted standards, which ensure equal or better quality than the standard mentioned above, will also be acceptable and in such case the copy of standards (English Version) adopted should be enclosed with the tender.

4.3 TECHNICAL DETAILS:

4.3.1 Technical details shall be as given below:

1.	Class of Accuracy	0.5s
2.	Rated Burden	5.00 VA
3.	Power Frequency Withstand Voltage	3KV
4.	Highest System Voltage	433 V
5.	Nominal System Voltage	400 V
6.	Frequency	50 Hz
7.	Supply System	3 Ph. Solidly grounded Neutral System

4.3.2 Transformation ratio shall be specified from the following standard ratings as per requirement:

Ratio	**50/5**	**100/5**	**200/5**	**300/5**	**400/5**	**500/5**

(Secondary with 1 A may be specified by the utility in case the same is desired.)

4.3.3 Bore diameter of the CT shall not be less than 40 mm.

4.3.4 The limits of current error and phase angle displacement as per IS: 2705 at several defined percentage of rated current are:

Accuracy Class	% Ratio error at % of rated current				Phase displacement in minutes at % of rated current			
	5	20	100	120	5	20	100	120
0.5s	1.5	0.75	0.5	0.5	90	45	30	30

Note: Current error and phase displacement at rated frequency is required to be as above when the secondary burden from 25% to 100% of the rated burden i.e. 50 V A.

4.3.5 Rated extended primary current shall be 120% of rated primary Current in accordance with IS: 2705 Pt-II.

4.3.6 Rated ISF (Instrument Security Factor) shall be declared by the manufacturer & marked on the CT.

4.3.7 CT's shall be made with good engineering practices. Core winding shall evenly spread stress & avoid stress concentration at any one point.

4.4 TESTS:

4.4.1. TYPE TESTS:

Copies of all type tests as per IS.2705 Part-I and II including short time current & temperature rise tests in NABL accredited laboratory shall be submitted and got approved before commencement of supply.

4.4.2 ROUTINE TESTS:

The supplier shall conduct all the routine tests such as Ratio test, phase angle error test for 0.5 accuracy class as per IS 2705 Part I & II.

4.2.3 COMMISSIONING TEST :

In accordance with IS: 2705, Power frequency test on primary winding shall be carried out after erection on site on sample basis.

4.5 MARKING:

The CTs shall have marking and nameplate as per IS 2705 in addition to class of insulation & ISF. The markings shall be indelible. The nameplate shall be securely fixed to the body of the CT.

4.6 PACKING:

Each CT shall be securely packed so as to withstand rough handling during transit and storage.

4.7 QUALITY ASSURANCE PLAN:

The requirements of clause 29.0 of Section – I of main specification for Energy Meters shall apply.

LOT 8 (Cable Jointing Kits & Cable Glands)

1. General Specifications

a. The cable accessories should be suitable for storage without deterioration in properties at temperatures up to 50 deg C and should have unlimited shelf life.

b. Fluorinated Silicon Grease should be provided for filling up the minor nicks & scratches on the insulation that may occur while removing the Semi conducting screen of the Cable.

2. END TERMINATIONS

a. Class of Termination: The End termination should be Class - I as defined by IEEE 48 Standard & amended up to date.

b. Stress Control :

- The stress control at the screen cutback should be provided by a Heat Shrinkable tubing having a minimum volume resistivity of 10^{10} Ohms cm. The relative permittivity of the tubing should be at least 15.

- To eliminate voids caused at the step due to semiconducting screen cutback, the manufacturer should provide high permittivity mastic the permittivity of which should be at least 15.

- The impedance of the stress control tubing should not change over a range of temperature of 0 deg C – 125 deg C, which is the temperature range over which an XLPE cable is expected to operate

c. Protection to Insulation :

A heat shrinkable tubing should be applied over exposed cable dielectric.
The material should be:

(1) Non tracking
(2) Weather resistant
(3) Erosion resistant
(4) U. V. radiation resistant

Test reports conforming that there is no degradation of the material after prolonged exposure to elevated temperatures This should include

- Thermal endurance- An Arrhenius plot to confirm the life expectancy on continuous at a temperature of 90 deg C.

- The materials should pass Tracking & Erosion Resistant test in accordance with ASTM D 2303.

- For weather resistance the materials should be tested on Atlas weather-O- meter test.

- The materials should be tested as per EMMAQUA test procedure for evaluating it's resistance to Ultra Violet radiations.

d. Environment sealing:

At the lug end the sealing against ingress of moisture should be provided by non-tracking sealant strips followed by heat shrinkable non tracking, erosion & weather resistant tubing precoated with non tracking sealant.

For 3 core cable the sealing at the crutch area should be provided by a heat shrinkable non tracking erosion & weather resistant breakout internally coated with a non tracking hot melt adhesive.

e. Provision for Earthing

The Copper tape screen and armour of the cable should be earthed by tinned copper braids of appropriate size provided with lug at one end.

3. STRAIGHT THROUGH JOINTS

a. Conductor Continuity

Proper conductor continuity should be ensured either by Crimping or by using Shear head bolted connector.

b. Stress Control :

- The stress control at the screen cutback should be provided by a heat shrinkable tubing having a minimum volume resistivity of 10^{10} Ohms cm. The relative permittivity of the tubing should be at least 15.

- To eliminate voids caused at the step due to semiconducting screen cutback , the manufacturer should provide a high permittivity mastic the permittivity of which should be at least 15.

- The impedance of the stress control tubing should not change over a range of temperature of 0 deg C – 125 deg C, which is the temperature range over which an XLPE cable is expected to operate.

c. Reinstatement of Insulation:

- This should be affected by means of a heat shrinkable, flexible, polymeric tubing made from discharge resistant polymer. The tubing after complete recovery should have a minimum wall thickness of 3 mm to ensure provision of adequate insulation in one step .

- To ensure a void free bond between the rebuilt tubing and screen the manufacturer should supply a single dual walled tubing. This enables the final insulating layer to be installed complete with a conductive polymeric screen.

- The kit should be provided with a high permittivity hot-melt mastic for applying over the ferrule to eliminate voids and sharp edges.

d. Armour/ Screen Continuity

The continuity of the copper tape screen should be affected by tinned copper Mesh and that of the armour by tinned copper braids of adequate cross section.

e. Environment Sealing :

The joints should be protected against ingress of moisture by a polymeric flexible heat shrinkable tubing precoated with hot melt adhesive. This should completely cover metallic sheaths/ earth connections.

4. TEST

a. The kits should be tested as per test sequence of VDE 0278 or IS: 13573 as per latest amendments

b. The Joints/ Terminations should be type Tested for series 1 and series 2 along with **SALT FOG TEST** at per testing procedures.

c. All Heat Shrinkable components should be tested as per ESI-09-13. The bidder shall furnish test reports along with the bid.

d. The manufacturer should provide life assessment test (accelerated ageing test) reports to prove that the heat shrinkable components are capable of retaining their properties within acceptable limits during the course of long term usage.

e. TERT (Track Erosion and Resistance Test) should be conducted on heat shrinkable tube used in termination to prove that they are non tracking.

f. The manufacturer should also furnish graphs showing the variation of impedance of the stress control tubing with respect to (1) change in temperature and (2) Time (aging at constant temperature).

Jointing Kits (Outdoor/Indoor/Straight Through)

Sl#	Particulars	Unit	Technical Particulars	
1	**Type**		Heat shrinkable type	
2	Applicable Standards		IS:13573	
3	Rated Voltage U/Uo(Um)	kV	6.35/11	19.05/33
4	AC Voltage withstand	kV(1min)		
	Dry		28	70
	Wet		35	75
5	Impulse voltage withstand(10 positive and 10 negative, 1.2us between each conductor and the ground screen)	kV	75	170
6	Partial Discharge	kV	12.7	38
7	Loading Cycle(60 cycle 5h heating, 3h cooling conductor temperature: 5+operating temperature)		16	50
	Kit Particulars			
8	Materials of the tubing/moulded part		Heat shrinkable	Heat shrinkable
9	Method of stress control		Heat shrinkable	Heat shrinkable
10	Method of environment seal		As per IS Standard	As per IS Standard
11	Allowable Kit storage temperature	Degree	Unlimited	Unlimited
12	All the jointing kits(outdoor/indoor/straight through joint kit)is complete with all accessories	(Yes/No)	Yes	Yes

The above values are approximate. In case of any specific deviation in values, the same shall be brought out in the deviation sheet

LOT 10: Paints

1.0 Aluminium Paints with Paste

1.1 General

The properties of Aluminium paint should be highly resistant to moisture, saline water and general corrosive conditions. It should be excellent for protection of underwater and underground installations and also for various exposed parts of structures, and machines etc. which are prone to corrosion because of entrapment of moisture and other natural phenomena.

1.2 Specification of the Paints

i. IS Standard : 158/1983 & 9862/1982

ii.	Colour	:	Silver Bronze
iii.	Finish	:	Semi gloss with low metallic luster
iv.	Flash Point	:	Above 30°C
v.	Mixing	:	Aluminium paste and Medium are supplied in proportionate quantities, which are to be mixed up just before painting.
vi.	Recommended Dryfilm thickness	:	20 microns per coat
vii.	Corresponding Wet film thickness	:	80 microns
viii.	Drying time	:	Touch dry- 4 hours Hard dry 12 – 18 hours
ix.	Dry heat resistance	:	Up to 120° C (intermittent)
x.	Storage life	:	Up to 12 months under standard warehouse storage conditions.

2.0 Bituminous Black Paints

2.1 General

A specially treated anticorrosive bituminous coating primarily designed to give long term protection to electrical poles and structures. The coating should have excellent water resistance characteristics along with resistance to impact and abrasion.

2.2 Specification of the Paints:

i.	IS Standard	:	158/1983 & 9862/1982
ii.	Colour	:	Black
iii.	Finish	:	Semigloss to Glossy
iv.	Flash Point	:	above 23°C
v.	Volume Solids	:	56 % approximately
vi.	Recommended dry film thickness	:	30 microns per coat
vii.	Corresponding wet film thickness	:	54 microns
viii.	Drying time	: :	Touch dry– 6 hours Hard dry- 24 - 48 hours
ix.	Dry Heat Resistance	:	Up to 120°C (intermittent)
x.	Storage life	:	Up to 12 months under standard warehouse storage conditions.

Lot 11: Line Materials & Transformer Spares

1.0 General

The Supplier shall provide the goods in complete form. The bidder is advised to inspect the samples from PSD warehouse before mass fabrication.

PART 3- Conditions of the Contract and Contract Forms

Section VI. General Conditions of Contract

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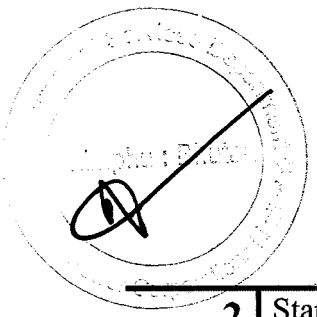

Section VI. General Conditions of Contract (GCC)

1. Definitions		
1.1	In this Contract, unless the contract otherwise requires, the term:	
	(a)	"The Contract" means any lawful agreement entered into between the Purchaser and the Supplier, as recorded in the Contract Agreement signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.
	(b)	"Contract Documents" means the documents listed in the Agreement, including any amendments thereto.
	(c)	"The Contract Price" means the price payable to the Supplier as specified in the Contract Agreement, subject to such additions and adjustments thereto or deductions there from as may be made pursuant to the Contract.
	(d)	"The Goods" means all the equipment, machinery, and/or other materials, which the Supplier is required to supply to the Purchaser under the Contract.
	(e)	"The Services" means those services ancillary to the supply of the Goods, such as transportation and Insurance, provision of technical assistance, training, and other such obligations of the Supplier covered under the Contract.
	(f)	"The Purchaser" means the entity purchasing the Goods and Related Services, as specified in the SCC.
	(h)	"The Supplier" means the individual or firm supplying the Goods and Services under the Contract.
	(i)	"Day" means calendar day.
	(j)	"Delivery" means the transfer of the Goods from the Supplier to the Purchaser in accordance with the terms and conditions set forth in the Contract Documents.
	(k)	"SCC" means Special Conditions of Contract.
	(l)	"Subcontractor" means any natural person, private or government entity, or a combination thereof, including its legal successors and permitted assigns, to whom any part of the Goods to be supplied or execution of any part of the Related Services is subcontracted by the Supplier.
	(m)	"Incoterms' means a series of international sales terms, published by the International Chamber of Commerce (ICC) in Paris, France.
2. Use of Contract Documents and Information		
2.1	The Supplier shall not, without the Purchaser's prior written consent, disclose the Contract, or any provision thereof, or any specification, drawings, pattern, sample or information furnished by or on behalf of the Purchaser in connection therewith, to any person other than a person employed by the Supplier in the Performance of the Contract. Disclosure to any such employed person shall be made in confidence and shall extend only so far as may be necessary for purposes of such performance.	

2.2	The supplier shall not, without the Purchaser's prior written consent, make use of any document or information specified in GCC Clause 2.1 above, except for purposes of performing the Contract.	
2.3	Any document, other than the Contract itself, specified in GCC Clause 2.1 above, shall remain the property of the Purchaser and shall be returned (in all copies) to the Purchaser, on completion of the Supplier's performance under the Contract, if so required by the Purchaser.	
3.	**Change Orders**	
3.1	The Purchaser may at any time, by a written notice to the Supplier, make changes within the general scope of the Contract in any one or more of the following:	
	(a)	Decrease or increase in quantity within the delivery period.
	(b)	Drawings, designs or specifications, where Goods to be furnished under the Contract are to be specifically manufactured for the Purchaser; or
	(c)	The method of shipment or packing; or
	(d)	The place of delivery.
	(e)	The Related Services to be provided by the Supplier.
3.2	If any such change causes an increase or decreases in the cost of, or the time required for, the Supplier's performance of any provisions under the Contract, an equitable adjustment shall be made in the Contract Price or in the Delivery/Completion Schedule, or both, and the Contract shall accordingly be amended. Any claims by the Supplier for adjustment under this Clause must be asserted within Twenty-eight (28) days from date of the Supplier's receipt of the Purchaser's change order.	
3.3	Prices to be charged by the Supplier for any Related Services that might be needed but which were not included in the Contract shall be agreed upon in advance by the parties and shall not exceed the prevailing rates charged to other parties by the Supplier for similar services.	
3.4	The Supplier shall not perform changes in accordance with GCC Clause 3.1 above until the Purchaser has authorized a change order in writing on the basis of the estimate provided by the Supplier as described in GCC Clause 3.2 above.	
3.5	Changes mutually agreed upon as a Change shall constitute a part of the work under this Contract, and the provisions and conditions of the Contract shall apply to the said change.	
4.	**Contract Amendments**	
4.1	Subject to Clause 3, no variation in or modification of the contract shall be made except by written amendment agreed and signed by the parties.	
5.	**Subcontracting**	
5.1	The Supplier shall not subcontract all or any part of the Contract without first obtaining the Purchaser's approval in writing of the subcontracting.	
5.2	The supplier guarantees that any and all subcontractors of the Supplier to performance of any part of the work under the Contract will comply fully with the terms of the Contract applicable to such part of the work under the Contract and shall not relieve the Supplier of any of its obligations, duties, responsibilities or liabilities under the Contract.	

6.	**Country of Origin**
6.1	All Goods supplied under the Contract shall have their origin in eligible countries if these eligible countries are specified in the Special Conditions of Contract. For purposes of this Clause, "origin" shall be considered to be the place where the Goods were mined, grown or produced. Goods are produced when, through manufacturing, processing or substantial and major assembling of components, a commercially recognized new product results that is substantially different in basic characteristics or in purpose or utility form its components.
7.	**Inspection and Tests**
7.1	The Purchaser or its representative shall have the right to inspect and /or to test the Goods to confirm their conformity to the Specifications. At its own expense and at no cost to the Purchaser, the Supplier shall carry out all such tests and/or inspections of the Goods and Related Services as specified in Section V, Schedule of Supply. The Purchaser shall notify the Supplier in writing of the identity of representatives nominated for these purposes.
7.2	The inspections and tests may be conducted on the premises of the Supplier or its subcontractor(s), at point of delivery, and/or at the Goods' final destination, or in an another place in Bhutan as specified in SCC. Where conducted on the premises of the Supplier or its subcontractor(s), all reasonable facilities and assistance, including access to drawings and production data, shall be furnished to the inspectors at no charge to the Purchaser. The supplier shall also furnish copies of relevant reference IS documents or other relevant standards and test certificates for electrical equipment if specified in Section V, Schedule of Supply.
7.3	As specified in SCC, whenever the Supplier is ready to carry out any such test and inspection, it shall give reasonable advance notice, including the place and time, to the Purchaser. The Supplier shall obtain from any relevant third party or manufacturer any necessary permission or consent to enable the Purchaser or it's designated representative to attend the test and/or inspection.
7.4	The Purchaser shall reject any Goods or any part thereof that fail to conform to the Specifications. The Supplier shall either rectify or replace such rejected Goods or parts thereof or make all alterations necessary to meet the Specifications at no cost to the Purchaser, and shall repeat the test and/or inspection, at no cost to the Purchaser, upon giving a notice pursuant to Clause 7.3 above.
7.5	The Purchaser's right to inspect, test and, where necessary, reject the Goods after the Goods' arrival in the Bhutan shall in no way be limited or waived by reason of the Goods' having previously been inspected, tested and passed by the Purchaser or its representatives prior to the Goods' shipment from the country of origin.
7.6	The Supplier shall ensure that all the materials are ready during the time of inspection. In case the materials are to be re-inspected due to reasons which are attributable to the supplier, the same shall be done at the cost of the supplier.
7.7	Nothing in this Clause 7 shall in any way release the Supplier from any Warranty or other obligations under the Contract.
8.	**Packing and Documents**
8.1	The Supplier shall provide such packing of the Goods as is required to prevent their damage or deterioration during transit to their final destination, as per the Contract. The packing shall be sufficient to withstand, without limitation, rough handling

	during transit and exposure to extreme temperatures, salt and precipitation during transit, and open storage. Packing case size and weights shall take into consideration, where appropriate, the remoteness of the Goods' final destination and the absence of heavy handling facilities at all points in transit.	
8.2	The packing, marking, and documentation within and outside the packages shall comply strictly with such special requirements as shall be expressly provided for in the Contract, including additional requirements, if any, specified in Section V, Schedule of Supply and in any subsequent instructions ordered by the Purchaser.	
9.	**Delivery and Documents**	
9.1	Delivery of the Goods shall be made by the Supplier in accordance with the Section V, Schedule of Supply. The details of shipping and/or other documents to be furnished by the Supplier are specified in the SCC.	
9.2	Unless inconsistent with any provision of the Contract or otherwise specified in the SCC, the meaning of any trade term and the rights and obligations of parties there under shall be as prescribed by Incoterms.	
9.3	The terms EXW,CIP, CIF, DDP, and other trade terms used to describe the obligations of the parties shall be governed by the rules prescribed in the current edition of Incoterms specified in the SCC and published by the International Chamber of Commerce, Paris..	
10.	**Indemnity against infringement of Intellectual Property Rights**	
10.1	The Supplier shall, subject to the Purchaser's compliance with GCC Sub-Clause 10.2, indemnify and hold harmless the Purchaser and its employee(s) or representative(s) from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs and expenses of any nature, including attorney's fees and expenses, which the Purchaser may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Contract by reason of:	
	(a)	The installation of the Goods by the Supplier or the use of the Goods in Bhutan; and
	(b)	The sale in any country of the products produced by the Goods.
	Such indemnity shall not cover any use of the Goods or any part thereof other than for the purpose indicated by or reasonably to be inferred from the Contract, neither any infringement resulting from the use of the Goods or any part thereof, or any products produced thereby in association or combination with any other equipment, plant or materials not supplied by the Supplier, pursuant to the Contract.	
10.2	If any proceedings are brought or any claim is made against the Purchaser arising out of the matters referred to in GCC Sub-Clause 10.1, the Purchaser shall promptly give the Supplier notice thereof, and the Supplier may at its own expense conduct such proceedings or claim and any negotiations for the settlement of any such proceedings or claim.	
10.3	The Purchaser may, at the Supplier's request, afford all available assistance to the Supplier in conducting such proceedings or claim, and shall be reimbursed by the Supplier for all reasonable expenses incurred in so doing.	
10.4	The Purchaser shall indemnify and hold harmless the Supplier and its employees,	

	officers and Subcontractors from and against any and all suits, actions or administrative proceedings, claims, demands, losses, damages, costs and expenses of any nature, including attorney's fees and expenses, which the Supplier may suffer as a result of any infringement or alleged infringement of any patent, utility model, registered design, trademark, copyright or other intellectual property right registered or otherwise existing at the date of the Contract arising out of or in connection with any design, data, drawing, specification or other documents or materials provided or designed by or on behalf of the Purchaser.	
11. Performance Security		
11.1	The Supplier shall within fifteen (15) working days of notification of contract award , provide Performance Security in the amount and currency specified in the SCC.	
11.2	The proceeds of the Performance Security shall be payable to the Purchaser as compensation from the Supplier's failure to complete its obligations under the Contract. The Performance Security is a security taken by the purchaser for due performance of the Contract and shall be forfeited if the Supplier fails without any legal excuse, to perform any promises that form the whole or part of a Contract or any agreement without need of establishing any loss incurred by the Purchaser. The Supplier shall cause the validity period of the Performance Security to be extended for such period(s) as the contract performance may be extended pursuant to GCC Clause 16.2.	
11.3	The Performance Security shall be denominated in a currency (ies) of the Contract, or in a freely convertible currency acceptable to the Purchaser and shall be in one of the following forms:	
	(a)	Unconditional bank guarantee issued by a reputable financial institution acceptable to the Purchaser, in the form provided for in the Contract or in any other form acceptable to the Purchaser; or
	(b)	Banker's Cheque/Cash Warrant; or
	(c)	Demand Draft.
11.4	If the institution issuing the Performance Security furnished by the Bidder is located outside the Purchaser's country, the Performance Security shall be counter guaranteed by a correspondent financial institutions located in the Purchaser's country to make it enforceable.	
11.5	The Performance Security shall be discharged by the Purchaser and returned to the Supplier not later than thirty (30) days following the date of completion of the Supplier's performance obligations or any pending contractual issues arising under the Contract, or any warranty obligations, unless specified otherwise in the SCC.	
12. Insurance		
12.1	All Goods supplied under the Contract shall be fully insured in the currency of Contract against loss or damage incidental to manufacture or acquisition, transportation, storage and delivery, in accordance with the applicable Incoterms or in the manner specified in the SCC.	
13. Warranty		
13.1	The Supplier warrants to the Purchaser that the Goods supplied under the Contract	

19.	**Termination for insolvency**
19.1	The Purchaser may, at any time terminate the Contract by giving written notice to

Section VIII- Contract Forms

		under the Contract, in tort or otherwise, shall not exceed the total Contract Price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipment, or to any obligation of the Supplier to indemnify the Purchaser with respect to patent infringement.
29.	**Export Restriction**	
31.1		Notwithstanding any obligation under the Contract to complete all export formalities, any export restrictions attributable to the Purchaser, to Bhutan, or to the use of the products/Goods, systems or services to be supplied, which arise from trade regulations from a country supplying those products/Goods, systems or services, and which substantially impede the Supplier from meeting its obligations under the Contract, shall release the Supplier from the obligation to provide deliveries or services, always provided, however, that the Supplier can demonstrate to the satisfaction of the Purchaser that it has completed all formalities in a timely manner, including applying for permits, authorizations and licenses necessary for the export of the products/Goods, systems or services under the terms of the Contract. Termination of the Contract on this basis shall be for the Purchaser's convenience pursuant to Clause 20.

Section VII. Special Conditions of Contract

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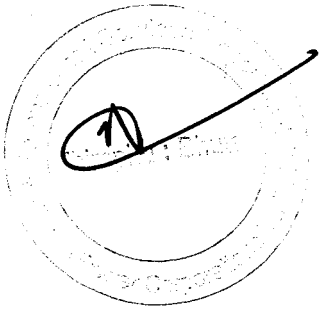


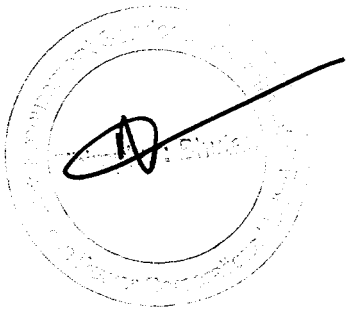
Section VII. Special Conditions of Contract (SCC)

The following Special Conditions of Contract (SCC) shall supplement the General Conditions of Contract (GCC). Whenever there is a conflict, the provisions herein shall prevail over those in the General Conditions of Contract (GCC).	
1. Definitions	
GCC 1.1 (f)	The Purchaser is: *Procurement Services Department, Bhutan Power Corporation Limited, Yarden Lam, Post Box No. 580, Thimphu, Bhutan.* The consignee is: *The Chief Manager, Regional Store Division, Regional Stores Division, Bhutan Power Corporation, Phuentsholing, Bhutan.*
2. Inspection and Test	
GCC 7.1	The inspections and tests shall be: *Applicable*
GCC 7.2	Inspections and tests shall be conducted at: *Manufacturer's premises.*
GCC 7.3	All materials shall be inspected and tested as specified in the relevant IEC or BS or IS standards. The supplier must notify the purchaser in writing by mailed copy within twenty (20) days in advance once the goods are ready for dispatch. This should be notified to purchaser at the following address: Attention: *The General Manager* Address: *Procurement Services Department* *Bhutan Power Corporation Limited* *Thimphu: Bhutan* Telephone: *00975-2-336046/325095, Extn: 717* E-mail address: *psdbpc@gmail.com & alkapradhan@bpc.bt* The period indicated is for deputing an inspector and has no connection with the stipulated delivery schedule. If the delay in the delivery of all or part of materials has been caused due to delay in nominating inspectors by the purchaser after the inspection call has been received in writing by the purchaser, the delivery period shall be extended by the period equivalent to the delay in sending inspectors by the purchaser for the whole or part of the materials.
GCC 7.5	To ensure that the goods are delivered in good condition, suppliers/supplier's representatives need to be present for the joint inspection of the goods at the BPC warehouse and sign the joint inspection report.
3. Packing and Documents	
GCC 8.2	The supplier shall pack all the Goods as is required to prevent damage or deterioration in transit to the final destination. The packing should be sufficient to withstand rough handling and exposure to extreme temperatures, salt and precipitation during transit and/or storage as per GCC Clause 8.
4. Delivery and Documents	
GCC 9.1	a. The good need to be delivered at the designated place as specified in Section V, Schedule of Supply. Further, the shipment should be completed within 21 (twenty one) days after inspection/dispatch clearance if the delivery is made from India and within 60 (sixty) days if the delivery is made from Third countries. However, the overall schedule for delivery of the material at the place

	of delivery as per contract stipulations shall be met and any delay in meeting the schedule will be dealt with as per contract stipulation including but not limited to Liquidated Damages. b. Details of Shipping and other Documents to be furnished by the Supplier after the delivery of goods are: *(i) Copies of the Supplier's invoice showing Goods description, quantity, unit price, and total amount;* *(ii) Suppliers Good Issues Note (Challan);* *(iii) Copy of import declaration form (B-Form)in Bhutan;* *(iv) Original tax paid receipt in Bhutan.* *(v) Manufacturer's or Supplier's warranty certificate;* *(vi) Packing List;* *(vii) Inspection report/Test Certificate;*
GCC 9.2	The meaning of the trade terms shall be as prescribed by Incoterms 2010, read in conjunction with any specific explanation of the tender.
GCC 9.3	The version of Incoterms shall be: *2010,* read in conjunction with any specific explanation of the tender.
5. Performance Security	
GCC 11.1	The amount of Performance Security shall be: *10% of the contract value.*
GCC 11.5	Discharge of Performance Security shall take place: *As indicated in GCC Sub-Clause 11.5*
6. Insurance	
GCC 12.1	The insurance coverage shall be as specified in the Incoterms 2010.
7. Warranty	
GCC 13.2	The period of validity of the Warranty shall be: *Twelve (12) months from the date of acceptance of goods at the place of destination by consignee as indicated in clause* GCC 1.1 (f). *As a proof of performance warranty, the supplier have to deposit 10% of the supplied value in the form of Bank Guarantee acceptable to the Purchaser which shall be valid for a period not less than twelve (12) months after delivery of last consignment.* *Or* *As a proof of performance warranty, the purchaser will not release the 10% retention money to cover the defects liability period which shall be minimum of twelve months after the delivery of the last consignment. However, the payment for the retention amount shall be made provided the Supplier presents request for payment accompanied by a Retention Security in the form of Bank Guarantee issued by a reputable financial institution acceptable to the purchaser for an amount equal to the amount of retention payment and the validity of the Bank Guarantee shall be not less than twelve (12) months after the delivery of last consignment.* *If the Financial institution issuing the performance warranty bank guarantee/retention security bank guarantee furnished by the Bidder is located outside the Purchaser's country, the bank guarantee shall be counter guaranteed by*

	a correspondent financial institution located in the Purchaser's country to make it enforceable.
8. Payment	
GCC 14.1	Payments shall be made in equivalent Ngultrum to the currency quoted amount but the payment shall be made through proper banking channels and the responsibilities of payment transfer and transfer charges lie on the Suppliers. Undertaking letter from routing of payment through the Banks (if the payment is not through Letter of Credit) shall not be issued. Payment of the Contract Price shall be made in through the following manner: a) **Advance Payment:** Maximum of ten percent (10%) of the Contract Price as advance payment shall be paid after signing of the contract. Payment shall be made provided the Supplier presents a request for payment accompanied by an Advance Payment Security in the form of Bank Guarantee issued by a reputable financial institution acceptable to the purchaser for an amount equal to the amount of the advance payment, and shall be valid until the goods are delivered. b) **On Acceptance:** Eighty percent (80%) of the contract price of the goods received shall be paid within thirty (30) days of receipt of the goods upon the submission of a claim supported by the Acceptance Certificate / Good Receipt Note (GRN) issued by the Purchaser. c) **Retention payment**: Ten percent (10%) of the Contract Price will be payable after the expiry of defect liability period (for a period not exceeding twelve months after delivery of all materials). However, payment shall be made provided the Supplier presents a request for payment accompanied by retention Security in the form of Bank Guarantee issued by a reputable financial institution acceptable to the purchaser for an amount equal to the amount of the retention payment, and shall be valid for a period not less than twelve (12) months after delivery of all materials. If the Financial institution issuing the advance payment bank guarantee/retention security bank guarantee furnished by the Bidder is located outside the Purchaser's country, the bank guarantee shall be counter guaranteed by a correspondent Financial Institutions located in the Purchaser's country to make it enforceable.
9. Contract Prices	
GCC 15.2	The prices charged for the Goods supplied and the related Services performed *shall not* be adjustable.
10. Contract Execution Schedule and Extension in the Supplier's Performance	
GCC 16.1	The contract shall be executed as per Contract Execution Schedule given below: *The commencement of the contract period shall be assumed from the date of signing of the contract agreement if an agreement is executed; otherwise the notification of award is an acceptance and shall constitute a contract between the parties.*

	<table><tr><th>*Phase*</th><th>*Activity*</th><th>*Remarks*</th></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table> *The Supplier shall submit a detailed program covering the manufacturing, testing and delivery of the materials and equipment within the time stated in the bid documents. The program shall be in the form of bar chart. The Supplier shall submit progress reports detailing progress and explaining any variations if any.*
11. Liquidated Damages	
GCC 17.1	The liquidated damages shall be*: 1 % per week.*
GCC 17.1	The maximum amount of liquidated damages shall be: *10 % of the contract value.*
12. Resolution of Disputes	
GCC 21.2	The rules of procedure for arbitration proceedings pursuant to GCC Sub-Clause 21.2 shall be as per the Alternative Dispute Resolution Act of Bhutan 2013.
13. Taxes and Duties	
GCC 26.1	Pursuant to GCC 26.1 a. Price quoted shall be inclusive of all taxes (both inside and outside the purchaser's country) and Purchaser shall not be responsible and liable for the reimbursement/payment of taxes and duties. Further, for the clarity of applicable taxes, the Bidders may check with Department of Revenue and Custom, Ministry of Finance, Thimphu Bhutan / for exact Tax Rates in Bhutan for goods offered from India/Third Countries that are payable in Bhutan; b. The manufacturer(s) in Bhutan are to pay the taxes in accordance with the rules of the Government without any liability to the Purchaser. Purchaser shall not be responsible for reimbursement/processing exemptions/payments of taxes, duties, levies, royalties etc. for raw materials; and c. Tax Deducted at Source (TDS) shall be deducted as per the regulations of Ministry of Finance, RGoB, Bhutan.



Section VIII. Contract Forms

Table of Contents

Contract Agreement

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

BETWEEN

[insert complete n*ame of Purchaser]*of Bhutan Power Corporation and having its principal place of business at [insert address of Purchaser (hereinafter "the Purchaser") of the one part and

[insert n*ame of Supplier], a corporation incorporated under the laws of [insert: country of Supplier] and having its principal place of business at [insert address of Supplier]*(hereinafter "the Supplier") of the other part.

WHEREAS the Purchaser is desirous that certain goods be provided by the Supplier, viz., [insert *Brief Description of Goods, as identified in the Bid Form and Price Schedule]*(hereinafter "the Goods") and has accepted a Bid by the Supplier for the provision of those Goods in the sum of [insert *Contract Price in Words and Figures)* (hereinafter "the Contract Price").

NOW THIS CONTRACT AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expression shall have the same meaning as are respectively assigned to them in the Conditions of Contract referred to.

2. The following documents shall constitute the Contract between the Purchaser and the Supplier, and each shall be read and construed as an integral part of the Contract:

    a. This Contract Agreement;
    b. The Purchaser's Notification of Award;
    c. Minutes of Contract Negotiation Meeting;
    d. Price Schedule;
    e. Special Conditions of Contract;
    f. General Conditions of Contract;
    g. Technical Requirements;
    h. The Supplier's Bid and original Price Schedule;
    i. Integrity Pact;
    j. VPMS Acceptance Form

3. 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.

4. In consideration of the payments to be made by the Purchaser to the Supplier as

hereinafter mentioned, the Supplier hereby covenants with the Purchaser to provide the Goods and to remedy defects therein in conformity in all respects with the provisions of the Contract.

5. The Purchaser hereby covenants to pay the Supplier, in consideration of the provision of the Goods 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.

IN WITNESS WHEREOF, the parties hereto have caused this Contract Agreement to be executed in accordance with the laws of Bhutan on the day, month and year indicated above

For and on behalf of the Purchaser

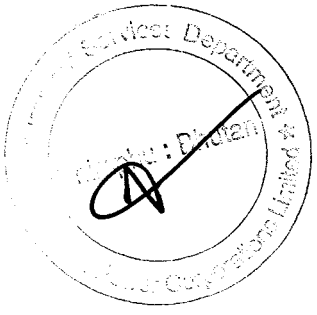
Signed: [insert signature]
in the capacity of [insert title or other appropriate designation]

in the presence of [insert signature]
[insert identification of official witness]

For and on behalf of the Supplier

Signed: [insert signature of authorized representative(s) of the Supplier]
in the capacity of [insert title or other appropriate designation]

in the presence of [insert signature]
[insert identification of official witness]



Performance Security

[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]*

Beneficiary: *[insert complete name of Purchaser]*

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)*[1] *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]*,[2] 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 Purchaser'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]

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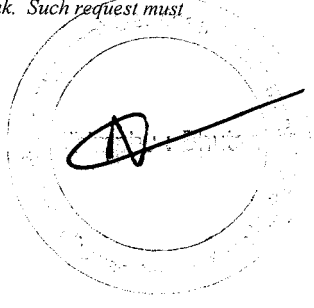
[1] *The Bank shall insert the amount(s) specified in the SCC and denominated, as specified in the SCC, either in the currency(ies) of the Contract or a freely convertible currency acceptable to the Purchaser.*

[2] *Date established in accordance with General Conditions of Contract ("GCC"). The Purchaser should note that in the event of an extension of the time to perform the Contract, the Purchaser would need to request an extension of this Guarantee from the Bank. Such request must be in writing and must be made prior to the expiration date established in the Guarantee.*



Bank Guarantee for Advance Payment

[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 number and title of bidding process]*

[bank's letterhead]

Beneficiary: *[insert legal name and address of Purchaser]*

ADVANCE PAYMENT GUARANTEE No.: *[insert Advance Payment Guarantee no.]*

We, *[insert legal name and address of bank],* have been informed that *[insert complete name and address of Supplier]* (hereinafter called "the Supplier") has entered into Contract No. *[insert number]* dated *[insert date of Contract]* with you, for the supply of *[insert types of Goods to be delivered]* (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, an advance payment is to be made against an advance payment guarantee.

At the request of the Supplier, we hereby irrevocably undertake to pay you any sum or sums not exceeding in total an amount of *[insert amount(s)[3] in figures and words]* upon receipt by us of your first demand in writing declaring that the Supplier is in breach of its obligation under the Contract because the Supplier used the advance payment for purposes other than toward delivery of the Goods.

It is a condition for any claim and payment under this Guarantee to be made that the advance payment referred to above must have been received by the Supplier in its account *[insert number and domicile of the account]*

This Guarantee shall remain valid and in full effect from the date of the advance payment received by the Supplier under the Contract until *[insert date[4]].* We agree to a one-time extension of this Guarantee for a period not to exceed *[six months][one year]*, in response to the Purchaser's written request for such extension, such request to be presented to us before the expiry of the Guarantee.

[signature(s) of authorized representative(s) of the bank]

The bank shall insert the amount(s) specified in the SCC and denominated, as specified in the SCC, either in the currency(ies) of the Contract or a freely convertible currency acceptable to the Purchaser.
Insert the Delivery date stipulated in the Contract Delivery Schedule. The Purchaser should note that in the event of an extension of the time to perform the Contract, the Purchaser would need to request an extension of this Guarantee from the bank. Such request must be in writing and must be made prior to the expiration date established in the Guarantee

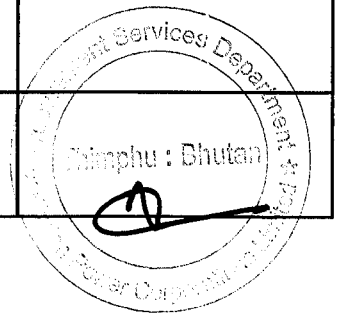
Guarenteed Technical Particulars

LOT 1: Aerial Bundled Conductors										
SL. No.	Parameters	Units	Bidders To Fill up				Bidders To Fill up			
			HV ABC (Item no. 1 & 2)		LV ABC (Item no. 3-4)		LV ABC (Item no. 5-7)			Covered AAAC(Item no.8)
			3 core 95 sq. mm	3 core 50 sqmm	2 core 50 sq. mm	2 core 95 sq. mm	4 core 50 sq.mm	4 core 95 sq.mm	4 core 120 sq. mm	Covered AAAC-111sq.mm
	Manufacturer									
2	Applicable Standards									
3	Rated voltage	kV								
	Conductor									
4	Nominal Area of core Conductor	mm^2								
5	Conductor Screen Material									
6	Min. Thickness of Conductor Screen	mm								
	Insulation									
7	Insulation material									
8	Minimum Insulation thickness	mm								
9	Minimum thickness of insulation screen	mm								
	Metallic Shield									
10	Material									
11	Size for Conductor screen	No./mm								
	Sheath									
12	Material									
13	Min. thickness	mm								
	Support Catenary									
14	Support Catenary size									
15	Material									
16	**Test Voltage**									
	One/five minute power frequency withstand voltage	kV								
17	Max. Current Rating at 35^0C	A								
18	Type of cable end sealing									
	Cable drums									
19	Dimensions	Mtr.								
20	Weight	Kg								
21	Nominal Length per drum	Mtr.								

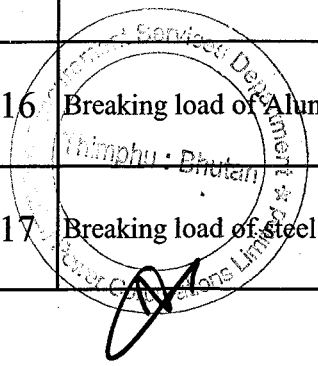
Guaranteed Technical Particulars

LOT 2 : ACSR Conductors

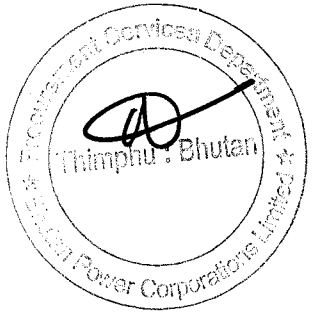
Sl. No.	Parameters	Unit	Bidders to fill up		
			ACSR Conductor (Rabbit)-50 sq. mm	ACSR Conductor (Dog)-100 sq. mm	ACSR Conductor (wolf)-150 sq. mm
1	Manufacturer				
2	Manufacturer Type Designation				
3	Applicable standard				
4	Nominal size of Conductor	mm^2			
5	Purity of material	%			
6	Percentage of carbon, sulphur phosphorus in steel wire rod	%			
7	Nominal Aluminium area	mm^2			
8	Tolerance in diameter	mm			



9	Guaranteed ultimate breaking strength	Kg / kN			
10	Weight in Kg/Km	kg			
11	Resistance Ω/Km	Ω			
12	Co-efficient of linear expansion °C per °C x 10^{-6}				
13	Stranding and wire diameter	mm			
	a) Aluminum				
	b) Steel				
14	Overall diameter of conductor	mm			
15	Breaking load of conductor	kN			
16	Breaking load of Aluminum wire after stranding	kN			
17	Breaking load of steel wire after stranding	kN			



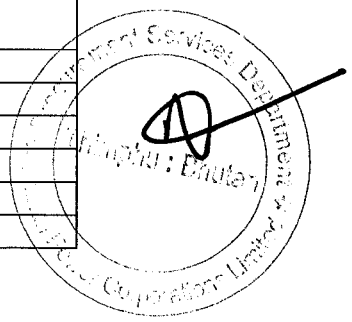
18	Resistance in Ω/Km at 20°C of the complete conductor (Max) in Ω/Km	Ω/Km			
19	Continues maximum current rating of the complete conductor (Max) in A	Amps			
20	Standard length of the conductor in one drum	Mtr.			
21	Approved grease to be applied for each conductor inner layer as cover to fill the interstices between the strands of the outer layer				
22	Conductor drum material & dimension				
23	Overall weight of drum & conductor per drum	Kg.			



Guarenteed Technical Particulars

LOT 3: XLPE Cables

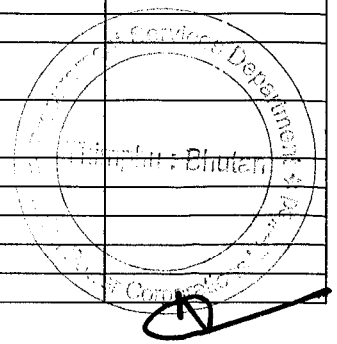
Sl.No.	Specified Terms and Conditions	Units	Bidders to fill up					
			11 kV (Item no. 1-4)				33 kV (item no. 5 & 6)	
			3C x 70 sq.mm	3C x 150 sq.mm	3C x 185 sq.mm	3C x 300 sq.mm	1C x 630sq.mm	3C x 150 sq.mm
1	Manufacturer							
2	Applicable Standards							
3	Rated voltage	kV						
4	System Voltage	kV						
5	Maximum current carrying capacity	A						
6	Short circuit capacity of conductor	A						
7	**Conductor**							
	Material							
	Crossectional Area	sqmm						
	Whether Stranded?							
8	**Insulation**							
	Material							
	Thickness	mm						
9	**Inner Sheath**							
	Material							
	Whether Extruded or Wrapped?							
	Thickness	mm						
10	**Outer sheath**							
	Material							
	Thickness	mm						
11	**Armour**							
	Material							
	Thickness	mm						
12	Details of screen, if any							
13	Total overall diameter	mm						
14	**Test Voltage**							
	One minute power frequency withstand voltage	kV						
	Impulse withstand voltage	kVp						
15	Type of cable end sealing							
16	**Cable drums**							
	Dimensions	mm						
	Weight	kg						
	Nominal length per drum	mtr						



Guarenteed Technical Particulars

LOT 4: PVC Cables

Sl.No.	Specified Terms and Conditions	Units	Bidders to Fill up		Bidders to Fill up			Bidders to Fill up			Bidders to Fill up			Bidders to Fill up	
			Arm. Al Cable PVC Insulated (Item no. 1-11)		Arm. Al Cable PVC Insulated (Item no. 1-11)			Arm. Al Cable PVC Insulated (Item no. 1-11)			Arm. Al Cable PVC Insulated (Item no. 1-11)			Arm. CU. Cable PVC Insulated (Item no.12)	Un. Arm. CU. Cable PVC Insulated (Item no.13)
			1C x 400 sq.mm	4C x 400 sq.mm	4C x 300 sq.mm	4C x 240 sq.mm	4C x 150 sq.mm	4C x 120 sq.mm	4C x 95 sq.mm	4C x 70 sq.mm	4C x 50 sq.mm	4C x 25 sq.mm	4C x 16sq.mm	2C x 10 sq. mm	2C x 6 sq. mm
1	Manufacturer														
2	Applicable Standards														
3	Rated voltage	kV													
4	System Voltage	kV													
5	Maximum current carrying capacity														
a	Air	A													
b	Ground	A													
c	Duct	A													
6	Short circuit capacity of conductor														
7	**Conductor**														
	Material														
	Crossectional Area	sqmm													
	Whether Stranded?														
8	**Insulation**														
	Material														
	Thickness	mm													
9	**Inner Sheath**														
	Material														
	Whether Extruded or Wrapped?														
	Thickness	mm													
10	**Outer sheath**														
	Material														
	Thickness	mm													
11	**Armour**														
	Material														
	Thickness	mm													
12	Details of screen, if any														
13	Total overall diameter	mm													
14	**Test Voltage**														
	One minute power frequency withstand voltage	kV													
	Impulse withstand voltage	kVp													
15	Type of cable end sealing														
16	**Cable drums**														
	Dimensions	mm													
	Weight	kg													
	Nominal length per drum	mtr													

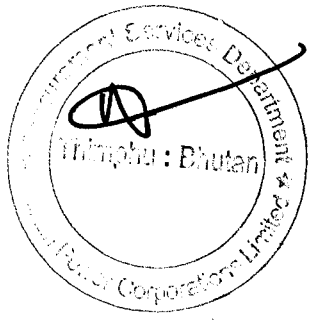


LOT 5A: HV ABC Fittings

Brand Restricted To: Sicamex Asia Pvt. Ltd., Singapore; Ensto India Pvt. Ltd., India; Niled Sa, France and Raychem RPG (P) Ltd., India; Axis Electrical; IAC Electricals

Sl. #	Parameters	Units	Bidders to fill up						
			Item No.1	Item No.2	Item No.3	Item No.4	Item No.5	Item No.6	Item No. 7
			Hook Bracket assembly for HV ABC	Hook Bolt Assembly for 3Cx95 sq.mm HV ABC	Strain Clamp (50-95 sq.mm)- HV ABC	Suspension Clamp (50-95 sq.mm) SA-HV ABC	Suspension Clamp (50-95 sq.mm) LA-HV ABC	Ins.ten.Joint sleeve (1Cx50 sq.mm)-11 kV ABC	Ins.ten.Joint sleeve (3Cx95 sq.mm)-11 kV ABC
1	Name of manufacturer and country								
3	Applicable Standards								
4	Test voltage for 1 Min	kV							
5	Mechanical Tensile Miminum Load	kN							
6	Material used								

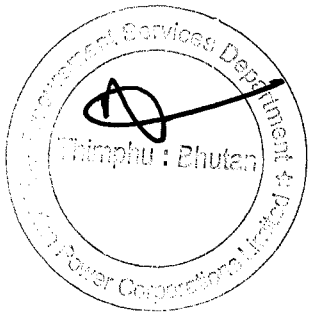
Sl. #	Parameters	Units	Bidders to fill up			
			Item No.23	Item No.24	Item No.25	Item No.26
			Insulation tension jointing sleeves for 50 sqmm	Suspension clamp-small angle for 4x50 sqmm LV ABC	Suspension clamp-large angle for 4x95 sqmm LV ABC	Suspension clamp (SA) for 4Cx120sqmm
1	Name of manufacturer and country					
3	Applicable Standards					
4	Test voltage for 1 Min	kV				
5	Mechanical Tensile Miminum Load	kN				
6	Material used					



LOT 5B: LV ABC Fittings

Brand Restricted To: Sicamex Asia Pvt. Ltd., Singapore; Ensto India Pvt. Ltd., India;. Niled Sa, France and Raychem RPG (P) Ltd., India; Axis Electrical; IAC Electricals

Sl. #	Parameters	Units	Bidders to fill up					
			Item No.1	**Item No.2**	**Item No.3**	**Item No.4**	**Item No.5**	**Item No.6**
			Hook Bolt Assembly for LV ABC	Hook Bracket assembly for LV ABC	Strain Clamp /dead end clamp (2Cx50 sq.mm) LV ABC	Strain Clamp /dead end clamp (4Cx50 sq.mm) LV ABC	Strain Clamp /dead end clamp (4Cx95 sq.mm) LV ABC	Strain Clamp /dead end clamp (4Cx120 sq.mm)
1	Name of manufacturer and country							
3	Applicable Standards							
4	Test voltage for 1 Min	kV						
5	Mechanical Tensile Miminum Load	kN						
6	Material used							



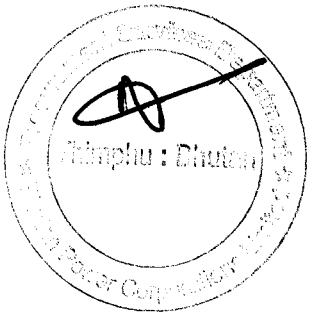
Lot 5B: LV ABC Fittings (IPC)

Brand Restricted To: Sicamex Asia Pvt. Ltd., Singapore; Ensto India Pvt. Ltd., India; Niled Sa, France and Raychem RPG (P) Ltd., India; Axis Electrical; IAC Electricals

Sl. #	Parameters	Units	Item No. 10	Item No. 11	Item No. 12	Item No. 13	Item No. 14	Item No. 15	Item No. 16
			IPC 50-6 sqmm	IPC (50/16sqmm)	IPC (50/25sq.mm)-LV ABC	Insulation Piercing connector (IPC 50/50)sq.mm	Insulation Piercing connector (IPC 50/10)sq.mm	Insulation Piercing connector (IPC 95/95)sq.mm	Insulation Piercing connector (IPC 95/50)sq.mm
1	Name of manufacturer and country								
3	Applicable Standards								
4	Test voltage for 1 Min	kV							
5	Shearhead Breaking	Nm							
6	Material used								

Continue..

Sl. #	Parameters	Units	Item No. 17	Item No. 18	Item No. 19	Item No. 20	Item No. 21	Item No. 22
			Insulation piercing connector (IPC 95/25)	Insulation Piercing connector (IPC 95/16)sq.mm	Insulation Piercing connector (IPC 95/10)sq.mm	Insulation Piercing connector (IPC 95/6)sq.mm	IPC (120/120sqmm)-LV ABC	IPC (120/95sqmm)-LV ABC
1	Name of manufacturer and country							
3	Applicable Standards							
4	Test voltage for 1 Min	kV						
5	Shearhead Breaking	Nm						
6	Material used							



LOT 6:Energy Meters		
Item No. 1 (AC Single Phase Two Wire, L.T. Static Whole Current (10-60)A Energy Meter with LCD Display		
Sl. No.	**Particular**	**Bidders To Fill Up**
1	Name of manufacturer	
2	Type, name & number	
3	Standard Applicable	
4	Type of Meter (Model No.)	
5	Rating	
(i)	Accuracy Class	
(ii)	Rated Voltage	
(iii)	Rated current	
(iv)	Rated frequency	
(v)	Power factor	
(vi)	Minimum saturation current	
(vii)	Meter Constant (imp / KWh)	
6. (i)	Maxm. Continuous current rating (Amp.)	
(ii)	Continuous current rating of terminals for two hours	
(iii)	Running with no load &(-)70% to 120 % voltage	
7	Short time over current for 10 milli seconds	
8	Starting current at which meter	
	shall run & continue to run	
9	Power loss at rated frequency & reference temperature	
(a)	Current circuit at rated voltage	
(b)	Voltage circuit	
10	Type of material used	
(a)	Base	
	Material	

(b)	Meter cover	
(c)	Terminal Block	
	Material	
(d)	Terminal cover	
	Material	
(e)	Screw	
	(i) Material	
	(ii) Size	
11	Internal diameter of Terminal Hole	
12	Centre to Centre clearances between adjacent terminals	
13	Output	
14	Type of Register	
(i)	No. of Digits	
(ii)	Size of Numerals	
15	Display	
(i)	On Up and down Scroll Mode & Auto display mode	
(ii)	Type of push button	
16	Reading on power off condition	
17	Battery of Real time clock	
18	Fixing/sealing arrangement	
	(i) Fixing of meter	
	(ii) Sealing of meter cover to	
	Base	
19	Type of hinged undetectable terminal cover	
20	Performance of meter in tamper conditions	
	(i) Input phase & neutrl connections Interchanged	
	(ii) Incomming mains is connected to outgoing and load is connected to incoming.	
	(iii)combination of (i) & (ii)	

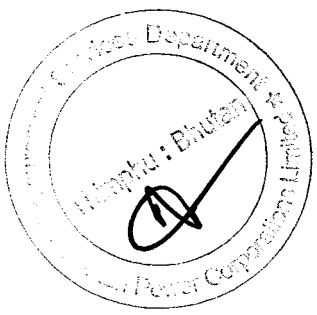
	(iv) Indication of above tamper	
	Condition	
	Electromagnetic compatibility	
	(EMI / EMC severity level)	
	(i) Effect on accuracy of external electromagnetic interference of electrical discharge, external magnetic field	
21	Effect on accuracy under tamper conditions / influence conditions	
22	Drift in accuracy of measurement with time	
23	Name plate details	
24	Approximate weight of meter	
25	Type of mounting	
26	Calibration	
27	Manufacturing activity	
	(i) Mounting of components on PCB shall be SMT type	
	(ii) Compliance to assurance	
28	Guarantee period of meter	
29	Other parameters / features not covered in the above GTP	

Lot No. 6 (Energy Meters)

Item No. 2 & 3 (AC Three Phase Four Wire, L.T. Static Whole Current (5-30)A & (10-80)A Energy Meter with LCD Display

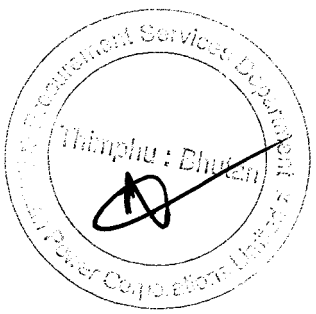
Sl. No.	Particular	Min. Requirement	Unit	Bidders To Fill Up (5-30)A	Bidders To Fill Up (10-80)A
1	Name of manufacturer				
2	Type, name & number				
3	Standard Applicable	IS:13779/1999, IS: 12346 / 1988, IS: 14434 / 1998, CEA regulation no. 502 / 70 / CEA / DT&D dt.17.03.06 and CBIP technical Report No.304 with its latest amendment as on date..			
4	Type of Meter (Model No.)				
5	Rating				
(i)	Accuracy Class	Class-I			
(ii)	Rated Voltage	240V Ph to Neutral (+ 20% to - 30%)			
(iii)	Rated current	Ib-5 & 10 Amp. Imax- 30 & 80 Amp			
(iv)	Rated frequency	50 Hz ± 5%			
(v)	Power factor	0 lag to Unity to 0 lead			
(vi)	Minimum saturation current	Bidders to specify			
(vii)	Meter Constant (imp / KWh)	-do-			
6 (i)	Maxm. Continuous current rating (Amp.)	30 & 80 Amps			
(ii)	Continuous current rating of terminals for two hours	45 Amp & 120 Amps			
(iii)	Running with no load &(-)70% to 120 % voltage	No creeping			
7	Short time over current for 10 milli seconds	30 Imax & 80 Amps for one half cycle at rated frequency			
8	Starting current at which meter shall run & continue to run	0.2% of Ib at rated voltage and unity power factor			
9	Power loss at rated frequency & reference temperature				
(a)	Current circuit at rated voltage	Less than 4 VA per phase			
(b)	Voltage circuit	Less than 1.5W / 8 VA per phase			
10	Type of material used				
(a)	Base				
	Material	High Impact strength, nonhygroscopic, fire retardant, fire resistant, UV stabilised poly carbonate (Lexan 503R or equivalent			
(b)	Meter cover	High Impact strength, nonhygroscopic, fire retardant, fire resistant, UV stabilized Transparent poly carbonate (Lexan 943A or equivalent)			
(c)	Terminal Block				
	Material	Material High Impact strength not hygroscopic, fire retardant, fire resistant, UV stabilised poly carbonate (Lexan 503R or equivalent) Barrier of adequate size shall be provided between phase and neutral			
(d)	Terminal cover				
	Material	High Impact strength, nonhygroscopic, fire retardant, fire resistant, glass reinforced poly carbonate (Transparent)& non detachable with hinging arrangement (Lexan 943A or			
(e)	Screw				
	(i) Material	Tin / Nickel Plated – Brass			
	(ii) Size	Bidders to specify			
11	Internal diameter of Terminal Hole	Min. 9.5 mm			
12	Centre to Centre clearances between adjacent terminals	13 mm			
13	Transducers				
(i)	Input	C.T provided in phase element and in the neutral. Voltage: Potential divider (PT less)			
(ii)	Output	LCD			
(iii)	C.T. – no of turns	Bidders to specify			
14	Type of Register	LCD suitable for operation up to 60 ^{0}C			
15	No. of Digits	6 (integer only)			
16	Size of Numerals	10.0 X 5 mm (minimum)			
17	Display				
(i)	On Up and down Scroll Mode & Auto display mode	Both required			
(ii)	Type of push button	Spring loaded push button to be provided on top cover of meter to read parameters			

18	Reading on power off condition	Meter shall be able to display reading during power off with back up power through the push button provided on the meter. All Data down loading facility should be provided in power off condition. Rating of the battery should be 650mAh or it should be rechargeable battery.			
19	Battery of Real time clock	(i) It shall be Lithium-ion battery having 350 mAh capacity and at least 10 years of life			
20	Fixing/sealing arrangement				
	(i) Fixing of meter	3 fixing holes (one at top & two at bottom under terminal block). The top			
	(ii) Sealing of meter cover to				
	Base	or any other technology which is equally or more efficacious so that cover cannot be opened without breaking, i.e. the meter should be break to open type.			
21	Type of hinged undetectable terminal cover	Terminal cover shall be hinged.			
22	Performance of meter in tamper conditions				
	(i) Input and out put Terminals Interchanged	Should work within specified Accuracy			
	(ii) Change of phase sequence	----do----			
	(iii)Phase current reverse	-do-			
	(iv) Indication of above tamper Condition	LCD / LED indication.			
23	Suitability of meter to sustain over voltage i.e. phase to phase voltage injected between phased	Should sustain			
24	Electromagnetic compatibility (EMI / EMC severity level)	As per IS 13779: 1999			
	(i) Effect on accuracy of external electromagnetic interference of electrical	Should work within accuracy as per latest ISS & CBIP report - 325 with latest amendment.			
	(ii) Tamper should be classified as C.T. related, P.T. related and Others tamper.	Meter shall log last 148 events with date and time for C.T. related tamper and so on clause 13.			
25	Effect on accuracy under tamper conditions / influence conditions	Should work within accuracy specified in IS: 13779 / 1999, and CBIP tech. Report 325. Error beyond +/- 4 % will not be acceptable for conditions not specified in IS: 13779 / 1999 & CBIP tech. Report 325.			
26	Drift in accuracy of measurement with time	No Drift in accuracy in measurement with time			
27	Name plate details	It should cover all the details as prescribed in Clause-10 of tech. spec.			
28	Approximate weight of meter	To be indicated			
29	Type of mounting	Projection type			
30	Calibration	Meter shall be software calibrated at factory & there shall not be any mechanical form of calibration, such as, mechanical preset / trim port / potentiometer etc. so that any adjustment in calibration is not possible after freezing the meter constant.			
31	Manufacturing activity				
	(i) Mounting of components on PCB shall be	SMT type and ASIC technology			
	(ii) Compliance to assurance	To be complied			
32	Guarantee period of meter	5 years from the date of supply. Guarantee period shall be printed on the nameplate.			
33	Other parameters / features not covered in the above GTP	Conform to specification of IS-13779 / 1999 & CBIP technical report No.304 (with its latest amendment).			



Lot No. 6 (Energy Meter)

Item 4 (Static Energy Meter-3 phase, 4W, X/5 A With LCD Display)		
Sl.	**Particular**	**Bidders to Fill Up**
1	Name of manufacturer	
2	Type, name & number	
3	Standard Applicable	
4	Type of Meter (Model No.)	
5	Rating	
(i)	Accuracy Class	
(ii)	Rated Voltage	
(iii)	Rated current	
(iv)	Rated frequency	
(v)	Power factor	
(vi)	Minimum saturation current	
(vii)	Meter Constant (imp / KWh)	
6 (i)	Maxm. Continuous current rating (Amp.)	
(ii)	Continuous current rating of	
	terminals for two hours	
(iii)	Running with no load &(-)70%	
	to 120 % voltage	
7	Short time over current for 10 milli seconds	
8	Starting current at which meter	
	shall run & continue to run	
9	Power loss at rated frequency	
	& reference temperature	
(a)	Current circuit at rated voltage	
(b)	Voltage circuit	
10	Type of material used	
(a)	Base	
	Material	
(b)	Meter cover	
(c)	Terminal Block	
	Material	
(d)	Terminal cover	
	Material	
(e)	Screw	
	(i) Material	
	(ii) Size	
11	Internal diameter of Terminal	
	Hole	
12	Centre to Centre clearances	
	between adjacent terminals	
13	Transducers	
(i)	Input	
(ii)	Output	
(iii)	C.T. – no of turns	

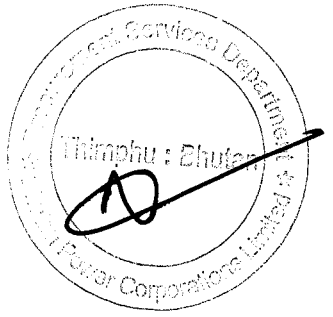


14	Type of Register	
15	No. of Digits	
16	Size of Numerals	
17	Display	
(i)	On Up and down Scroll Mode	
	& Auto display mode	
(ii)	Type of push button	
18	Reading on power off condition	
19	Battery of Real time clock	
20	Fixing/sealing arrangement	
	(i) Fixing of meter	
	(ii) Sealing of meter cover to	
	Base	
21	Type of hinged undetectable	
	terminal cover	
22	Performance of meter in	
	tamper conditions	
	(i) Phase sequence reversal	
	(ii) Missing Potential	
	(iii)Reversal of C.C Polarity	
	(iv)C.C Shorting/Bypass	
	(v) Indication of above tamper	
	Condition	
23	Suitability of meter to sustain over voltage i.e. phase to	
24	Electromagnetic compatibility	
	(EMI / EMC severity level)	
	(i) Effect on accuracy of external electromagnetic	
	(ii) Tamper should be classified as C.T. related, P.T.	
25	Effect on accuracy under tamper conditions / influence	
26	Drift in accuracy of measurement with time	
27	Name plate details	
28	Approximate weight of meter	
29	Type of mounting	
30	Calibration	
31	Manufacturing activity	
	(i) Mounting of components on PCB shall be SMT type	
	(ii) Compliance to assurance	
32	Guarantee period of meter	
33	Other parameters / features not	
	covered in the above GTP	

LOT 7: CT Ring								
S.No.	DESCRIPTION	Units	Bidders To Fill Up					
			CT Ring 100/5 Amps	CT Ring 200/5 Amps	CT Ring 300/5 Amps	CT Ring 400/5 Amps	CT Ring 500/5 Amps	CT Ring 1000/5 Amps
1	Maker's Name & address							
2	Type and capacity							
3	Rated voltage							
a)	Highest system Voltage							
b)	Rated Primary Current							
c)	Rated Secondary Current							
e)	Rated Output							
f)	Rated continuous thermal current Temperature rise over ambient							
	Power Frequency Withstand Voltage							
4	Class of Accuracy							
5	Material							
a)	Core							
b)	Conductor							
c)	Insulation							
6	Dimension in mm							
a)	Inner Dia. of CT							
b)	Outer Dia. of CT							
c)	Height of center of CT from base							
7	Secondary termination							
8	ISF							
9	Extended primary current							

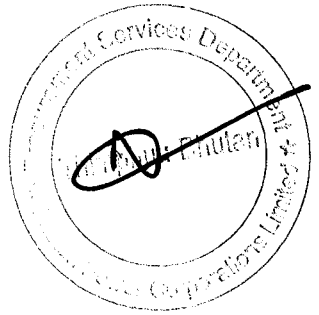
Lot 8 (Jointing Kits) : Guaranteed Technical Particulars

Sl#	Particulars	Unit	Bidders to fill up									
			Item No 1	Item No 2	Item No 3	Item No 4	Item No 5	Item No 6	Item No 7	Item No 8	Item No 9	tem No 10
			ID Termination kit for 3X50sqmm 11kV	ID Termination kit for 3X70sqmm 11kV	ID Termination kit for 3X95sqmm 11kV	Shrinkable cable termination kit 3cx150sqmm (ID) 11KV	ID Termination kit for 3X185sqmm 11kV	ID Termination kit for 3X300sqmm 11kV	ID Termination kit for 3X150sqmm 33kV	ID Termination kit for 3X185sqmm 33kV	ID Termination kit for 3X300sqmm 33kV	I/D Termination Kit 1x630sqmm XLPE 33kV
1	**Type**											
2	Applicable Standards											
3	Rated Voltage U/Uo(Um)	kV										
4	AC Voltage withstand	kV(1min)										
	Dry											
	Wet											
5	Impulse voltage withstand(10 positive and 10 negative, 1.2us between each conductor and the ground screen)	kV										
6	Partial Discharge	kV										
7	Loading Cycle(60 cycle 5h heating, 3h cooling conductor temperature: 5+operating temperature)											
	Kit Particulars											
8	Materials of the tubing/moulded part											
9	Method of stress control											
10	Method of environment seal											
11	Allowable Kit storage temperature	Degree										
12	All the jointing kits(outdoor/indoor/straight through joint kit)is complete with all accessories	(Yes/No)										



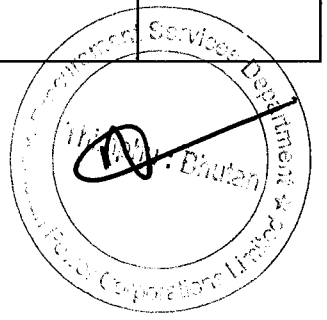
Lot 8 (Jointing Kits) : Guaranteed Technical Particulars

Sl#	Particulars	Unit	Bidders to fill up												
			Item No 11	Item No 12	Item No 13	Item No 14	Item No 15	Item No 16	Item No 17	Item No 18	Item No 19	item No 20	Item 21	Item 22	Item 23
			OD Termination kit for 1X50sqmm 11kV	OD Termination kit for 3X70sqmm 11kV	OD Termination kit for 3X95sqmm 11kV	OD Termination kit for 3X95sqmm 11kV ABC	Shrinkable cable termination kit 3cx150sqmm (OD) 11KV	OD Termination kit for 3X185sqmm 11kV	OD Termination kit for 3X240 sqmm 11kV	OD Termination kit for 3X300sqmm 11kV	Shrinkable cable termination kit 3cx120 sqmm (OD) 33KV	OD Termination kit for 3X150sqmm 33kV	OD Termination kit for 3X185sqmm 33kV	OD Termination kit for 3X300sqmm 33kV	O/D Termination Kit 1x630sqmm XLPE 33kV
1	**Type**														
2	Applicable Standards														
3	Rated Voltage U/Uo(Um)	kV													
4	AC Voltage withstand	kV(1min)													
	Dry														
	Wet														
5	Impulse voltage withstand(10 positive and 10 negative, 1.2us between each conductor and the ground screen)	kV													
6	Partial Discharge	kV													
7	Loading Cycle(60 cycle 5h heating, 3h cooling conductor temperature: 5+operating temperature)														
	Kit Particulars														
8	Materials of the tubing/moulded part														
9	Method of stress control														
10	Method of environment seal														
11	Allowable Kit storage temperature	Degree													
12	All the jointing kits(outdoor/indoor/straight through joint kit)is complete with all accessories	(Yes/No)													



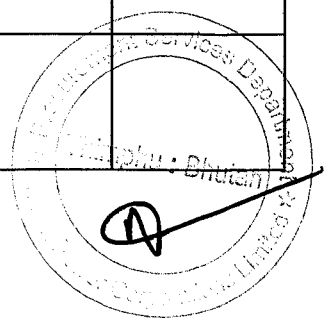
Lot 8 (Jointing Kits) : Guaranteed Technical Particulars

Sl#	Particulars	Unit	Bidders to fill up							
			Item No 24	Item No 25	Item No 26	Item No 27	Item No 28	Item No 29	Item No 30	Item No 31
			St. thr. Jointing kit for 3X70sqmm 11kV	ST.Through Jointing kit for 3X95sqmm 11kV	St. thr. Jointing kit for 3X150sqmm 11kV	St. thr. Jointing kit for 3X240qmm 11kV	St. thr. Jointing kit for 3X300sqmm 11kV	St. thr. Jointing kit for 3X150sqmm 33kV	St. thr. Jointing kit for 3X185sqmm 33kV	St. thr. Jointing kit for 3X300sqmm 33kV
1	**Type**									
2	Applicable Standards									
3	Rated Voltage U/Uo(Um)	kV								
4	AC Voltage withstand	kV(1min)								
	Dry									
	Wet									
5	Impulse voltage withstand(10 positive and 10 negative, 1.2us between each conductor and the ground screen)	kV								
6	Partial Discharge	kV								
7	Loading Cycle(60 cycle 5h heating, 3h cooling conductor temperature: 5+operating temperature)									
	Kit Particulars									
8	Materials of the tubing/moulded part									
9	Method of stress control									
10	Method of environment seal									
11	Allowable Kit storage temperature	Degree								
12	All the jointing kits(outdoor/indoor/straight through joint kit)is complete with all	(Yes/No)								

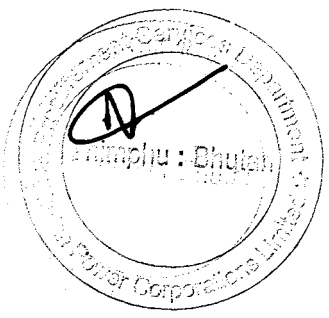


Lot 8 (Jointing Kits) : Guaranteed Technical Particulars

Sl#	Particulars	Unit	Item No 32	Item No 33	Item No 34	Item No 35	Item 36	Item No 37	Item 38	Item No 39
			St. through Jointing kit for 4X50sqmm	St. through Jointing kit for 4X70sqmm	St. through Jointing kit for 4X95sqmm	St. through Jointing kit for 4X150sqmm	St. through Jointing kit for 4X240sqmm	ST.Through Jointing kit for 4X300sqmm	St. through Jointing kit for 4X400sqmm	St.through jointing kit 1CX400sqmm 1.1kV
1	**Type**									
2	Applicable Standards									
3	Rated Voltage U/Uo(Um)	kV								
4	AC Voltage withstand	kV(1min)								
	Dry									
	Wet									
5	Impulse voltage withstand(10 positive and 10 negative, 1.2us between each conductor and the ground screen)	kV								
6	Partial Discharge	kV								
7	Loading Cycle(60 cycle 5h heating, 3h cooling conductor temperature: 5+operating temperature)									
	Kit Particulars									
8	Materials of the tubing/moulded part									
9	Method of stress control									
10	Method of environment seal									
11	Allowable Kit storage temperature	Degree								
12	All the jointing kits(outdoor/indoor/straight through joint kit)is complete with all	(Yes/No)								



LOT 10: Paints			
Sl.No	**Parameters**	**Bidders To Fill Up**	
		Aluminium Paints with Paste	**Black Bituminious Paint**
1	IS Standard		
2	Colour		
3	Finish		
4	Flash Point		
5	Mixing		
5	Drying time		
a	Touch Drying		
b	Hard Drying		
6	Storage life		



Price Schedule for Schedule A						
Sl.#	**Description**	**UoM**	**Qty**	**Brand and Country of Origin**	**Unit Price DDP (Nu.)**	**Amount DDP (Nu.)**
Lot No. 5A (HV ABC Fittings)						
1	Hook bracket assembly for HV ABC	Set	40.00	Ensto India Private Ltd., India; Sicamex Asia Pte Ltd, Singapore; Niled Sa, France; Raychem RPG (P) Ltd., India; Axis Electrical ; IAC Electricals		
2	Hook bolt asseembly for 3Cx95sqmm HV ABC	No.	50.00			
3	Strain clamp (50-95sq.mm)- HV ABC	Set	88.00			
4	SuspensionClamp(50-95sqmm) SA-HV ABC	Set	5.00			
5	SuspensionClamp(50-95sqmm) LA-HV ABC	Set	24.00			
6	Ins.Ten.joint. sleeve 1Cx50sqmm 11kV ABC	Set	6.00			
7	Ins.ten. Joint.sleeve(3Cx95sqmm)11kV ABC	Set	15.00			
Lot No. 5B (LV ABC Fittings)						
1	Hook Bolt Assembly for LV ABC	SET	553.00	Ensto India Private Ltd., India; Sicamex Asia Pte Ltd, Singapore; Niled Sa, France; Raychem RPG (P) Ltd., India; Axis Electrical ; IAC Electricals		
2	Hook bracket assembly for LV ABC	SET	828.00			
3	Strain clamps/dead end clamp for 2x50 sqmm LV ABC	SET	1,551.00			
4	Strain clamps/dead end clamp for 4x50 sqmm LV ABC	SET	2,100.00			
5	Strain clamps/dead end clamp for 4x95 sqmm LV ABC	NO	1,021.00			
6	Strain clamp/deadend clamp(4Cx120sq.mm)	SET	200.00			
7	Stainless Steel Strip 20x0.7 mm	ROL	48.00			
8	Stainless Steel Buckle 20x0.7 mm	NO	1,476.00			
9	Set of terminal caps for 120 sq.mm	NO	192.00			
10	IPC 50-6 sqmm	NO	212.00			
11	IPC (50/16sqmm)	NO	420.00			
12	IPC (50/25sq.mm)-LV ABC	NO	1,080.00			
13	Insulation Piercing connector (IPC 50/50)sq.mm	NO	11,932.00			
14	Insulation Piercing connector (IPC 50/10)sq.mm	NO	2,829.00			

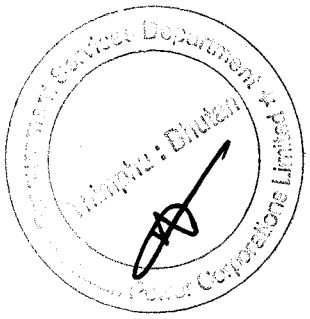
Sl.#	Description	UoM	Qty	Brand and Country of Origin	Unit Price DDP (Nu.)	Amount DDP (Nu.)
15	Insulation Piercing connector (IPC 95/95)sq.mm	NO	11,545.00	Ensto India Private Ltd., India; Sicamex Asia Pte Ltd, Singapore; Niled Sa, France; Raychem RPG (P) Ltd., India; Axis Electrical ; IAC Electricals		
16	Insulation Piercing connector (IPC 95/50)sq.mm	NO	1,120.00			
17	Insulation piercing connector (IPC 95/25)	NO	1,442.00			
18	Insulation Piercing connector (IPC 95/16)sq.mm	NO	100.00			
19	Insulation Piercing connector (IPC 95/10)sq.mm	NO	466.00			
20	Insulation Piercing connector (IPC 95/6)sq.mm	NO	192.00			
21	IPC (120/120sqmm)-LV ABC	NO	248.00			
22	IPC (120/95sqmm)- LV ABC	NO	3,800.00			
23	Insulation tension jointing sleeves for 50 sqmm	SET	1,425.00			
24	Suspension clamp-small angle for 4x50 sqmm LV ABC	SET	956.00			
25	Suspension clamp-large angle for 4x95 sqmm LV ABC	SET	81.00			
26	Suspension clamp (SA) for 4Cx120sqmm	SET	51.00			
Lot No. 6 (Energy Meter)						
1	Static Energy Meter-1phase, 2W, 10-60A	No	30,100.00	Actaris (Itron); Iskrameco, Slovakia; Landis-Gyr, India; Secure Meters, India; Micro Star Electric Company Limited, China		
2	Static Energy Meter-3phase, 4W, 5-30A	No	1,205.00			
3	Static Energy Meter-3phase, 4W, 10-80A	No	1,048.00			
4	Satic Energy Meter-3 phase, 4W, X/5A	No	890.00			
Lot No. 7 (CT Ring)						
1	CT Ring 100/5 Amps	No	360.00			
2	CT Ring 200/5 Amps	No	305.00			
3	CT Ring 300/5 Amps	No	309.00			
4	CT Ring 400/5 Amps	No	279.00			
5	CT Ring 500/5 Amps	No	260.00			

Sl.#	Description	UoM	Qty	Brand and Country of Origin	Unit Price DDP (Nu.)	Amount DDP (Nu.)
6	CT Ring 1000/5 Amps	No	129.00			
7	Met Grip Seal	No	28,453.00			
Lot No. 8 (Cable Jointing Kits & Cable Glands)						
1	ID Termination kit for 3X50sqmm 11kV	SET	6.00			
2	ID Termination kit for 3X70sqmm 11kV	SET	21.00			
3	ID Termination kit for 3X95sqmm 11kV	SET	10.00			
4	Shrinkable cable termination kit 3cx150sqmm (ID) 11KV	SET	64.00			
5	ID Termination kit for 3X185sqmm 11kV	SET	8.00			
6	ID Termination kit for 3X300sqmm 11kV	SET	58.00			
7	ID Termination kit for 3X150sqmm 33kV	SET	26.00			
8	ID Termination kit for 3X185sqmm 33kV	SET	12.00			
9	ID Termination kit for 3X300sqmm 33kV	SET	16.00			
10	I/D Termination Kit 1x630sqmm XLPE 33kV	NO	9.00			
11	OD Termination kit for 1X50sqmm 11kV	SET	6.00			
12	OD Termination kit for 3X70sqmm 11kV	SET	22.00			
13	OD Termination kit for 3X95sqmm 11kV	SET	10.00			
14	OD Termination kit for 3X95sqmm 11kV ABC	SET	48.00			
15	Shrinkable cable termination kit 3cx150sqmm (OD) 11KV	SET	55.00			
16	OD Termination kit for 3X185sqmm 11kV	SET	9.00			
17	OD Termination kit for 3X240 sqmm 11kV	SET	5.00			
18	OD Termination kit for 3X300sqmm 11kV	SET	77.00			
19	Shrinkable cable termination kit 3cx120 sqmm (OD) 33KV	SET	3.00			
20	OD Termination kit for 3X150sqmm 33kV	SET	45.00			
21	OD Termination kit for 3X185sqmm 33kV	SET	11.00			
22	OD Termination kit for 3X300sqmm 33kV	SET	33.00			

Sl.#	Description	UoM	Qty	Brand and Country of Origin	Unit Price DDP (Nu.)	Amount DDP (Nu.)
23	O/D Termination Kit 1x630sqmm XLPE 33kV	NO	9.00			
24	St. thr. Jointing kit for 3X70sqmm 11kV	SET	54.00			
25	ST.Through Jointing kit for 3X95sqmm 11kV	SET	65.00			
26	St. thr. Jointing kit for 3X150sqmm 11kV	SET	47.00			
27	St. thr. Jointing kit for 3X240qmm 11kV	SET	7.00			
28	St. thr. Jointing kit for 3X300sqmm 11kV	SET	57.00			
29	St. thr. Jointing kit for 3X150sqmm 33kV	SET	29.00			
30	St. thr. Jointing kit for 3X185sqmm 33kV	SET	3.00			
31	St. thr. Jointing kit for 3X300sqmm 33kV	SET	25.00			
32	St. through Jointing kit for 4X50sqmm	SET	5.00			
33	St. through Jointing kit for 4X70sqmm	SET	15.00			
34	St. through Jointing kit for 4X95sqmm	SET	16.00			
35	St. through Jointing kit for 4X150sqmm	SET	18.00			
36	St. through Jointing kit for 4X240sqmm	SET	8.00			
37	ST.Through Jointing kit for 4X300sqmm	SET	57.00			
38	St. through Jointing kit for 4X400sqmm	SET	40.00			
39	St.through jointing kit 1CX400sqmm 1.1kV	SET	10.00			
40	11KV Cable route marker with nut & bolts	NO	152.00			
41	33KV Cable route marker with nut & bolts	NO	20.00			
42	Double compression gland for 4 core 150 sq.mm cable	SET	110.00			
43	Double compression gland for 4x185 sq.mm cable	SET	2.00			
44	Double compression gland for 4x240 sq.mm cable	SET	2.00			
45	Double compression gland for 4x300 sq.mm cable	SET	150.00			
46	Double compression gland for 4x300 sq.mm cable	SET	50.00			
Lot No. 9 (Copper Wire)						
1	Super enameled Cu. wire 9 SWG	Kg	50.00			
2	Super enameled Cu. wire 15 SWG	Kg	50.00			
3	Super enameled Cu. wire 16 SWG	Kg	50.00			

Sl.#	Description	UoM	Qty	Brand and Country of Origin	Unit Price DDP (Nu.)	Amount DDP (Nu.)
4	Super enameled Cu. wire 17 SWG	Kg	100.00			
5	Super enameled Cu. wire 18 SWG	Kg	100.00			
6	Super enameled Cu wire, 19 SWG	Kg	100.00			
7	Super enameled cu wire,20 SWG	Kg	100.00			
8	Super enameled cu wire,21 SWG	Kg	100.00			
9	Super enameled Cu. wire 22 SWG	Kg	100.00			
10	Super enameled Cu. wire 23 SWG	Kg	150.00			
11	Super enameled Cu wire,24 SWG	Kg	150.00			
12	Super enameled Cu wire,25 SWG	Kg	150.00			
13	Super enameled Cu wire,26 SWG	Kg	150.00			
14	Super enameled Cu wire,27 SWG	Kg	150.00			
15	Super enameled Cu wire, 28 SWG	Kg	100.00			
16	Dual coated enameled Cu. strip 5mmX3mm	Kg	50.00			
17	Super enameled cu strip,6mmx3mm	Kg	50.00			
18	Super enameled Cu strip,10mm x 5.5mm	Kg	50.00			
Lot No. 10 (Paints)						
1	Aluminium paint with paste	L	15,787.00			
2	Bituminous paint	L	1,650.62			
Lot No. 11 (Transformer Spare Parts & Line Materials)						
1	Breather 3/4" Silicagel .75kg	NO	105.00			
2	Transformer Breather 1/2" dia	NO	190.00			
3	Silica gel	KG	295.00			
4	Arcing horn for 11kv	NO	25.00			
5	Arching horn for 33kv	NO	55.00			
6	Transformer Bushing 1.1 kV (250 Amps)	SET	6.00			
7	Strain clamp (Rabbit)	NO	332.00			
8	Strain clamp (Dog)	NO	471.00			

Sl.#	Description	UoM	Qty	Brand and Country of Origin	Unit Price DDP (Nu.)	Amount DDP (Nu.)
9	GI Strain clamp (Wolf) -150sq.mm	SET	190.00			



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Bhutan Power Corporation Limited
(An ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified Company)
Registered Office, Thimphu
Procurement Services Department
Thimphu: Bhutan

BPC/PSD/2021 Materials/2020/09/ August 25, 2020

.....
.....

Subject: Addendum No. 1

Reference: **Tender No:** BPC/PSD/2021 Materials/2020/09 dated August 15, 2020.

Dear Sir(s),

This is with reference to above-mentioned tender whereby PSD, BPC would like to issue addendum for:

Lot 6 (Energy Meter)

There is a change in the list of restricted brands for Energy Meter under lot no.6 (Energy Meters). Please find the new price schedule for the above mentioned items in ***Annexure I.***

The Technical Specification for energy meter has been changed and a new one is attached as ***Annexure ii***, and also the missed out Guaranteed Technical Specification (GTP) for Item no. 4 (Static Energy Meter-3 phase, 4W, X/5 A With LCD Display) under lot 6 (Energy Meter) has been attached as ***Annexure iii.***

Lot 5A (HV ABC Fittings) & Lot 5B (LV ABC Fittings)

There is a slight change in Guaranteed Technical Particulars (GTP) for both the Lot 5A (HV ABC Fittings & 5B (LV ABC Fittings). Please find the new GTP for the mentioned items in ***Annexure iv.***

Lot 1, 2, 3, 4 (ABC & AAAC Conductors, ACSR Conductors, XLPE Cables, PVC Cables)

The price schedule for these lots are attached here as ***Annexure-v.*** Kindly refer the price schedule of the lots.

The Bid Data Sheet (BDS) for cable jointing kits and cable glands is attached as A***nnexure vi.*** Kindly refer the BDS for GTP requirements.

However, due to the above inclusion and additional information, no time extension shall be granted and the submission date and time shall remain the same.

Thanking you,

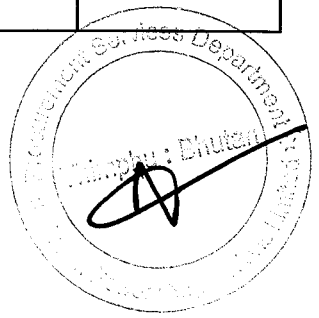
Yours sincerely,

(Nim Dorji)
General Manager

Phone: +975-2-326289; Fax: +975-2-333583; Box 580; E-mail: psd@bpc.bt; web: www.bpc.bt

Price Schedule

Mat. No.	Sl. No	Material Description	Unit	Qty	Brand and Country of Origin	Rate DDP (NU.)	Amount DDP (Nu.)
Annexure 1							
Lot No. 6 (Energy Meter)							
Brand Restricted to : Actaris (Itron); Iskrameco, Slovakia; Landis-Gyr, India; Secure Meters, India; Micro Star Electric Company Limited, China							
7000024	1	Static Energy Meter-1phase, 2W, 10-60A	No	30,100.00			
7000033	2	Static Energy Meter-3phase, 4W, 5-30A	No	1,205.00			
7000665	3	Static Energy Meter-3phase, 4W, 10-80A	No	1,048.00			
70000026	4	Satic Energy Meter-3 phase, 4W, X/5A	No	890.00			
Total Amount (Nu.)							
Lot No. 7 (CT Ring)							
7000014	1	CT Ring 100/5 Amps	No	360.00			
7000015	2	CT Ring 200/5 Amps	No	305.00			
7000016	3	CT Ring 300/5 Amps	No	309.00			
7000017	4	CT Ring 400/5 Amps	No	279.00			
7000018	5	CT Ring 500/5 Amps	No	260.00			
7001344	6	CT Ring 1000/5 Amps	No	129.00			
7000044	7	Met Grip Seal	No	28,453.00			
Total Amount (Nu.)							



Annexure 2

LOT 6 (Energy Meters)

1.0 AC Single Phase, 2 Wire Static Fully Electronic Meter, Accuracy Class 1.0 & Curren Rating 10-60 Amp with Backlit LCD display for 240 Volt System

1.1 SCOPE

a) This specification covers design, engineering, manufacturer, testing, inspection & supply of A.C Single phase, two wire solid state (static) fully electronic energy meters of accuracy class 1.0 & current rating 10-60 A, with backlit LCD display for 240 Volt systems as per requirement in this specification. The meter should be capable of recording & displaying energy in kWh & demanc in any kW for single phase two wire A.C load respectively for power factor range of Zero lag unity-Zero lead. Meters should have facility/capability of recording probable tamper information.

b) It is not the intent to specify completely here in all the details of the design and construction o meter. However, the meter shall conform in all respect to high standards of engineering, desigr and workmanship shall be capable of performing commercial operation continuously in a manne Bhutan Power Corporation Limited, who will interpret the meanings of drawing & specificatior and shall have the right to reject any work or material which in its judgment is not in accordance therewith. The offered meters shall be complete with all components, accessories necessary fo their effective and trouble free operation of the system for the purpose mentioned above. Such components shall be deemed to be within the scope of bidders supply irrespective of whethe those are specifically brought out in this specification and/ or the commercial order or not.

1.2 STANDARDS APPLICABLE

Unless specified elsewhere in this specification, the performance & testing of the meters should conform to the following International standards, to be read with up to date and latest amendments/revisions there of as on 90 days prior to floating of tender.

Sl. No.	Standard No.	Title
1	IEC 62052-11:2003	Electricity Metering Equipment (AC)-General Requirements, tests and test conditions
2	IEC 62053-21:2003	Class 1 and 2 alternating current watt hour meter
3	IS 13779:1999	ac STATIC WATIHOUR METERS, CLASS 1AND 2 – SPECIFICATION
4	CBIP 325	Standardization of AC Static Electrical Energy Meter
5	IS 14434 (1998)	Polycarbonate Molding and Extrusion Materials.

1.3 CLIMATIC CONDITION

The meters to be supplied against this specification should be suitable for satisfactory continuous operation under the following tropical conditions. Meters should be capable of maintaining required accuracy under cold, hot 7 tropical and dusty climatic conditions.

i)	Maximum Ambient Air Temperature in shade	:	45^0C
ii)	Minimum Ambient Air Temperature	:	(-) 10^0C
Iii	Maximum Relative Humidity	:	95% (non-condensing)
iv)	Minimum Relative Humidity	:	10%
v)	Height above mean sea level	:	Up to 4000 meters
vi)	Average number of tropical monsoon per	:	5 months
vii)	Annual Rainfall	:	100 mm to1500 mm

1.4 SUPPLYSYSTEM

System	1 Phase2Wire
Rated voltage(Vref)	240V–Phaseto Neutral
Rated Current	Basic current 10Amps(lb), Maximum current 60Amps(I_{max})
Rated Frequency	50Hz

1.5 POWER FACTOR RANGE

The meter should be suitable for full power factor range from zero (lagging) through to Unity to zero (leading).

1.6 POWER SUPPLY VARIATION

The meter should be suitable for working with following supply system variations.

System	1 Phase 2Wire
Specified range of operation	60% to 120% of reference Voltage i.e. 240
Frequency	50 Hz±5%

1.7 ACCURACY

1.7.1 Class of accuracy of the meter should be1.0. The accuracy should not drift with time.

1.7.2 Maximum error limit at1%I_b, UPF should preferably be within+/-2%.

1.8 POWER CONSUMPTION

1.8.1 Voltage Circuit: The active and apparent power consumption in the voltage circuit including the power supply of meter at reference voltage, reference temperature and reference frequency should not exceed1.5Watt and 4 VA respectively.

1.8.2 Current Circuit: The apparent power taken by each current circuit at basic current, reference frequency and reference temperature should not exceed 1.0VA.

1.9 STARTING CURRENT

The meter should start registering energy at 0.2 of basic current at unity power factor.

1.10 MAXIMUM CONTINUOUS CURRENT

The maximum continuous current in meters should be the current at which the meter purports to meet the accuracy requirement of the specification. The same is indicated in table in clause 4 above.

1.11 GENERAL & CONSTRUCTIONAL REQUIREMENTS

1.11.1 Meters should be designed and constructed in such a way so as to avoid causing any danger during use and under normal conditions. However, the following should be ensured.

a) Personal safety against electric shock
b) Personal safety against effects of excessive temperature.
c) Protection against spread of fire
d) Protection against penetration of solid objects, dust & water

1.11.2 The meter should be designed with ASIC (application specific integrated circuit) and should be manufactured using SMT (Surface Mount Technology) components. Power supply and voltage divider circuits may be of PTH (Pin Through Hole) technology.

1.11.3 The meter should be housed in a safe, high grade, unbreakable, fire resistant, UV stabilized, virgin Polycarbonate casing of projection mounting type. The meter cover should be transparent, for easy reading of displayed parameters, and observation of operation indicators. The meter casing should not change in shape, color, size, and dimensions when subjected to 200 hrs on UV test as per ASTMD 53. It should withstand 650 deg.C.glow wire test and heat deflection test as per ISO 75.

The meter cover should be sealable to the meter base with at least 1 nos. seal.

1.11.4 The meter should be supplied with a transparent extended terminal block cover (ETBC). The ETBC should not be easily detachable from the base and be secured to the base using a hinge/ without hinge arrangement. ETBC should have cut at the bottom for wire termination. The terminal block should be made of high grade non- hygroscopic, fire retardant, fire resistant, glass reinforced poly-carbonate with terminal holes of minimum dia 9.5mmand should be suitable to accommodate the conductor. The minimum center-to-center distance clearance between adjacent terminals should be 13 mm. Terminal cover should have provision for sealing with at least one seal.

The poly carbonate material of only the following manufacturers shall be used:

a)	G.E. Plastics/SABIC	LEXAN 943A or equivalent for cover & Terminal cover /LEXAN 50R or equivalent for terminal block.
b)	BAYER	Grade corresponding to above
c)	DOW Chemicals	- DO -
d)	MITSUIECHI	- DO -
e)	TEJIN	- DO -
f)	DUPONT	- DO -

1.11.5 All insulating material used in the construction of meters should be non-hygroscopic, non-ageing and of tested quality. All parts that are likely to develop corrosion should be effectively protected against corrosion during operating life by providing suitable protective coating.

1.11.6 The meter should conform to the degree of protection IP 51 for protection against ingress of dust, moisture and vermin.

1.11.7 The meter should be capable of providing phase to neutral protection up to 415V for 4 hours.

1.11.8 The manner of fixing the cables to the terminal block should ensure adequate and durable contact such that there is no risk of loosening or undue heating. Meter should have 2 screws in each terminal for effective clamping of cables. The screws shall not have pointed ends at the end of the thread. Screw connections transmitting contact force and screw fixing which may be loosened and tightened several times during the life of the meter should be such that the risk of corrosion resulting from contact with any other metal part is minimized. Electrical connections should be so designed that contact pressure is not transmitted through insulating material. All terminals and connecting screws and washers should be of nickel plated brass material.

The terminals and all connecting screws will be of suitable material capable of withstanding a current of 150% of Imax for two hours, continuously.

1.11.9 The meter should be compact in design. The entire construction should be capable of withstanding stresses likely to occur in actual service and rough handling during transportation. The meter should be convenient to transport and immune to shock and vibration during transportation and handling.

1.11.10 The meter should have fixing holes, at least one at top and one at bottom. The top hole should be such that the holdings crew is not accessible after fixing the meters. The lower fixing screws should be provided under the sealable terminal cover.

1.11.11 The meter should be fitted with Shunt and C.T. for measuring current in the phase and neutral element with proper isolation.

The C.T. and Shunt used in current circuit must be of high quality having high thermal stability and temperature co-efficient. The shunts should be E-Beam/ Spot welded.

1.11.12 The meter cover should be permanently fixed to the meter base by using ultrasonic welding or any other technology which is either equally or more efficacious in such a way that the meter cover cannot be opened without breaking the same, i.e. the meter should be break-to-open type. In case any attempt is made to separate the meter cover from the base by using any tools/ implements/ device, there should be visible evidence of tampering or attempt to open. However, sealing with commonly available adhesives will not be accepted.

1.11.13 Meter should have an indication in its display if top cover is removed even in power off condition and it should not disappear even if cover is fitted.

1.11.14 Sealing Arrangement: The sealing screws used for the meter cover shall be fixed upside down so that these are tightened from the rear or screw less design for fixing the base and cover but provision for sealing arrangement must be there. The sealing screws of the terminal cover should be Tinned Brass.

Meters must be supplied with 1 no. manufacture's seal between meter base & cover at either side.

1.11.15 Meter should have load survey for **35** days, **15** minutes interval period for Active energy, voltage, Metering Current, Power Factor.

1.12 ANTI-TAMPERFEATURES

The meter should have the following anti-tamper features and should record & register forward energy accurately under the following conditions:

i) Input phase and neutral connections are interchanged.

ii) Tamper events like 35 kV tamper shall be included

iii) Incoming mains is connected to outgoing terminals and load is connected to incoming terminals.

iv) A combination of conditions (i) and (ii) occurs.

v) Load return is connected to a local earth and not returned to the meter as well as the phase and neutral at supply side are reversed.

vi) A combination of ` (ii) and (iv)" or (iii)" and (iv) occurs.

vii) The meter should accurately measure energy in case of partial bypass of either phase or neutral current.

viii) A part of the load is. "Earth load indication "should appear in display if difference of current between phase and neutral lies more than6%.

ix) Meter should record energy with maximum error of (+) 6% to (-) 4% on Injection of DC (+)ve & DC (-)ve neutral having magnitude up to 400 V & injection of chopped AC in neutral. Tests in this respect will be conducted by using a device available with us for

chopped AC injection (60 V to 300V) & steady DC injection. DC voltage will be rectified from a three phase power supply.

x) Meter should record energy with maximum error of +/-4% even in absence of neutral wire not connected at incoming & outgoing, i.e. single wire operation. In such condition Meter should start recording energy at 1.0 Amps. However, meters, which are immune or maintain better accuracy, will be preferred. Both elements should record energy under single wire mode if same phase is given in both elements and load is driven through hearth.

The meter should be immune to tamper using external magnets as per CBIP 325 or record tamper at Imax, Vref, UPF with logging in BCS.

The meter should offer a link less design i.e. there is no isolation link provided between the current and voltage circuits and hence there would not be any possibility of tampering with the same. The meter should be capable of recording the following tamper events in memory, minimum 25 events with date and time stamp preferably along with snapshots of V, I, PF and kWh. The logging will be on FIFO basis.

- Current reversal
- Neutral Disturbance
- Magnetic Tamper
- Single Wire

1.13 DISPLAY

1.13.1 The measured value(s) shall be displayed on Liquid Crystal display (LCD) display. The height of the digit shall be minimum 8.0 mm. The KWh and kVAh energy registration under normal power on condition shall take place on 6 complete digits. LCD should contain the suitable legends/annunciators for event notification.

1.13.2 The data should be stored in non-volatile memory (NVM). The non-volatile memory should retain data for a period of not less than10 years under un-powered condition. Battery back-up memory will not be considered as NVM.

1.13.3 In addition to provide serial number of the meter on the display plate, the meter serial number should also be programmed in to meter memory for identification through communication port for CMRI/ Laptop/ meter reading print out.

1.13.5 It should be possible to read the meter during power–off condition. It should also be possible to read the meter with CMRI/ Laptop in this condition. If battery is used for the same, it should be a separate battery and not the one used for RTC. The battery should be of high quality Lithium/ Lithium –ion battery, with life of at least10 years. Display should be auto off type in battery mode.

1.14 DISPLAY SEQUENCE

The meter should display the required parameters in two different modes as per the sequence given below.

A) Auto Display Mode:

The following parameters herein after referred to as "Billing Parameters"(B.P) should be displayed in an auto-cycle mode, in the following sequence:

1. LCD test
2. Total Cumulative Active Forwarded Energy (up to date)
3. Meter serial number
4. Real Date (dd mm yy)
5. Real Time (hh mm ss)
6. Present Month MD in KW and KVA since last MD reset with date and time.

Each parameter should be on meter display for 10 seconds and the time gap between two auto- cycles should be 60 seconds.

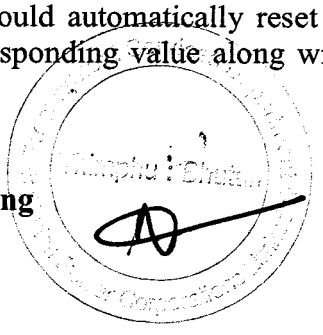
B) Push Button Mode:

The following parameters should be displayed on pressing the push button in the form of Spring loaded/ Rubber elastomer.

1. LCD test
2. Total Cumulative Active Forwarded Energy (up to date)
3. Meter serial number
4. Real Date (dd mm yy)
5. Real Time (hh mm ss)
6. Present Month MD in KW and KVA since last MD reset with date and time.
7. Previous 3 months (at least) cumulative KWh, KVAh and Maximum Demand in KVA a 24.00 hrs. of last date of the month.
8. Instantaneous Phase Voltages
9. Instantaneous Phase Currents
10. Instantaneous Neutral Current* i.e. Actual Current flowing through the Neutral
11. Instantaneous Power Factor
12. Average Power Factor (Previous Month)
13. Instantaneous Active Power
14. Instantaneous Apparent Power
15. Instantaneous Frequency
16. High resolution display for KWh and KVAH (minimum 2+4 i.e. 4 digit after decimal
17. Self-Diagnosis

1.15 MAXIMUM DEMAND REGISTRATION & RESET

Meter should continuously monitor & calculate the maximum demand for each demand interval time of 15 minutes and maximum of these in a calendar month should be stored along with date and time when it occurred. The maximum demand should automatically reset at 00:00 hrs. of the first date of each calendar month and the corresponding value along with date/ time stamp shall be transferred to Billing (History) registers.



The billing purpose parameters (active forwarded energy, maximum demand in kW should be recorded and should be available in Bill (History) for a minimum period of last 12 months.

1.16 TIME OF USE/ Time of Day MONITORING

The meter should offer the capability of time of use monitoring for energy. Sufficient numbers of registers should be capable of being configured for TOD monitoring for Peak/ off peak hours. TOD timing will be confirmed before placement of order.

1.17 SELF-DIAGNOSTIC FEATURE

The meter should be capable of performing complete self diagnostic check to monitor integrity of data memory location a tall time. The meter should have indication for unsatisfactory / non-functioning/ malfunctioning of the following:

a) Time and date on meter display
b) All display segments on meter display
c) Real Time Clock (RTC) status in meter reading prints out at BCS end
d) Non-volatile Memory (NVM) status in meter reading prints out at BCS end

1.18 COMMUNICATION PORTS AND PROTOCOL:

The meter should have a galvanically isolated optical communication port for data communication with CMRI/ Laptop. The port should be compatible with IEC 1107/ PACT/ ANSI. Adequate sealing provision should be provided.

1.19 CMRI/ Laptop/ BCS REQUIREMENTS

The Common Meter Reading Instrument (CMRI/ Laptop) should be capable of being loaded with user- friendly software (MS-DOS5.0 or higher version compatible) for reading/ downloading meter data. Windows based Base Computer Software (BCS) should be provided for receiving data from CMRI/ Laptop and downloading instructions from base computer software to CMRI/ Laptop. The BCS should be compatible WIN 7 or higher operating system and should be copyrighted. The data stored in the meters memory should be available on the BCS.

This BCS should have, amongst other requirements, features and facilities described later in this specification, the facility to convert meter reading data in to user definable ASCII file format so that it may be possible for the user to integrate the same with the user's billing data and process the selected data in desired manner. All the data available in the meter including energy, MD, and history data should be convertible to user defined ASCII file format for integration with third party software. The vendor should supply necessary base computer software for reading/ viewing of meter data and converting to user defined ASCII files formats. The user should have the flexibility to select the parameters to be converted in to ASCII file. The vendor should also supply the necessary CMRI/ Laptop software.

The bidder has to supply the Meter Reading protocol (API) free of cost. The protocol should not be complicated & should be easily understandable to introduce compatibility between meters, BCS and CMRI of other makes. The bidder shall indicate the relevant standard to which the protocol complies.

The compatibility of transferring data from the meter to CMRI & then to the BCS should be easily established. Any change or upgradation of CMRI software or BCS in future, required for any reason, has to be done by the supplier at his own cost.

It should not be possible to alter date in the meter by-passing commands from the CMRI or Laptop. For alteration of RTC time and change of TOD timing. It should be possible to perform these functions through CMRI but only through authenticated commands sets by BCS after scheduling for particular meter Sl.nos. No alternation, change should be possible through authenticated commands sets by BCS without scheduling of meters. Moreover, no alternation, change should be possible using CMRI only, i.e. the control has to be with the BCS.

The supplier shall provide at least 10 numbers of meter Reading optical USB probes without any cost.

1.20 DISPLAY POWER UP IN ABSENCE OF MAINS SUPPLY

The meter should have the provision of providing the display parameters in absence of main supply. Press of push button should activate the display to facilitate hands free meter reading with auto-off provision. All the parameters available in the push button mode should be available in power off mode.

It should be possible to read the meter using CMRI during power-off condition using this facility.

1.21 MARKING OF THE METER

The basic marking on the meter name plate should be as follows:

a) Manufacturer's name & trade mark
b) Type Designation
c) No. of phases & wires
d) Serial number (Size not less than 5mm)
e) Month & Year of manufacture
f) Reference Voltage
g) Rated Current
h) Operating Frequency
i) Principal unit(s) of measurement
j) Meter Constant (impulse/kWh)
k) Class index of meter
l) Property of BPC
m) Purchase Order No. & Date
n) Guarantee (Guaranteed for a period of 5 and half Yrs. From date of delivery)
p) Place of manufacture
q) Meter Sl. No. in numerical form, Dt. of manufacturer, Current rating of the meter and P.O. reference should be bar coded. Bar Code may be extended up to two layers but readable by single layer Bar code reader.
r) Meter Sl. No. Should be of seven digits and its should start serially corresponding to the quantity of meter ordered.

1.22 CONNECTION DIAGRAM & TERMINAL MARKINGS:

The connection diagram of the meter should be clearly shown on terminal cover.

1.23 OUTPUT DEVICE

The meter should have a test output accessible from the front and capable of being monitored with suitable testing equipment while in operation at site. The test output device should be provided in the form of LED output. There should be adequate clearance of the test output from other outputs so that there is no interference of other outputs while performing accuracy test with standard scanners.

The relation between test output and the indication on display should comply with the marking on the name plate (imp/kWh)

1.24 ELECTRO-MAGNETIC-COMPATIBILITY&INTERFERENCEREQUIREMENT

The meter should meet EMI/ EMC requirements as specified in the relevant standards described in Clause2.0 of this specification.

1.25 SEALS:

The manufacturer of meter will be responsible for sealing of the meters at his works with his own no. Poly carbonates seal with manufacturer's logo & sequential numbers

General Requirements

1. GUARANTEEDTECHNICALPARTICULARS:

The bidder shall furnish all the necessary information as per technical specification.

2. TECHNICAL DEVIATIONS:

Any deviation in Technical Specification as specified in the Specification shall be specifically and clearly indicated in the Schedule of deviation format.

3.. TESTS:

i) Type Testing of Meter:

The offered meters should be type tested at an independent laboratory accredited by International Accreditation Corporation (ILAC) or International Accreditation Forum (IAF) or NABL in accordance with relevant IEC/IS Standard with latest amendments. The type test report should not be more than 5 (five) years old. A copy of the Type Test results should be enclosed with the offer. If there is any modification in the design/ parameters of the specifications or use of constituent materials in the offered meters submitted with the offer, from the meter which was submitted type tested, which may affect the characteristics as well as parameters of the meter, revised type test certificates as per the design, parameters and constituent material used in the offered meter, shall have to be submitted failing which the offer may be liable to be rejected.

ii) Acceptance tests

A) The acceptance tests as stipulated in CBIP / IS (with latest amendments) shall be carried out by the supplier in presence of purchaser's representative at manufacturer premises.

B) Also the following additional tests are to be carried out on one meter randomly selected from each lot offered for inspection / acceptance testing.

i. Magnetic induction of external origin (AC & DC)
ii. Tamper & Fraud protection, as per Clause of 12 of this specification.
iii. Test of endurance upto 120% of Imax, for two hours, followed by verification of limits of error.
iv. Verification of internal components.
v. Dry Heat Test as per IS 13779 / 99, Clause 12.6.1, of one meter from the offered lot is to be arranged by the supplier at any NABL accredited laboratory, at his cost.
vi. The Supplier shall manufacture one extra number of meter from PO quantity for Dry Heat Test at its own cost.

In case of failure of Meters as specified in Annexure – H of IS-13779 (For A above) the entire lot will be treated as rejected.
In case of failure of any single meter (as per B above) the entire lot will be rejected.

iii) Test Facilities:

The tests for equipment/ instrument shall be carried out as per relevant Standards and test certificates shall be furnished for scrutiny. The Bidder shall indicate the details of the equipment available with him for carrying out the various tests as per relevant Standards.

NOTE: The standard meters used for conducting tests shall be calibrated periodically and test certificates shall be available at Works for verification by purchaser's representative.

The manufacturer shall have the following testing facilities to ensure accurate calibration:

AC high voltage test
Insulation test
Test of no load condition
Test of Starting condition
Test on Limits of error
Power loss in voltage and current circuit
Test of Repeatability of error
Test of meter constant
Test of magnetic influence

4. INSPECTION:

All acceptance tests and inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the Bidder and purchaser at the time of purchase.

The supplier shall keep the purchaser informed in advance, about the manufacturing program for each lot so that arrangement can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance /routine testing of the bought out items.

The purchaser reserves the right for type testing of any meter & meter casing etc. from any of the offered lots, received at any destination stores.

6. QUALITY ASSURANCE PLAN:

- The factory shall be completely dust proof.
- The testing rooms shall be temperature and humidity controlled as per relevant standards.
- The testing and calibrating equipments should be automatic and all test equipment shall have their valid calibration certificates.

- Power supplies used in testing equipment shall be distortion free with sinusoidal wave-forms and maintaining constant voltage, current and frequency as per the relevant standards.

The manufacturer laboratory must be well equipped for testing of the meters. They must have computerized standard power source and standard equipment calibrated not later than a year (or as per standard practice).The details of testing facilities available for conducting

i. The routine tests.
ii. Acceptance tests.

7. MANUFACTURING ACTIVITIES

All the materials, electronics and power components, ICs used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy.

The manufacturer should use Application Specific Integrated Circuit (ASIC) or Microcontroller for metering functions.

The electronic components shall be mounted on the printed circuit board using latest Surface Mounted Technology (SMT) except power components by deploying automatic SMT pick and place machine and reflow solder process. The electronic components used in the meter shall be of high quality and there shall be no drift in the accuracy of the meter at least up to10 years. Further, the Bidder should own or have assured access (through hire, lease or sub-contract) of the mentioned facilities. The PCB material should be of glass epoxyFR-4grade conforming to relevant standards.

All insulating materials used in the construction of meters shall be non-hygroscopic, non-aging and of tested quality. All parts that likely to develop corrosion shall be effectively protected against corrosion by providing suitable protective coating.

Quality should be ensured at the following stages:

At PCB manufacturing stage, each board shall be subjected to bare board testing.

At insertion stage, all components should undergo testing for conforming to design parameters and orientation.

Complete assembled and soldered PCB should undergo functional testing using test equipments.

The calibration of meters shall be done in-house.

The bidder should submit the list of components used in the meter along with the offer.

A detailed list of bought-out items, which are used in the manufacture of the meter, should be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought-out items.

The details of testing facilities available for conducting the routine and acceptance tests and other special tests on the meter shall be furnished with the bid. The facility available if any for conducting type test may also be furnished.

The acceptance test certificates in case pre-dispatch inspection or a routine test certificate in cases where inspection is waived has to be approved by the purchaser.

8. GUARANTEE:

The meters should be guaranteed against any manufacturing defects arising out of faulty design or bad workmanship or component failure for a period of five and half years from the date of supply.

Life of RTC battery used for the meter should be guaranteed for 10years.

The meter/ battery found defective within the above guarantee period shall be replaced by the supplier free of cost within 6 months of the receipt of intimation of failure/ defect.

9. REPLACEMENTOFDEFECTIVEMETERS:

The meters declared defective by the BPC shall be replaced by the supplier up to the full satisfaction of the BPC at the cost of supplier.

10. PACKING&FORWARDING:

The equipment shall be packed in cartons/ crates suitable for vertical/ horizontal transport as the case may be, and suitable to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing.

The easily damageable material shall be carefully packed and marked with the appropriate caution symbol. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc., shall be provided. Supplier without any extra cost shall supply any material found short inside the packing cases immediately.

Component Specifications

The meters shall be designed and manufactured using SMT (Surface Mount Technology) components, except for power supply components, LED/ LCD etc., which are PTH type.

All the material and electronic power components used in the manufacture of the meter shall be of highest quality and reputed makes so as to ensure higher reliability, longer life and sustained accuracy.

Sl. no.	Component Function/Feature	Requirement	Make/origin
1.	Current Element	E-beam/ spot welded shunts shall be provided in the phase element andC.T.in the neutral. Alternatively, both the current elements (phase & neutral) shall have Shunts with proper isolation.	Any make or origin Conforming to IEC
2.	Measurement/ Computing chips	The Measurement/ computing chips used in the meter should be with the Surface mount type along with the ASICs.	Renesas, Texas Instruments, Teridian, Maxim
3.	Memory chips	The memory computing chips should not be affected by the external parameters like sparking, high voltage spikes o electrostatic discharges.	Atmel, National Semiconductors, Microchip, Texas Instruments, Phillips, Hitachi, Teridian,ST
4.	Display modules	The display modules should be well protected from the external UV radiations. The display should be clearly visible over an angle of at least a cone of 70^{o}. The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. The display should be TN type industrial grade with extended temperature	Haijing, Holtek, Bonafied Technologies, Advantek, Truly Semiconductor, Hitachi, SONY
5.	Communication Modules	Communication modules should be compatible for any of the following ports: RS232, RS485, RJ45, USB	National Semiconductors, Hitachi, Texas Instruments, Philips, HP, Agilent, Everlight, Fairchild

6.	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	National Semiconductors, Hitachi, Texas Instruments, Siemens, Agilent, Philips, Hp, Everlight, Siemens

Sl. no.	Component Function/Feature	Requirement	Make/origin
7.	Power Supply	The power supply should be with the capabilities as per the relevant standards. The power supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	As specified.
8.	Electronic Components	The active& passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	Philips, Toshiba, Fairchild, Murata, Rohm, Siemens. National semiconductors, ATMEL, Texas Instruments, Hitachi. Ligitec, OKI, . EPCOS, Incap
9.	Mechanical parts	The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.	
10.	Battery	Lithium/ Lithium-ion/NiMh with guaranteed life of 10years	Renata, Panasonic, Varta, Tedrium, Sanyo, National, Teridian Duracell, Maxell, Elegance, EVE .

11.	RTC/ Micro Controller	The accuracy of RTC shall be as per relevant IEC standards	Philips, Dallas, Atmel, Motorola, NEC, Renesas, Hitachi, Xicor, Texas Instruments, NEC or OKI, ST, Mitsubishi

2.0 Technical Specification for A.C. 3-Phase 4-Wire L.T. Solid State (Static) Whole Current DLMS Compliant Energy Meter of 1.0 Class Accuracy and Current Rating (5-30) Amp and (10-80) Amp

2.1 SCOPE

(a) This specification covers design, engineering, manufacture, testing, inspection and supply of solid state (Static) Whole Current lag only energy meter with backlit LCD display use for balanced unbalanced load in urban / rural area. The meter should be capable of recording and displaying energy in KWh & demand in KW, KVA, power factor range of Zero lag-unity-Zero lead. Meter should have facility/capability of recording tamper information & load survey in active energy, apparent energy, reactive energy, phase currents, Phase Voltages & Other parameters with nonvolatile memory.

(b) It is not the intent to specify completely herein all the design and construction of meter however the meter shall conform in all respect to high standard of engineering, design and workmanship shall be capable of performing in continuous commercial operation in a manner acceptable to Bhutan Power Corporation Limited, who will interpret the meanings of drawings and specification shall have the right to reject any work or material which in its judgment is not in accordance herewith. The offered meter shall be complete with all components, accessories necessary for their effective and trouble free operation of the system for the purpose mentioned above. Such components shall be deemed to be within the scope of bidders supply irrespective of whether those are specifically brought out in this specification and or the commercial order or not.

The meter should be flexible enough to accommodate changing requirements in future and design for minimum maintenance.

2.2 STANDARDS APPLICABLE:

Unless specified elsewhere in this specification, the performance & testing of the meters should conform to the following Indian / International standards, to be read with up to date and latest amendments / revisions thereof as on 90 days prior to floating of tender.

Sl. No.	Standard No.	Title
1	IEC 62052-11:2003	Electricity Metering Equipment (AC)-General Requirements, tests and test conditions

2	IEC 62053-21:2003	Class 1 and 2 alternating current watt hour meter
3	IS 13779:1999	ac STATIC WATIHOUR METERS, CLASS 1AND 2 – SPECIFICATION
4	CBIP 325	Standardization of AC Static Electrical Energy Meter
5	IS 14434 (1998)	Polycarbonate Molding and Extrusion Materials.

Meters matching with requirements of other national or international standards that ensure equal or better performance than the above mentioned standards should also be considered. When the equipment offered by the bidder conforms to standards other than those specified above, salient points of difference between standards adopted and the standards specified in this specification shall be clearly brought out in the relevant schedule. A copy of such standards along with their English translation shall invariably be furnished along with the offer.

2.3 CLIMATIC CONDITIONS:

The meters to be supplied against this specification should be suitable for satisfactory continuous operation under the following tropical conditions. Meters should be capable of maintaining required accuracy under hot, tropical and dusty climatic conditions.

i)	Maximum Ambient Air Temperature in shade	: 55 °C
ii)	Minimum Ambient Air Temperature	: (-) 10 °C
iii)	Maximum Relative Humidity	: 95% (Non-condensing)
iv)	Minimum Relative Humidity	: 10%
v)	Height above mean sea level	: Upto 4000 meters
vi)	Average number of tropical monsoon per Annum	: 5 months
vii)	Annual Rainfall	: 100 mm to 1500 mm

2.4 TROPICAL TREATMENT :

The meters shall be suitably designed and treated for normal life and satisfactory operation under hot and hazardous tropical climate conditions and shall be dust and vermin proof. All the parts and surface, which are subject to corrosion, shall either be made of such material or shall be provided with such protective finish which provides suitable protection to them from any injurious effect of excessive humidity.

2.5 MAXIMUM CONTINUOUS CURRENT:

The maximum continuous current in meters should be the current at which the meter purports to meet the accuracy requirement of the specification.

2.6 CONSTRUCTION:

The case, winding, voltage circuit, sealing arrangements, registers, terminal block, terminal cover & name plate etc. shall be in accordance with the relevant standards. The meter should be compact & reliable in design, easy to transport & immune to vibration & shock involved in the transportation & handling. The construction of the meter should ensure consistence performance

under all conditions especially during heavy / heavy rains / very hot weathers. The insulating materials used in the meter should be non-hygroscopic, non-ageing & have tested quality. The meter should be sealed in such a way that the internal parts of the meter becomes inaccessible and attempts to open the meter shall result in viable damage to the meter cover. **This is to be achieved by using continuous Ultrasonic welding on all the four sides of the Meter base and cover or any other technology which is either equally or more efficacious.**

The meter should comply latest technology such as Microcircuit or Application Specific Integrated Circuit (ASIC) to ensure reliable performance. The mounting of the components on the PCB should compulsorily be Surface Mounted Technology (SMT) type. Power supply component may be of PTH type. The electronic components used in the meter should be of high quality and there should be no drift in the accuracy of the meter for at least ten years. The circuitry of the meter should be compatible with 16 Bit (or better) ASIC with compatible processor and meter should be based on Digital measuring and sampling technique.

The meter should be housed in a safe, high grade, unbreakable, fire resistant, UV stabilized, virgin Polycarbonate casing of projection mounting type. The meter cover should be transparent / translucent. But the viewing portion should be transparent for easy reading of displayed parameters, and observation of operation indicators. The meter base may not be transparent, but it should not be black in colour." The meter casing should not change in shape, colour, size and dimensions when subjected to 72 hrs on UV test as per ASTMD 53." It should withstand 650 deg. C. glow wire test and heat deflection test as per ISO 75 or as per IEC 60068 -2-5.

In addition to the above, the meter cover should be sealable to the meter base with at least 2 nos. bar coded seals bearing the identification marks of the Manufacturer. Suitable arrangement should be made for fitting/fixing of utility seal at two sides of meter terminal cover in such a manner that any access to the terminal cannot be possible without removing the seal. There should also be provision for sealing at the optical port.

The bidder shall submit relevant documents regarding the source of procurement of polycarbonate material. The polycarbonate material procured from the following manufacturers should be used.

a)	G.E. Plastics	LEXAN 943A, or equivalent like 143, 123R for Top cover & Terminal cover/ LEXAN 503R or equivalent like 143R, 500R for Base & Terminal Block
b)	BAYER	Grade corresponding to above
c)	DOW Chemicals	-Do-
d)	MITSUBISHI	-Do-
e)	TEJIN	-Do-
f)	DUPONT	-Do-

2.7 METER CASE AND COVER:

The meter should have a case, which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the seal and cover. This is to be achieved by use of **Ultrasonic Welding** (Ultrasonically continuously welded at three sides so that the cover cannot be separated from the base without breaking/damaging the case and cover) i.e. break to open type or any other technology which is either equally or more efficacious. In case, ultrasonic welding using plate / strip is used, the material of plate / strip should be same as that of cover and base and the strip. The manufacturer's logo should be embossed on the strip / plate. The material of the meter body (case and cover) shall be of Engineering Plastic.
The meter cover should be fixed to the meter base (case) with Unidirectional Screws, so that the same cannot be opened by use of screwdrivers. These unidirectional screws should be covered with transparent caps, ultrasonically welded with the meter body and the screw covers should be embedded in the meter body in a groove. The meter shall withstand external magnetic influence as per latest amendments of CBIP Technical Report No.325.

2.8 TERMINAL BLOCK AND COVER:

The terminals may be grouped in a terminal block having adequate insulating properties and mechanical strength. The terminal block should be made from best quality non-hygroscopic, flame retardant material (capable of passing the flammability tests) with nickel plated brass inserts / alloy inserts for connecting terminals. It should be rigidly fixed to the base of the meter so that it cannot be separated from the meter base without breaking either the meter base or the terminal block and this fixing arrangement should be in parallel to the meter base in such a way that it cannot be viewed or approached from any part of the meter without breaking the meter.

The terminals in the terminal block shall be of adequate length in order to have proper grip of conductor. **The screws shall not have pointed ends at the end of threads.** All terminals and connecting screws and washers should be of tinned / nickel plated brass material. The terminal should withstand glow wire test at 960 + 15 °C and the terminal should withstand at least 135 °C.as per IS.

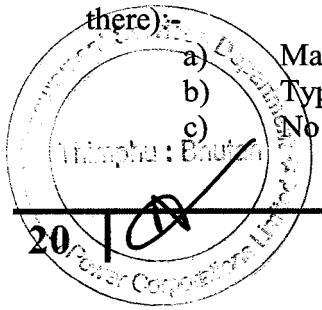
The internal diameter of terminal hole should be minimum 5.5 mm for (5 -30A) & 9.5mm for (10 –80A) meters and center to center distance is 13 mm. The holes in the insulating material shall be of sufficient size to accommodate the insulation of conductor also.

The terminal cover shall be transparent re-enforced Polycarbonate, Engineering Plastic with minimum thickness 2.0 mm and the terminal cover shall be of extended type completely covering the terminal block and fixing holes. The space inside the terminal cover should be sufficient to accommodate adequate length of external cables. The bottom of the terminal cover should be cut through inside 25 mm to accommodate the cables while closing the terminal cover.

2.9 MARKING OF THE METER:

The marking on the meter should be in accordance with relevant clauses of IS 13779. The basic marking on the meter nameplate should be as follows (all other markings as per IS shall also be there):-

a) Manufacturer's name & trade mark
b) Type Designation
c) No. of phases & wires



d) Serial number (Size not less than 5mm)
e) Month & Year of manufacture
f) Reference Voltage
g) Rated Current
h) Operating Frequency
i) Principal unit(s) of measurement
j) Meter Constant (impulse/kWh)
k) Class index of meter
l) Property of BPC
m) Purchase Order No. & Date
n) Guarantee (Guaranteed for a period of 5 and half Yrs. From date of delivery)
p) Place of manufacture
q) Meter Sl. No. in numerical form, Dt. of manufacturer, Current rating of the meter and P.O. reference should be bar coded. Bar Code may be extended up to two layers but Readable by single layer Bar code reader.
r) Meter Sl. No. Should be of seven digits and it should start serially corresponding to the quantity of meter ordered.

2.10 DISPLAY OF MEASURED VALUES:

The meter shall have numeric display with at **least 6 full digit** and with LCD backlit display, having minimum character height of 10 mm. The data should be stored in non-volatile memory. The non-volatile memory should retain data for a period of not less than 10 years under unpowered condition. Battery back-up memory will not be considered as NVM.

It should be possible to easily identify the single or multiple displayed parameters through symbols / legend on the meter display itself or through display annunciation which should be self-explanatory and symmetric.

The register shall be able to record and display energy register starting from zero, for a minimum of 2500 hours. The energy corresponding to rated maximum current at reference voltage and unity power factor. The register should not roll over in between this duration.
In addition to provide Serial Number of the meter on the display plate, the meter serial no. should also be programmed into meter memory for identification through communication port for CMRI / laptop / meter reading printout.

Visibility of display in poor light conditions is an important criterion. STN or TN or any better type of advanced LCD to be used. Proper legends for the displayed parameters to be provided (Factory programmable). Back lit provided for clear visibility should be uniform throughout all part of the LCD.

The meters should have auto-display mode for pre-selected parameters. Push-Button mode of display should display all parameters and it should have priority over auto mode. The meter should give clear message on display to indicate that the meter has experienced tampers and the nature of tamper with date and time of first occurrence, last occurrence and last restoration, if the Last tamper status is not restored, then meter will indicate first occurrence, penultimate

restoration and last occurrence. Connection check, Phase sequence and self-diagnostic should give clear message on display.

The meter shall have a test output (blinking **LED)** accessible from the front and be capable of being monitored with suitable testing equipment. The operation indicator must be visible from the front. Test output device should be provided in the form of one common LED for active and reactive energy with the provision of selecting the parameter being tested (separate LED may also be used with proper separation).

2.11 DISPLAY SEQUENCE:

The meter should display the required parameters in two different modes as follows:
(Display sequence for both auto and Push button must be maintained, no interchange in sequence or display parameter will be accepted. All the display should have proper legend to identify the same.)

A. Auto Display Mode:
The following parameters should be displayed in auto cycle mode, in the following sequence. Each parameter should be on meter display for 10 seconds and the time between two auto cycles should be at 60 seconds gap.

1. LCD test
2. Total Cumulative Active Forwarded Energy (up to date)
3. Meter serial number
4. Real Date (dd mm yy)
5. Real Time (hh mm ss)
6. Present Month MD in KW and KVA since last MD reset with date and time.

Each parameter should be on meter display for 10 seconds and the time between two auto cycles should be at 60 seconds gap.

B. Push Button mode:

The following parameters should be displayed on pressing the push button

1. LCD test
2. Total Cumulative Active Forwarded Energy (up to date)
3. Meter serial number
4. Real Date (dd mm yy)
5. Real Time (hh mm ss)
6. Present Month MD in KW and KVA since last MD reset with date and time.
7. Previous 3 months (at least) cumulative KWh, KVAh and Maximum Demand in KVA at 24.00 hrs. of last date of the month.
8. Instantaneous Phase Voltages
9. Instantaneous Phase Currents
10. Instantaneous Neutral Current* i.e. Actual Current flowing through the Neutral

11. Instantaneous Average Power Factor
12. Inst. Power Factor – Phase Wise
13. Average Power Factor (Previous Month)
14. Instantaneous Active Power
15. Instantaneous Apparent Power
16. Instantaneous Frequency
17. High resolution display for KWh, KVARH and KVAH (minimum 2+4 i.e. 4 digit after decimal)
18. Phase Sequence
19. Connection check (For CT Reversal Connection Not OK)
20. Self-Diagnosis

Display for Auto and manual mode must be listed by two headers

A) Auto Display Mode and

B) Push Button Mode (Parameters should be pasted in front of the PP Box
Each parameter should be on meter display for 10 seconds and the time between two auto cycles should be at least 60 seconds gap).

2.12 ANTI TAMPER FEATURES:

The meter should have the following anti-tamper features:

i) ***Current Reversal:*** The meter shall be capable of recording energy correctly even if the input and output terminals are interchanged in one, two or all the three phases including logging of tamper.

ii) The meter shall work correctly irrespective of phase sequence of supply (there must be an indication in display & downloaded data). Tamper alerts is not required. But it must be shown in instantaneous parameters both in tabular as well as in phasor diagram.

iii) The meter shall work correctly even in absence of neutral as per IS13779. Accuracy in between 70% Vref to 50 % Vref must be maintained within + 4%.

iv) Meter should record energy within maximum error of + 4% on injection of DC, pulsating DC (7-10 Hz), Chopped AC in Neutral. Maximum chopping for AC injection will be 25% to 30% at peak end.

v) The registration shall not be affected more than + 4% if high frequency (60-100Hz) A.C. Voltage w.r.t. earth is applied to the meter neutral.

vi) Meter will be tested at Low Frequency (30-40 Hz) and High Frequency (60 – 80 Hz). Meter should be immune on these tests.

vii) High Frequency Jammer Circuit Test – Meter should be immune on this test.

viii) The meter should be immune to Electro Static Discharge or Sparks of 35 KV (approx) induced by using frequency-generating devices having very high output voltage.

N.B.:- Tests in this respect will be conducted by using commonly available devices and during spark discharge test, spark will be applied directly at all vulnerable points of the meter for a period of 10 to 20 minutes and meter should record ±4 % w.r.t. Master Meter under this condition. After application of spark discharge meter should record correctly within the specified limits of errors. Beyond 35 KVp meter should record as tamper if not immune. It should record

the event under Indian Event Reference of others type with Event ID's 249 for Occurrence and 250 for Restoration with OBIS (0.0.99.98.4.255). Other details are applicable as per "Others Tamper Profile of IS 15959.

The meter shall be capable of recording; occurrences and restoration with date and time i.r.o. the following tamper conditions:

a. Missing Potential for all phases (phase wise).
b. Voltage unbalance
c. Current reversal for all phases (phase wise). (It must not be restored without threshold current).
d. All potential missing or Power failure (This should not be considered in tamper events. Minimum 20 events need to be given separately)
e. Magnetic Disturbances (As per IS 13779 & CBIP 325 including 0.5 T Permanent Magnet along with latest amendments)
f. Neutral Disturbances (if it logged).
g. C.T. open
h. C.T. Bypass/ C.T. Short.
i. C.T. Unbalance (should occur only on activation of neutral C.T.)
j. Over Current (during existence of this tamper current unbalance tamper should not log).
k. Low power factor.

Snapshot values of Phase Voltage, Phase Current & Phase wise Power Factor, Active Energy value during occurrence & restoration to be provided in all the above mentioned tamper conditions in BCS with date and time. (In Event logging Snapshots should be considered when the actual phenomenon occurred)

The occurrence and restoration of tamper should be equal to 5 min. (Except Magnetic and Neutral Disturbances tampers) *Magnetic tamper should appear instantaneously, ND within 3 min.*

All authenticated commands should be Base Computer Software controlled. All transactions with meter should be date and time logged, in the downloaded data minimum last 12 such transactions need to be provided.

Properly designed meter tamper logic should be provided and clearly explained in the bid. The tamper logic should be capable of discriminating the system abnormalities from source side and load side and it should not log/record tamper due to any source side abnormalities. More than one tamper *CT related/ PT related/ others* should not be logged at a time. A minimum of 300 events (one event means either occurrence or restoration) of all types of tamper with date & time stamping should be available in meter memory compartment wise. The logging will be on FIFO basis. The events will be divided into three compartments like *CT related (148 Events), PT related (88Events) and others (64 Events).*

- **Meter should have a continuous and clear indication in its display if top cover is removed / opened and even re-fixed (non rollover) and only cover open must be**

logged in BCS without any restoration. Auto scroll display may be sacrificed for that COVER OPEN.

2.13 Measurement of Harmonics:

The meter should be capable of measuring fundamental energy as well total energy i.e., fundamental plus Harmonics energy. Total energy shall be made available on meter display and the same shall be used for billing purpose. Provision for measuring Fundamental energy should be kept for utilization in future.

The total energy and Fundamental energy shall be logged in the meter memory and be capable of downloading to the BCS through the CMRI and be available for viewing at the BCS end.

2.14 RESETTING OF MAX. DEMAND:

The meter should be capable of recording the Apparent MD with integration period of 15 minutes (programmable).
MD reset should be through each of the three means:
1) Automatic resetting at present date & time (at present it will be at 00.00 hrs of the first day of the month).
2) Manually i.e., by push button.
3) Through authenticated command from MRI or through Remote Communication.
The means by which the reset has been done should be made available to downloaded data.
Facility to invoke any of the above through authenticated MRI command should be provided at BCS.
MD reset button should have proper sealing arrangement.

There should be separate Push button for scrolling display (up and down) and MD reset.

2.15 LOAD SURVEY:

The meter should be capable of recording load survey for the following parameters for a period of minimum 60 days - subject to availability of all parameters listed below with 15 minutes integration period.

i) Energy in KWh,
ii) Demand in KVA and KW,
iii) Current – phase-wise
iv) Voltage – phase-wise

The NVM shall not require any additional battery backup to retain the data in case of power failure, for up to 10 years and the data storage shall be independent of battery backup unit.
The life of the RTC battery in circuit condition should be minimum 6 years in case of power failure.
It should be possible to transfer this data to base computer software through MRI/Lap top or RMR. **The data so obtained should be displayed in both graphical &numeric form in the BCS.** The BCS with all details is to be provided by the supplier at no extra cost.

2.16 METER READING DURING POWER OFF:

It should be possible to read the meter-display visually and with MRI/Lap top in absence of input voltages with the help of internal battery backup (through optical port only).
In case of external battery the arrangements should be such that hands free operation is possible.
In case of external battery 10 years guarantee must be given for external battery/power pack.
Separate battery should be used for this purpose (Not RTC or processor battery).

2.17 SELF DIAGNOSTIC FEATURES:

The meter shall be capable of performing complete self-diagnostic check to monitor the circuits for any malfunctioning to ensure integrity of data memory location all the time.
If possible, the details of malfunctioning should be recorded in the meter memory.

The bidder should furnish the details of self-diagnostic capability feature, viz Memory status (NVM) and Battery status, RTC Status etc. and clear indication should be in display and BCS.\

a. IMMUNITY TO ELECTRO MAGNETIC DISTURBANCE:

The meter should be designed in such a way so that external electromagnetic field or electrostatic discharges do not influence the performance of the meter as per IS 13779.

2.18 TECHNICAL SUPPORT, MANUALS &TRAINING:

Extensive technical support, detailed technical literature (should supply with each meter at the time of packing) & training is to be provided by the manufacturer. Supply of External Battery Packs if required to be provided by the manufacturer and should be clearly offered in their bids.

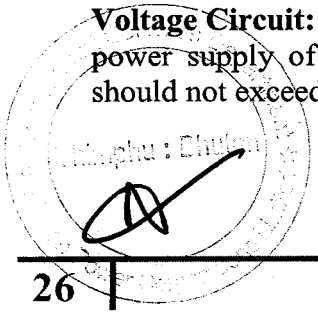
2.19 INFLUENCE QUANTITIES:

The meter shall work satisfactory with guaranteed accuracy as per limit of IS: 13779 (clause No.9.2.1 and 11.2) under presence of the following quantities:

i) Electromagnetic field
ii) External magnetic field
iii) Radio frequency interference
iv) Vibration
v) Voltage variation (70% - 120% of Vref.) in 0.5 lag and upf both in 5% and 100% of Ib.
vi) Frequency variation (+/-) 5% of 50 Hz in 0.5 lag and upf both in 5% and 100% of Ib.

2.20POWER CONSUMPTION BY METER :

Voltage Circuit: The active and apparent power consumption in the voltage circuit including the power supply of meter at reference voltage. Reference temperature and reference frequency should not exceed 1.5 Watt and 8 VA per phase respectively.



Current Circuit: The apparent power taken by each current circuit at basic current, reference frequency and reference temperature should not exceed 4 VA per phase in power up condition.

2.21 STARTING CURRENT:

The meter should start registering energy at 0.2 % of basic current at unity power factor and should be fully functional within five seconds after the rated voltage is applied.

2.21.1 RUNNING AT NO LOAD:

When 70% & 120% voltage is applied and no current flows in the current circuit, the test output of the meter should not produce more than one pulse.

2.22 COMMUNICATION CAPABILITY:

The meter shall have a galvanically isolated optical communication port as per IEC 1107/ANSI/PACT so that it can be easily connected to a hand-held common meter reading instrument (CMRI) for data transfer. The billing data & the tamper data downloading time should be less than 5 minutes. The optical port should be provided with proper sealing arrangement so that the optical cover should not be opened without breaking the seal. The stored data in the meter should be available through CMRI even when the display of the meter is not available.

The above ports suitable for interface of the meter with appropriate protocol to Common Meter Reading Instrument (CMRI) / LAPTOP / PC.

A separate suitable serial port (RS-232/RJ-11) capable of being hooked (into a remote metering device such as modem, etc. should be provided inside the terminal cover to enable future Automatic meter reading) in such a way that the same cannot be accessed without interfering the Terminal cover and seal.

It should not be possible to alter date in the meter by-passing commands from the CMRI or Laptop. For correction of RTC time, change of TOD timing, etc. it should be possible to perform this functions through CMRI/Laptop but only through authenticated commands sets by BCS after scheduling for particular meter Sl nos.(Which is possible as per DLMS protocol). Billing parameters should be factory programmable. No alteration, change should be possible through authenticated commands sets by the BCS without scheduling the meters. Moreover, no alternation change should be possible using CMRI only, i.e. the control has to be with the BCS (Which is possible as per DLMS protocol).

The BCS shall have multi-level password for data protection & security. Bidder has to submit CMRI software (.exe format) also at the time of sample meter testing.
Seal tracking software should be submitted and installed at PC/ Laptop of the Purchaser before commencement of supply of the meters i.e. it must be supplied before / at the time of offering first lot inspection.

2.23 BASE COMPUTER SYSTEM & SOFTWARE REQUIREMENTS:

The Common Meter reading Instrument (CMRI/Laptop) should be capable of being loaded with user-friendly software (MS-DOS 5.0 or higher version compatible) for reading / downloading meter data. Windows based Base Computer Software (BCS) should be provided for receiving data from CMRI / Laptop and downloading instructions from base computer software to CMRI / Laptop.

The BCS should be compatible at Windows 7/8/8.1/10 (both 32 bit and 64 bit) operating systems and copy righted. The data stored in the meters memory including defrauded energy should be available on the BCS. **Only one BCS should be provided for downloading data and authenticated command from CMRI/ Laptop**. So that at the time of reading meter should get the authenticated command.

This BCS should have, amongst other requirements, features and facilities described later in this specification, the facility to convert meter-reading data into user definable ASCII file format so that it may be possible for the user to integrate the same with the user's billing data and process the selected data in desired manner. All the data available in the meter including energy, MD, all Transaction data with date and time, New TOD time Zones and history data should be available in BCS after down loading, more over convertible to user defined ASCII file format for integration with third party software. The vendor should supply necessary base computer software for reading / viewing of meter data and converting to user defined ASCII files formats. The user should have the flexibility to select the parameters to be converted into ASCII file. The vendor should also supply the necessary CMRI / Laptop software (during sample testing also).

The bidder has to supply the Meter Reading protocol (API), free of cost. The protocol should not be complicated & should be easily understandable to introduced compatibility between meters, BCS and CMRI of other makes. The bidder shall indicate the relevant standard to which the protocol complies. The compatibility of transferring data from the meter to CMRI & then to the BCS should be easily established. Any change or up gradation of CMRI software of CMRI software or BCS in future, required for any reason, has to be done by the supplier at his own cost.
All transactions should be made at the time of reading. No extra operations will be allowed for transactions. All transactions should be available in downloaded data with date and time stamping.

The same software should be capable of preparing CMRI to read the meter information or to reconfigure the meter for change of TOD timings and / or time setting of the meter etc. The exhaustive on-line help should be available with the software so that user can use all the features of the software by just reading the help contents.
Test for automated Meter reading will be conducted by downloading Meter data through Modem at our system through third party software also.
In BCS 12 months data back-up data for KWh, KVAh, MD & KVA (total & TOD wise), Average load factor, average power factor must be available.

The supplier shall provide at least 10 numbers of meter Reading optical USB probes without any cost.

2.24 ACCURACY:

There shall be no drift in accuracy, for a period of ten years from the date of supply. In case any drift is noticed which is beyond the permissible limits, the bidder shall replace by a new meter without any extra cost.

General Requirements:-

1.0 GUARANTEED TECHNICAL PARTICULARS :

The bidder shall furnish all the necessary information as desired in the Schedule of Guaranteed Technical Particulars and data, appended with this Specification. If the bidder desire to furnish any other information in addition to the details as asked for, the same may be furnished against the last item of this Annexure. – I

2.0 TECHNICAL DEVIATIONS:

Any deviation in Technical Specification as specified in the Specification shall be specifically and clearly indicated in the Schedule of deviation format.

3.0 TESTS:

3.1 Type Testing of Meter

The offered meters should be type tested at any NABL accredited laboratory in accordance with IS i3779 with latest amendments, CBIP Report 325 with latest amendments. The type test report should not be more than 3 (three) years old. A copy of the Type Test results should be enclosed with the offer. If there is any modification in the design / parameters of the specifications or use of constituent materials in the offered meters submitted with the offer, from the meter which was submitted type tested, which may affect the characteristics as well as parameters of the meter, revised type test certificates as per the design, parameters and constituent material used in the offered meter, shall have to be submitted failing which the offer may be liable to be rejected.

Type Test Certificate from any NABL accredited Lab. shall only be considered.
Type test certificate should contain the following information clearly:

1) **Type of display or LCD.**
2) **Class of accuracy.**
3) **Meter constant.**
4) **Type of meter.**

3.2 Acceptance tests

C) The acceptance tests as stipulated in CBIP / IS (with latest amendments) shall be carried out by the supplier in presence of purchaser's representative at manufacturer premises.

D) Also the following additional tests are to be carried out on one meter randomly selected from each lot offered for inspection / acceptance testing.

vii. Magnetic induction of external origin (AC & DC)
viii. Tamper & Fraud protection, as per Clause of 12 of this specification.
ix. Test of endurance upto 120% of Imax, for two hours, followed by verification of limits of error.
x. Verification of internal components.
xi. Dry Heat Test as per IS 13779 / 99, Clause 12.6.1, of one meter from the offered lot is to be arranged by the supplier at any NABL accredited laboratory, at his cost.
xii. The supplier shall manufacture one extra number of meter from the PO quantity for Dry Heat Test at its own cost.

In case of failure of Meters as specified in Annexure – H of IS-13779 (For A above) the entire lot will be treated as rejected.
In case of failure of any single meter (as per B above) the entire lot will be rejected.

3.3 Routine Tests:

Each and every meter of the offered lot shall undergo the routine tests as well as functional tests as per IS: 13779/1999, CBIP Report 325 and after sealing the meters, the manufacturers will have to submit the routine test report of all the meters as well as a statement showing seal Sl. Nos. against each meter Sl.No. of offered lot in soft copy (MS WORD or EXCEL format), to

(a) The General Manager (Procurement Services Department)
(b) The General Manager (Distribution & Customer Services Department), along with offer letter for acceptance test.

4.0. TEST FACILITIES:

The tests for equipment / instrument shall be carried out as per relevant Standards and test certificates shall be furnished for scrutiny. The Bidder shall indicate the details of the equipment available with him for carrying out the various tests as per relevant Standards. The bidder shall indicate the sources of all equipment's / instruments.

NOTE: The standard meters used for conducting tests shall be calibrated periodically at any NABL Accredited Test Laboratories and test certificates shall be available at Works for verification by purchaser's representative.

The manufacturer shall have at least the following testing facilities to ensure accurate calibration:-

- AC high voltage test
- Insulation test
- Test of no load condition
- Test of Starting condition
- Test on Limits of error (Automatic Testing facility with ICT)
- Power loss in voltage and current circuit

- Test of Repeatability of Error (at 100% Ib UPF and 5% Ib UPF. Deviation of Errors should be within 0.1).
- Test of meter constant
- Test of magnetic influence (As per CBIP 325 & 0.5 T Permanent Magnet)

5.0 INSPECTION:

The purchaser may carry out the inspection at any stage of manufacture. The manufacturer shall grant free access to the purchaser's representative at a reasonable time when the work is in progress. Inspection and acceptance of any equipment under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing the equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found to be defective.

All acceptance tests and inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the Bidder and purchaser at the time of purchase. The Bidder shall provide all reasonable facilities without charge to the inspector, to satisfy him that the equipment is being furnished in accordance with this specification.

The supplier shall keep the purchaser informed in advance, about the manufacturing programme for each lot so that arrangement can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance / routine testing of the bought out items. The supplier shall give 15 days for local supply / 30 days in case of foreign supply advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine tests.

The purchaser reserves the right to get type test any meter, for meter casing etc. from any of the offered lots, reserve at any destination stores.

7.0 QUALITY ASSURANCE PLAN:

The design life of the meter shall be minimum 20 years and to prove the design life the firm shall have at least the following quality Assurance Plan: -

- The factory shall be completely dust proof.
- The testing rooms shall be temperature and humidity controlled as per relevant standards.
- The testing and calibrating equipments should be automatic and all test equipment shall have their valid calibration certificates.
- Meter will be tested (in case of lot test) in fully automatic test bench with ICT. No human intervention will be allowed during testing.
- Power supplies used in testing equipment shall be distortion free with sinusoidal wave-forms and maintaining constant voltage, current and frequency as per the relevant standards.

During the manufacturing of the meters the following checks shall be carried out.

i) Meter frame dimensions tolerances shall be minimum.
ii) The assembly of parts shall be done with the help of jigs and fixtures so that human errors are eliminated.
iii) The meters shall be batch tested on automatic, computerized test bench and the results shall be printed directly without any human errors.

The Bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

- Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw materials.
- Information and copies of test certificates in respect of bought out accessories.
- List of manufacturing facilities available.
- Level of automation achieved and lists of areas where manual processing exists.
- List of areas in manufacturing process, where stage inspections are normally carried out of quality control and details of such tests and inspections.
- List of testing equipment available with the bidder for final testing of equipment specified and test-plant limitations, if any, vis-à-vis type, special acceptance and routine tests specified in the relevant standards and this specification. These limitations shall be very clearly brought out in schedule of deviations.

The laboratory of manufacturer must be well equipped for testing of the meters. They must have computerized standard power source and standard equipment calibrated not later than a year (or as per standard practice). The details of testing facilities available for conductingshall be furnished with the bid.

1. The routine tests
2. Acceptance tests

8.0. MANUFACTURING ACTIVITIES:

All the materials, electronics and power components, ICs used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy.

The manufacturer should use Application Specific Integrated Circuit (ASIC) or Micro controller for metering functions.

The electronic components shall be mounted on the printed circuit board using latest Surface Mounted Technology (SMT) except power components by deploying automatic SMT pick and place machine and re flow solder process. The electronic components used in the meter shall be of high quality **and there shall be no drift in the accuracy of the meter at least up to 10years.**

Further, the Bidder should own or have assured access (through hire, lease or sub-contract) of the mentioned facilities. The PCB material should be of glass epoxy FR-4 grade conforming to relevant standards.

All insulating materials used in the construction of meters shall be non-hygroscopic, non-aging and tested quality. All parts that likely to develop corrosion shall be effectively protected against corrosion by providing suitable protective coating.

Quality should be ensured at the following stages:

At PCB manufacturing stage, each board shall be subjected to bare board testing. At insertion stage, all components should undergo testing for conforming to design parameters and orientation. Complete assembled and soldered PCB should undergo functional testing using test equipment's (testing jig).

The calibration of meters shall be done in-house.

The bidder should submit the list of components used in the meter along with the offer. A detailed list of bought-out items, which are used in the manufacture of the meter, should be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought-out items.

The details of testing facilities available for conducting the routine and acceptance tests and other special tests on the meter shall be furnished with the bid. The facility available if any for conducting type test may also be furnished.

9.0 DOCUMENTATION:

Seventy-five sets of operating manuals shall be supplied to the office of the General Manager (Procurement Services) for distribution at sites.

One set of routine test certificates shall accompany each dispatch consignment.

The acceptance test certificates in case pre-dispatch inspection or a routine test certificate in cases where inspection is waived has to be approved by the purchaser.

10.0 GUARANTEE:

a) The Meters and Pilfer Proof Meter Boxes shall be guaranteed arising out of faulty design, materials, and bad workmanship for a period of **5 and Half years** from the date of supply. The meters found defective within the above guarantee period should be replaced by the supplier free of cost within one month on receipt of intimation. If the defective meters are not replaced within the above specified period, BPC will recover twice the cost of meters from the supplier.
Life of battery used for the meter should be guaranteed for **10 years**.
b) Name plate of the meter is to be marked with "Guarantee of the Meter": "5 and half years from the date of supply".

11.0 REPLACEMENT OF DEFECTIVE METERS:

The meters declared defective by the BPC shall be replaced by the supplier up to the full satisfaction of the BPC at the cost of supplier. Failure to do so within the time limit prescribed shall lead to **imposition of penalty of twice the cost of meter**. The same may lead to black listing even, as decided by BPC. In this connection the decision of BPC shall be final.

12.0 PACKING &FORWARDING:

The equipment shall be packed in cartons / crates suitable for vertical / horizontal transport as the case may be, and suitable to withstand handling during transport and outdoor storage during transit.

The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbol. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc., shall be provided. Supplier without any extra cost shall supply any material found short inside the packing cases immediately.

The packing shall be done as per the standard practice as mentioned in IS 15707: 2006. Each package shall clearly indicate the marking details (for e.g, manufacturer's name, Sl. Nos. of meters in the package, quantity of meter, and other details as per supply order). However, he should ensure the packing is such that, the material should not get damaged during transit by Rail / Road.

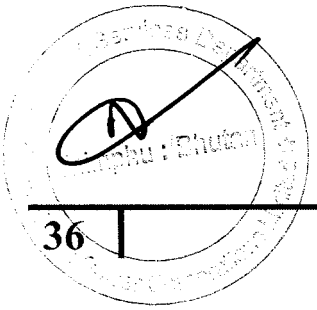
Component Specifications:

The meters shall be designed and manufactured using SMT (Surface Mount Technology) components, except for power supply components, LED / LCD etc., which are PTH type.
All the material and electronic power components used in the manufacture of the meter shall be of highest quality and reputed makes so as to ensure higher reliability, longer life and sustained accuracy.

Sl. No	Component Function / Feature	Requirement	Make / origin
1	Current Element	E-beam /spot welded C.T. shall be provided in the phase element and in the neutral with proper isolation.	Any make or origin conforming to IS-2705
2	Measurement / computing chips	The Measurement / computing chips used in the meter should be with the Surface mount type along with the ASICs.	Analog Devices, AMS, Cyrus Logic, Atmel, SAMES, NEC, Texas Instruments, Phillips, Teridian, Freescale,

			Renesas.
3	Memory chips	The memory computing chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	Atmel, National Semiconductors, Microchip, Texas Instruments, Phillips, Hitachi, Teridian ,ST, Renesas.
4	Display modules	The display modules should be well protected from the external UV radiations. The display should be clearly visible over an angle of at least a cone of 70^0.The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. The display should be TN type industrial grade with extended temperature range.	Haijing, Holtek, Bonafied Technologies, Advantek, Truly Semiconductor, Hitachi, SONY, Tianma.
5	Communicati -on modules	Communicationmodulesshouldbecompatible for any of the following ports: RS232, RS485, RJ45, USB	National Semiconductors, Hitachi, Texas Instrument, Philips,HP, Agilent, Everlight, Fairchild, Avago.
6	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	National Semiconductors, Hitachi, Texas Instrument, Siemens, Philips,HP, Agilent, Everlight, Avago.
7	Power Supply	The power supply should be with the capabilities as per the relevant standards. The power supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	As specified.
8	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	Philips, Toshiba, Fairchild, Murata, Rohm, Siemens. National Semiconductors, ATMEL, Texas Instruments, Hitachi. Ligitec, OKI, EPCOS

9	Mechanical parts	The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. The other mechanical components should be protected from rust, corrosion etc. by suitable plating / painting methods.	N.A.
10	Battery	Lithium-ion with guaranteed life of 10 years	Renata, Panasonic, Varta, Tedrium, Sanyo, National, Teridian, Duracell, Maxell, Elegance,TekCell, Mitsubishi,Tadiran, EVE.
11	RTC / Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	Philips, Dallas, Atmel, Motorola, NEC, Renesas, Hitachi, Xicor, Texas Instruments, NEC or OKI, ST,Mitsubishi, Epson, Teridian, Freescale.



3.0 Technical Specification for A.C. 3-Phase 4-Wire L.T. CT Operated DLMS Compliant Energy Meter of 0.5 Class Accuracy and Current Rating -/5A

3.1 SCOPE

This Specification covers the design, engineering, manufacture, assembly, inspection and testing before dispatch and supply of 3 phase 4 wire, Class 0.5 accuracy, 3 X 240V and -/5 Amps static meter for outdoor use.

3.2 APPLICABLE STANDARDS

Sl. No.	Standard No.	Title
1	IEC 62052-11:2003	Electricity Metering Equipment (AC)-General Requirements, tests and test conditions
2	IEC 62053-22:2003	Class 0.5 alternating current watt hour meter
3	IS 14697	ac STATIC WATIHOUR METERS, CLASS 0.5 AND 0.2 - SPECIFICATION
4	CBIP 325	Standardization of AC Static Electrical Energy Meter
5	IS 14434 (1998)	Polycarbonate Molding and Extrusion Materials.

3.3 CLIMATIC CONDITIONS :

The meters to be supplied against this specification should be suitable for satisfactory continuous operation under the following tropical conditions. Meters should be capable of maintaining required accuracy under hot, tropical and dusty climatic conditions.

18. Maximum Ambient Air Temperature in shade : 55 °C
19. Minimum Ambient Air Temperature : (-) 10 °C
20. Maximum Relative Humidity :95%(Noncondensing)
21. Minimum Relative Humidity :10%
22. Height above mean sea level : Upto 4000 meters
23. Average number of tropical monsoon per Annum : 5 months
24. Annual Rainfall : 100 mm to 1500 mm

3.4.TROPICAL TREATMENT :

The meters shall be suitably designed and treated for normal life and satisfactory operation under hot and hazardous tropical climate conditions and shall be dust and vermin proof. All the parts and surface, which are subject to corrosion, shall either be made of such material or shall be provided with such protective finish which provides suitable protection to them from any injurious effect of excessive humidity.

3.5 MAXIMUM CONTINUOUS CURRENT :

The maximum continuous current in meters should be the current at which the meter purports to meet the accuracy requirement of the specification.

3.6 CONSTRUCTION :

The case, winding, voltage circuit, sealing arrangements, registers, terminal block, terminal cover & name plate etc. shall be in accordance with the relevant standards. The meter should be compact & reliable in design, easy to transport & immune to vibration & shock involved in the transportation & handling. The construction of the meter should ensure consistence performance under all conditions especially during heavy / heavy rains / very hot weathers. The insulating materials used in the meter should be non-hygroscopic, non-ageing & have tested quality. The meter should be sealed in such a way that the internal parts of the meter becomes inaccessible and attempts to open the meter shall result in viable damage to the meter cover. **This is to be achieved by using continuous Ultrasonic welding on all the four sides of the Meter base and cover or any other technology which is either equally or more efficacious.**

The meter should comply latest technology such as Microcircuit or Application Specific Integrated Circuit (ASIC) to ensure reliable performance. The mounting of the components on the PCB should compulsorily be Surface Mounted Technology (SMT) type. Power supply component may be of PTH type. The electronic components used in the meter should be of high quality and there should be no drift in the accuracy of the meter for at least ten years. The circuitry of the meter should be compatible with 16 Bit (or better) ASIC with compatible processor and meter should be based on Digital measuring and sampling technique.

The meter should be housed in a safe, high grade, unbreakable, fire resistant, UV stabilized, virgin Polycarbonate casing of projection mounting type. The meter cover should be transparent / translucent. But the viewing portion should be transparent for easy reading of displayed parameters, and observation of operation indicators. The meter base may not be transparent, but it should not be black in colour." The meter casing should not change in shape, colour, size and dimensions when subjected to 72 hrs on UV test as per ASTMD 53." It should withstand 650 deg. C. glow wire test and heat deflection test as per ISO 75 or as per IEC 60068 -2-5.

In addition to the above, the meter cover should be sealable to the meter base with at least 2 nos. bar coded seals bearing the identification marks of the Manufacturer. Suitable arrangement should be made for fitting/fixing of utility seal at two sides of meter terminal cover in such a manner that any access to the terminal cannot be possible without removing the seal. There should also be provision for sealing at the optical port.

The bidder shall submit relevant documents regarding the source of procurement of polycarbonate material. The polycarbonate material procured from the following manufacturers should be used.

a)	G.E. Plastics	LEXAN 943A, or equivalent like 143, 123R for Top cover & Terminal cover/ LEXAN 503R or equivalent like 143R, 500R for Base & Terminal Block

b)	BAYER	Grade corresponding to above
c)	DOW Chemicals	-Do-
d)	MITSUBISHI	-Do-
e)	TEJIN	-Do-
f)	DUPONT	-Do-

3.7 METER CASE AND COVER:

The meter should have a case, which can be sealed in such a way that the internal parts of the meter are accessible only after breaking the seal and cover. This is to be achieved by use of **Ultrasonic Welding** (Ultrasonically continuously welded at three sides so that the cover cannot be separated from the base without breaking/damaging the case and cover) i.e. break to open type or any other technology which is either equally or more efficacious. In case, ultrasonic welding using plate / strip is used, the material of plate / strip should be same as that of cover and base and the strip. The manufacturer's logo should be embossed on the strip / plate. The material of the meter body (case and cover) shall be of Engineering Plastic.

The meter cover should be fixed to the meter base (case) with Unidirectional Screws, so that the same cannot be opened by use of screwdrivers. These unidirectional screws should be covered with transparent caps, ultrasonically welded with the meter body and the screw covers should be embedded in the meter body in a groove. The meter shall withstand external magnetic influence as per latest amendments of CBIP Technical Report No.325.

3.8 TERMINAL BLOCK AND COVER:

The terminals may be grouped in a terminal block having adequate insulating properties and mechanical strength. The terminal block should be made from best quality non-hygroscopic, flame retardant material (capable of passing the flammability tests) with nickel plated brass inserts / alloy inserts for connecting terminals. It should be rigidly fixed to the base of the meter so that it cannot be separated from the meter base without breaking either the meter base or the terminal block and this fixing arrangement should be in parallel to the meter base in such a way that it cannot be viewed or approached from any part of the meter without breaking the meter.

The terminals in the terminal block shall be of adequate length in order to have proper grip of conductor. **The screws shall not have pointed ends at the end of threads.** All terminals and connecting screws and washers should be of tinned / nickel plated brass material. The terminal should withstand glow wire test at 960 + 15 °C and the terminal should withstand at least 135 °C.as per IS.

The internal diameter of terminal hole should be minimum 5 mm and center to center distance is 13 mm. The holes in the insulating material shall be of sufficient size to accommodate the insulation of conductor also.

The terminal cover shall be transparent re-enforced Polycarbonate, Engineering Plastic with minimum thickness 2.0 mm and the terminal cover shall be of extended type completely covering the terminal block and fixing holes. The space inside the terminal cover should be

sufficient to accommodate adequate length of external cables. The bottom of the terminal cover should be cut through inside 25 mm to accommodate the cables while closing the terminal cover.

3.9 MARKING OF THE METER:

The marking on the meter should be in accordance with relevant clauses of IS 13779. The basic marking on the meter nameplate should be as follows (all other markings as per IS shall also be there):-

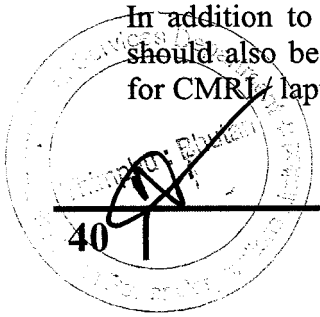
a) Manufacturer's name & trade mark
b) Type Designation
c) No. of phases & wires
d) Serial number (Size not less than 5mm)
e) Month & Year of manufacture
f) Reference Voltage
g) Rated Current
h) Operating Frequency
i) Principal unit(s) of measurement
j) Meter Constant (impulse/kWh)
k) Class index of meter
l) Property of BPC
m) Purchase Order No. & Date
n) Guarantee (Guaranteed for a period of 5 and half Yrs. From date of delivery)
p) Place of manufacture
q) Meter Sl. No. in numerical form, Dt. of manufacturer, Current rating of the meter and P.O. reference should be bar coded. Bar Code may be extended up to two layers but Readable by single layer Bar code reader.
r) Meter Sl. No. Should be of seven digits and it should start serially corresponding to the quantity of meter ordered.

3.10 DISPLAY OF MEASURED VALUES:

The meter shall have Alphanumeric display with at **least 6 full digit** and with LCD. backlit display, having minimum character height of 10 mm. The data should be stored in non-volatile memory. The non-volatile memory should retain data for a period of not less than 10 years under unpowered condition. Battery back-up memory will not be considered as NVM.

It should be possible to easily identify the single or multiple displayed parameters through symbols / legend on the meter display itself or through display annunciation which should be self-explanatory and symmetric.

The register shall be able to record and display energy register starting from zero, for a minimum of 2500 hours. The energy corresponding to rated maximum current at reference voltage and unity power factor. The register should not roll over in between this duration.
In addition to provide Serial Number of the meter on the display plate, the meter serial no. should also be programmed into meter memory for identification through communication port for CMRI / laptop / meter reading printout.



Visibility of display in poor light conditions is an important criterion. STN or TN or any better type of advanced LCD to be used. Proper legends for the displayed parameters to be provided (Factory programmable). Back lit provided for clear visibility should be uniform throughout all part of the LCD.

The meters should have auto-display mode for pre-selected parameters. Push-Button mode of display should display all parameters and it should have priority over auto mode. The meter should give clear message on display to indicate that the meter has experienced tampers and the nature of tamper with date and time of first occurrence, last occurrence and last restoration, if the Last tamper status is not restored, then meter will indicate first occurrence, penultimate restoration and last occurrence. Connection check, Phase sequence and self-diagnostic should give clear message on display.

The meter shall have a test output (blinking **LED)** accessible from the front and be capable of being monitored with suitable testing equipment. The operation indicator must be visible from the front. Test output device should be provided in the form of one common LED for active and reactive energy with the provision of selecting the parameter being tested (separate LED may also be used with proper separation).

3.11 DISPLAY SEQUENCE:

The meter should display the required parameters in two different modes as follows:
(Display sequence for both auto and Push button must be maintained, no interchange in sequence or display parameter will be accepted. All the display should have proper legend to identify the same.)

A. Auto Display Mode:
The following parameters should be displayed in auto cycle mode, in the following sequence. Each parameter should be on meter display for 10 seconds and the time between two auto cycles should be at 60 seconds gap.

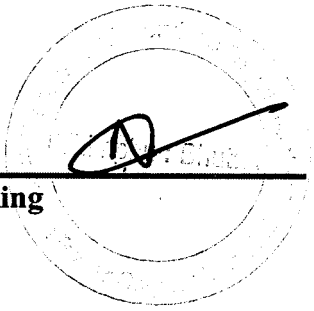
7. LCD test
8. Total Cumulative Active Forwarded Energy (up to date)
9. Meter serial number
10. Real Date (dd mm yy)
11. Real Time (hh mm ss)
12. Present Month MD in KW and KVA since last MD reset with date and time.

Each parameter should be on meter display for 10 seconds and the time between two auto cycles should be at 60 seconds gap.

B. Push Button mode:

The following parameters should be displayed on pressing the push button

21. LCD test
22. Total Cumulative Active Forwarded Energy (up to date)
23. Meter serial number



24. Real Date (dd mm yy)
25. Real Time (hh mm ss)
26. Present Month MD in KW and KVA since last MD reset with date and time.
27. Previous 3 months (at least) cumulative KWh, KVAh and Maximum Demand in KVA at 24.00 hrs. of last date of the month.
28. Instantaneous Phase Voltages
29. Instantaneous Phase Currents
30. Instantaneous Neutral Current* i.e. Actual Current flowing through the Neutral
31. Instantaneous Power Factor
32. Inst. Power Factor – Phase Wise
33. Average Power Factor (Previous Month)
34. Instantaneous Active Power
35. Instantaneous Apparent Power
36. Instantaneous Frequency
37. High resolution display for KWh, KVARH and KVAH (minimum 2+4 i.e. 4 digit after decimal
38. Phase Sequence
39. Connection check (For CT Reversal Connection Not OK)
40. Self Diagnosis

Display for Auto and manual mode must be listed by two headers
A) Auto Display Mode and
B) Push Button Mode (Parameters should be pasted in front of the PP Box
Each parameter should be on meter display for 10 seconds and the time between two auto cycles should be at least 60 seconds gap).

3.12 ANTI TAMPER FEATURES:

Total no of tamper events logged by meter shall be at least 200 nos., compartment wise division of each event and their persistence time shall be indicated at the time of finalizing GTP.

The meter shall not get affected by any remote control devices and shall continue recording energy under any one or combinations of the following conditions. Meter shall log all three-phase voltage, current, power factor, **neutral current** etc. at the time of tamper attempt for all such occurrences:

1.1 **Phase sequence reversal**: The meters shall work accurately irrespective of the phase sequence of the supply.

1.2 **Detection of missing potential**: In case someone intentionally takes out a potential lead, the meter shall record the date and time of such occurrence. The last restoration of normal supply shall also be similarly recorded. The threshold value of voltage should be agreed before delivery.

1.3 **Reversal of C.C. Polarity**: Meter shall record the reversal of C.C. polarity with time and date, and also the time of restoration. Meter shall, however, register the energy consumed correctly with any one, two or all three-phase C.C. reversal.

1.4 **C.C. Shorting/ Bypass**: Meter shall record C.C. terminal shorting/ bypass with time and date and time of restoration. The threshold value of currents should be programmable. Logging of neural current is most important.

1.5 **Unbalance voltage:** Meter shall record all events when the difference between two phase voltage is more than 20V.

1.6 **Low voltage:** Meter shall record all events, if all the three voltages are beyond 20% of Vref.

1.7 **Power On/Off**: Meter shall detect power OFF (minimum power off period 5 mins) if any of phase voltages are not present. This event shall be recorded at the time of each power OFF. At the same time power ON event shall be recorded. **Meter should have provision to record last 30 such events.**

1.8 **Snap Shots:** Meter shall log all three-phase voltage, current, power factor, neutral current etc. at the time of tamper attempt for all such occurrences.

1.9 **Neutral Disturbance**: Meter shall record correctly in case of any AC, DC high frequency signal injected in the neutral circuit of meter. Meter should log the event. Meter shall record correctly in case of missing neutral connection.

1.10 **External Magnetic tampers:** Meter should log on the events of attempt of tampering by external magnetic field as mentioned in the relevant IS. The Meter shall record as per actual load once the external abnormal magnetic field is removed. In such conditions the Meter shall log the event for presence of abnormal external magnetic field and its restoration.

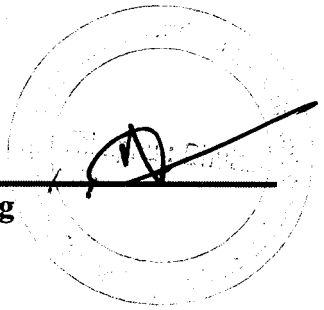
1.11 Protection against HV spark/ ESD: Meter shall continue to record energy or log the event, incase it is disturbed externally using a spark gun/ ignition coil. Upto 35 KV meter should be immune.

1.12 Over Load: Meter shall record Over Load as an event, in case the current in any phase persist >120 % of Imax or Ib.

1.13 Abnormal voltage/ load: meter shall record abnormal voltage and / or abnormal current if either the angle between two phases is beyond 120 +/- 20deg or angle between two current is less than 30deg.

1.14 Top Cover open: The meter shall have top cover opening detection mechanism. The top cover opening event shall be indicated display continuously in auto scroll mode with kWh or through additional LED and shall be logged in memory. The detection and logging mechanism shall work even when meter is not energized. In case of indication of display, meter display shall get reset in 150 days.

1.15Manufacturing Detail in memory :- Meter shall have manufacturing month and year in the memory and should come in data downloading



1.16Wiring connection Display: In case of abnormal wiring like sequence error. Phase association error, CT reversal, Phase- CT mismatch, one/two phase no voltage- An indication, clearly indicating type of fault should appear and get logged in meter.

Note:

- Vendor has to define Tamper Logic, Occurrence and restoration time before supply.
- Tamper and fraud protection test shall be part of acceptance test.

3.13 RESETTING OF MAX. DEMAND:

The meter should be capable of recording the Apparent MD with integration period of 15 minutes (programmable).
MD reset should be through each of the three means:
1) Automatic resetting at preset date & time (at present it will be at 00.00 hrs of the first day of the month).
2) Manually i.e., by push button.
3) Through authenticated command from MRI or through Remote Communication.
The means by which the reset has been done should be made available to downloaded data.
Facility to invoke any of the above through authenticated MRI command should be provided at BCS.
MD reset button should have proper sealing arrangement.

There should be separate Push button for scrolling display (up and down) and MD reset.

3.14 LOAD SURVEY:

The meter should be capable of recording load survey for the following parameters for a period of minimum 60 days - subject to availability of all parameters listed below with 15 minutes integration period.

v) Energy in KWh,
vi) Demand in KVA and KW,
vii) Current – phase-wise
viii) Voltage – phase-wise

The NVM shall not require any additional battery backup to retain the data in case of power failure, for up to 10 years and the data storage shall be independent of battery backup unit.
The life of the RTC battery in circuit condition should be minimum 6 years in case of power failure.
It should be possible to transfer this data to base computer software through MRI/Lap top or RMR. **The data so obtained should be displayed in both graphical &numeric form in the BCS**. The BCS with all details is to be provided by the supplier at no extra cost.

3.15 METER READING DURING POWER OFF:

It should be possible to read the meter-display visually and with MRI/Lap top in absence of input voltages with the help of internal battery backup (through optical port only).

In case of external battery the arrangements should be such that hands free operation is possible. In case of external battery 10 years guarantee must be given for external battery/power pack. **Separate battery should be used for this purpose** (Not RTC or processor battery).

3.16 SELF DIAGNOSTIC FEATURES:

The meter shall be capable of performing complete self-diagnostic check to monitor the circuits for any malfunctioning to ensure integrity of data memory location all the time.
If possible, the details of malfunctioning should be recorded in the meter memory.

The bidder should furnish the details of self-diagnostic capability feature, viz Memory status (NVM) and Battery status, RTC Status etc. and clear indication should be in display and BCS.\

A. IMMUNITY TO ELECTRO MAGNETIC DISTURBANCE:

The meter should be designed in such a way so that external electromagnetic field or electrostatic discharges do not influence the performance of the meter as per IS 13779.

3.17 TECHNICAL SUPPORT, MANUALS:

Extensive technical support, detailed technical literature (should supply with each meter at the time of packing) is to be provided by the manufacturer. Supply of External Battery Packs if required to be provided by the manufacturer and should be clearly offered in their bids.

3.18 INFLUENCE QUANTITIES:

The meter shall work satisfactorily with guaranteed accuracy limit under the presence of the following influence quantities as per IEC-1036 and CBIP Technical Report no.88 with latest amendment.
The influence quantities are:

- External Magnetic field – 0.2 tesla (with log on feature)
- Electromagnetic field induction,
- Radio frequency interference,
- Unbalanced load,
- Vibration etc,
- Wave form 10% of 3rd harmonics,
- Phase sequence,
- Voltage unbalance,
- Electro Magnetic H.F. Field, and

3.19 POWER CONSUMPTION BY METER:

Voltage Circuit: The active and apparent power consumption in the voltage circuit including the power supply of meter at reference voltage. Reference temperature and reference frequency should not exceed 1.5 Watt and 8 VA per phase respectively.

Current Circuit: The apparent power taken by each current circuit at basic current, reference frequency and reference temperature should not exceed 4 VA per phase in power up condition.

3.20 STARTING CURRENT:

The meter should start registering energy at 0.1 % of basic current at unity power factor and should be fully functional within five seconds after the rated voltage is applied.

3.20.1 RUNNING AT NO LOAD:

Meter shall not record any energy under no-load condition.

3.21 COMMUNICATION CAPABILITY:

The meter shall have a galvanically isolated optical communication port as per IEC 1107/ANSI/PACT so that it can be easily connected to a hand-held common meter reading instrument (CMRI) for data transfer. The billing data & the tamper data downloading time should be less than 5 minutes. The optical port should be provided with proper sealing arrangement so that the optical cover should not be opened without breaking the seal. The stored data in the meter should be available through CMRI even when the display of the meter is not available.

The above ports suitable for interface of the meter with appropriate protocol to Common Meter Reading Instrument (CMRI) / LAPTOP / PC.

A separate suitable serial port (RS-232/RJ-11) capable of being hooked (into a remote metering device such as modem, etc. should be provided inside the terminal cover to enable future Automatic meter reading) in such a way that the same cannot be accessed without interfering the Terminal cover and seal.

It should not be possible to alter date in the meter by-passing commands from the CMRI or Laptop. For correction of RTC time, change of TOD timing, etc. it should be possible to perform this functions through CMRI/Laptop but only through authenticated commands sets by BCS after scheduling for particular meter Sl nos.(Which is possible as per DLMS protocol). Billing parameters should be factory programmable. No alteration, change should be possible through authenticated commands sets by the BCS without scheduling the meters. Moreover, no alternation change should be possible using CMRI only, i.e. the control has to be with the BCS (Which is possible as per DLMS protocol).

The BCS shall have multi-level password for data protection & security. Bidder has to submit CMRI software (.exe format) also at the time of sample meter testing.

Seal tracking software should be submitted and installed at PC/ Laptop of the Purchaser before commencement of supply of the meters i.e. it must be supplied before / at the time of offering first lot inspection.

3.22 BASE COMPUTER SYSTEM & SOFTWARE REQUIREMENTS:

The Common Meter reading Instrument (CMRI/Laptop) should be capable of being loaded with user-friendly software (MS-DOS 5.0 or higher version compatible) for reading / downloading meter data. Windows based Base Computer Software (BCS) should be provided for receiving data from CMRI / Laptop and downloading instructions from base computer software to CMRI / Laptop.

The BCS should be compatible at Windows 7/8/8.1/10 (both 32 bit and 64 bit) operating systems and copy righted. The data stored in the meters memory including defrauded energy should be available on the BCS. **Only one BCS should be provided for downloading data andauthenticated command from CMRI/ Laptop**. So that at the time of reading meter should get the authenticated command.

This BCS should have, amongst other requirements, features and facilities described later in this specification, the facility to convert meter-reading data into user definable ASCII file format so that it may be possible for the user to integrate the same with the user's billing data and process the selected data in desired manner. All the data available in the meter including energy, MD, all Transaction data with date and time, New TOD time Zones and history data should be available in BCS after down loading, more over convertible to user defined ASCII file format for integration with third party software. The vendor should supply necessary base computer software for reading / viewing of meter data and converting to user defined ASCII files formats. The user should have the flexibility to select the parameters to be converted into ASCII file. The vendor should also supply the necessary CMRI / Laptop software (during sample testing also).

The bidder has to supply the Meter Reading protocol (API), free of cost. The protocol should not be complicated & should be easily understandable to introduced compatibility between meters, BCS and CMRI of other makes. The bidder shall indicate the relevant standard to which the protocol complies. The compatibility of transferring data from the meter to CMRI & then to the BCS should be easily established. Any change or up gradation of CMRI software of CMRI software or BCS in future, required for any reason, has to be done by the supplier at his own cost.

All transactions should be made at the time of reading. No extra operations will be allowed for transactions. All transactions should be available in downloaded data with date and time stamping.

The same software should be capable of preparing CMRI to read the meter information or to reconfigure the meter for change of TOD timings and / or time setting of the meter etc. The exhaustive on-line help should be available with the software so that user can use all the features of the software by just reading the help contents.
Test for automated Meter reading will be conducted by downloading Meter data through Modem at our system through third party software also.
In BCS 12 months data back-up data for KWh, KVAh, MD & KVA (total & TOD wise), Average load factor, average power factor must be available.
The supplier shall provide at least 10 numbers of meter Reading optical USB probes without any cost.

3.23 ACCURACY:

There shall be no drift in accuracy, for a period of ten years from the date of supply. In case any drift is noticed which is beyond the permissible limits, the bidder shall replace by a new meter without any extra cost.

General Requirements:-

1. **GUARANTEED TECHNICAL PARTICULARS :**

The bidder shall furnish all the necessary information as desired in the Schedule of Guaranteed Technical Particulars and data, appended with this Specification. If the bidder desire to furnish any other information in addition to the details as asked for, the same may be furnished against the last item of this Annexure. – I

2. **TECHNICAL DEVIATIONS :**

Any deviation in Technical Specification as specified in the Specification shall be specifically and clearly indicated in the Schedule of deviation format.

3. **TESTS :**

3.1 Type Testing of Meter

The offered meters should be type tested at any NABL accredited laboratory in accordance with IS i3779 with latest amendments, CBIP Report 325 with latest amendments. The type test report should not be more than 3 (three) years old. A copy of the Type Test results should be enclosed with the offer. If there is any modification in the design / parameters of the specifications or use of constituent materials in the offered meters submitted with the offer, from the meter which was submitted type tested, which may affect the characteristics as well as parameters of the meter, revised type test certificates as per the design, parameters and constituent material used in the offered meter, shall have to be submitted failing which the offer may be liable to be rejected.

Type Test Certificate from any NABL accredited Lab. shall only be considered.
Type test certificate should contain the following information clearly:

1) Type of display or LCD.
2) Class of accuracy.
3) Meter constant.
4) Type of meter.

3.2 Acceptance tests

E) The acceptance tests as stipulated in CBIP / IS (with latest amendments) shall be carried out by the supplier in presence of purchaser's representative at manufacturer premises.

F) Also the following additional tests are to be carried out on one meter randomly selected from each lot offered for inspection / acceptance testing.

xiii. Magnetic induction of external origin (AC & DC)
xiv. Tamper & Fraud protection, as per Clause of 12 of this specification.
xv. Test of endurance upto 120% of Imax, for two hours, followed by verification of limits of error.
xvi. Verification of internal components.
xvii. Dry Heat Test as per IS 13779 / 99, Clause 12.6.1, of one meter from the offered lot is to be arranged by the supplier at any NABL accredited laboratory, at his cost.
xviii. The supplier shall manufacture one extra number of meter from PO Quantity for Dry Heat Test at its own cost.

In case of failure of Meters as specified in Annexure – H of IS-13779 (For A above) the entire lot will be treated as rejected.
In case of failure of any single meter (as per B above) the entire lot will be rejected.

3.3 Routine Tests :

Each and every meter of the offered lot shall undergo the routine tests as well as functional tests as per IS: 13779/1999, CBIP Report 325 and after sealing the meters, the manufacturers will have to submit the routine test report of all the meters as well as a statement showing seal Sl. Nos. against each meter Sl.No. of offered lot in soft copy (MS WORD or EXCEL format), to

(a) The General Manager (Procurement Services Department)
(b) The General Manager (Distribution & Customer Services Department), along with offer letter for acceptance test.

4. TEST FACILITIES :

The tests for equipment / instrument shall be carried out as per relevant Standards and test certificates shall be furnished for scrutiny. The Bidder shall indicate the details of the equipment available with him for carrying out the various tests as per relevant Standards. The bidder shall indicate the sources of all equipments / instruments.

NOTE : The standard meters used for conducting tests shall be calibrated periodically at any NABL Accredited Test Laboratories and test certificates shall be available at Works for verification by purchasers representative.

The manufacturer shall have at least the following testing facilities to ensure accurate calibration:-

- AC high voltage test
- Insulation test
- Test of no load condition
- Test of Starting condition
- Test on Limits of error (Automatic Testing facility with ICT)
- Power loss in voltage and current circuit
- Test of Repeatability of Error (at 100% Ib UPF and 5% Ib UPF. Deviation of Errors should be with in 0.1).

- Test of meter constant
- Test of magnetic influence (As per CBIP 325 & 0.5 T Permanent Magnet)

5. INSPECTION:

The purchaser may carry out the inspection at any stage of manufacture. The manufacturer shall grant free access to the purchaser's representative at a reasonable time when the work is in progress. Inspection and acceptance of any equipment under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing the equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found to be defective.

All acceptance tests and inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the Bidder and purchaser at the time of purchase. The Bidder shall provide all reasonable facilities without charge to the inspector, to satisfy him that the equipment is being furnished in accordance with this specification.

The supplier shall keep the purchaser informed in advance, about the manufacturing programme for each lot so that arrangement can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance / routine testing of the bought out items. The supplier shall give 15 days for local supply / 30 days in case of foreign supply advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine tests.

The purchaser reserves the right to get type test any meter, for meter casing etc. from any of the offered lots, reserve at any destination stores.

6. QUALITY ASSURANCE PLAN :

The design life of the meter shall be minimum 20 years and to prove the design life the firm shall have at least the following quality Assurance Plan: -

- The factory shall be completely dust proof.
- The testing rooms shall be temperature and humidity controlled as per relevant standards.
- The testing and calibrating equipments should be automatic and all test equipment shall have their valid calibration certificates.
- Meter will be tested (in case of lot test) in fully automatic test bench with ICT. No human intervention will be allowed during testing.
- Power supplies used in testing equipment shall be distortion free with sinusoidal wave-forms and maintaining constant voltage, current and frequency as per the relevant standards.

During the manufacturing of the meters the following checks shall be carried out.

iv) Meter frame dimensions tolerances shall be minimum.

v) The assembly of parts shall be done with the help of jigs and fixtures so that human errors are eliminated.

vi) The meters shall be batch tested on automatic, computerized test bench and the results shall be printed directly without any human errors.

The Bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

- Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw materials.
- Information and copies of test certificates in respect of bought out accessories.
- List of manufacturing facilities available.
- Level of automation achieved and lists of areas where manual processing exists.
- List of areas in manufacturing process, where stage inspections are normally carried out of quality control and details of such tests and inspections.
- List of testing equipment available with the bidder for final testing of equipment specified and test-plant limitations, if any, vis-à-vis type, special acceptance and routine tests specified in the relevant standards and this specification. These limitations shall be very clearly brought out in schedule of deviations.

The laboratory of manufacturer must be well equipped for testing of the meters. They must have computerized standard power source and standard equipment calibrated not later than a year (or as per standard practice). The details of testing facilities available for conductingshall be furnished with the bid.

1. The routine tests
2. Acceptance tests

7. MANUFACTURING ACTIVITIES:

All the materials, electronics and power components, ICs used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy.

The manufacturer should use Application Specific Integrated Circuit (ASIC) or Micro controller for metering functions.

The electronic components shall be mounted on the printed circuit board using latest Surface Mounted Technology (SMT) except power components by deploying automatic SMT pick and place machine and re flow solder process. The electronic components used in the meter shall be of high quality **and there shall be no drift in the accuracy of the meter at least up to 10years.** Further, the Bidder should own or have assured access (through hire, lease or sub-contract) of the mentioned facilities. The PCB material should be of glass epoxy FR-4 grade conforming to relevant standards.

All insulating materials used in the construction of meters shall be non-hygroscopic, non-aging and tested quality. All parts that likely to develop corrosion shall be effectively protected against corrosion by providing suitable protective coating.

Quality should be ensured at the following stages:

At PCB manufacturing stage, each board shall be subjected to bare board testing. At insertion stage, all components should undergo testing for conforming to design parameters and orientation. Complete assembled and soldered PCB should undergo functional testing using test equipment's (testing jig).

The calibration of meters shall be done in-house.

The bidder should submit the list of components used in the meter along with the offer. A detailed list of bought-out items, which are used in the manufacture of the meter, should be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought-out items.

The details of testing facilities available for conducting the routine and acceptance tests and other special tests on the meter shall be furnished with the bid. The facility available if any for conducting type test may also be furnished.

8. DOCUMENTATION:

Seventy-five sets of operating manuals shall be supplied to the office of the General Manager (Procurement Services) for distribution at sites.

One set of routine test certificates shall accompany each dispatch consignment.

The acceptance test certificates in case pre-dispatch inspection or a routine test certificate in cases where inspection is waived has to be approved by the purchaser.

9. GUARANTEE:

a) The Meters and Pilfer Proof Meter Boxes shall be guaranteed arising out of faulty design, materials, bad workmanship for a period of **5 and half years** from the date of supply. The meters found defective within the above guarantee period should be replaced by the supplier free of cost within one month on receipt of intimation. If the defective meters are not replaced within the above specified period, BPC will recover twice the cost of meters from the supplier.
Life of battery used for the meter should be guaranteed for **10 years**.
b) Name plate of the meter is to be marked with "Guarantee of the Meter": "5 and half years from the date of supply".

10. REPLACEMENT OF DEFECTIVE METERS :

The meters declared defective by the BPC shall be replaced by the supplier up to the full satisfaction of the BPC at the cost of supplier. Failure to do so within the time limit prescribed shall lead to **imposition of penalty of twice the cost of meter**. The same may lead to black listing even, as decided by BPC. In this connection the decision of BPC shall be final.

11. PACKING & FORWARDING :

The equipment shall be packed in cartons / crates suitable for vertical / horizontal transport as the case may be, and suitable to withstand handling during transport and outdoor storage during transit.

The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbol. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc., shall be provided. Supplier without any extra cost shall supply any material found short inside the packing cases immediately.

The packing shall be done as per the standard practice as mentioned in IS 15707: 2006. Each package shall clearly indicate the marking details (for e.g, manufacturer's name, Sl. Nos. of meters in the package, quantity of meter, and other details as per supply order). However, he should ensure the packing is such that, the material should not get damaged during transit by Rail / Road.

Component Specifications:

The meters shall be designed and manufactured using SMT (Surface Mount Technology) components, except for power supply components, LED / LCD etc., which are PTH type.
All the material and electronic power components used in the manufacture of the meter shall be of highest quality and reputed makes so as to ensure higher reliability, longer life and sustained accuracy.

Sl. No	Component Function / Feature	Requirement	Make / origin
1	Current Element	E-beam /spot welded C.T. shall be provided in the phase element and in the neutral with proper isolation.	Any make or origin conforming to IS-2705
2	Measurement / computing chips	The Measurement / computing chips used in the meter should be with the Surface mount type along with the ASICs.	Analog Devices, AMS, Cyrus Logic, Atmel, SAMES, NEC, Texas Instruments, Phillips, Teridian, Freescale, Renesas.
3	Memory chips	The memory computing chips should not be affected by the external parameters like sparking, high voltage spikes or electrostatic discharges.	Atmel, National Semiconductors, Microchip, Texas Instruments, Phillips, Hitachi, Teridian ,ST, Renesas.
4	Display modules	The display modules should be well protected from the external UV radiations. The display should be clearly visible over an	Haijing, Holtek, Bonafied Technologies,

		angle of at least a cone of 70^0.The construction of the modules should be such that the displayed quantity should not disturbed with the life of display. The display should be TN type industrial grade with extended temperature range.	Advantek, Truly Semiconductor, Hitachi, SONY, Tianma.
5	Communication modules	Communication modules should be compatible for the RS 232 ports	National Semiconductors, Hitachi, Texas Instrument, Philips,HP, Agilent, Everlight, Fairchild, Avago.
6	Optical port	Optical port should be used to transfer the meter data to meter reading instrument. The mechanical construction of the port should be such to facilitate the data transfer easily.	National Semiconductors, Hitachi, Texas Instrument, Siemens, Philips,HP, Agilent, Everlight, Avago.
7	Power Supply	The power supply should be with the capabilities as per the relevant standards. The power supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections.	As specified.
8	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	Philips, Toshiba, Fairchild, Murata, Rohm, Siemens. National Semiconductors, ATMEL, Texas Instruments, Hitachi. Ligitec, OKI, EPCOS
9	Mechanical parts	The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. The other mechanical components should be protected from rust, corrosion etc. by suitable plating / painting methods.	N.A.
10	Battery	Lithium-ion with guaranteed life of 10 years	Renata, Panasonic, Varta, Tedrium, Sanyo, National, Teridian, Duracell, Maxell, Elegance,TekCell, Mitsubishi,Tadiran, EVE.

11	RTC / Micro controller	The accuracy of RTC shall be as per relevant IEC / IS standards	Philips, Dallas, Atmel, Motorola, NEC, Renesas, Hitachi, Xicor, Texas Instruments, NEC or OKI, ST,Mitsubishi, Epson, Teridian, Freescale.

Annexure 4

LOT 5A: HV ABC Fittings

Brand Restricted To: Sicamex Asia Pvt. Ltd., Singapore; Ensto India Pvt. Ltd., India; Niled Sa, France and Raychem RPG (P) Ltd., India; Axis Electrical; IAC Electricals

Sl. #	Parameters	Units	Bidders to fill up						
			Item No.1	Item No.2	Item No.3	Item No.4	Item No.5	Item No.6	Item No. 7
			Hook Bracket assembly for HV ABC	Hook Bolt Assembly for 3Cx95 sq.mm HV ABC	Strain Clamp (50-95 sq.mm)- HV ABC	Suspension Clamp (50-95 sq.mm) SA-HV ABC	Suspension Clamp (50-95 sq.mm) LA-HV ABC	Ins.ten.Joint sleeve (1Cx50 sq.mm)-11 kV ABC	Ins.ten.Joint sleeve (3Cx95 sq.mm)-11 kV ABC
1	Name of manufacturer and country								
3	Applicable Standards								
4	Test voltage for 1 Min	kV							
5	Mechanical Tensile Miminum Load	kN							
6	Material used								

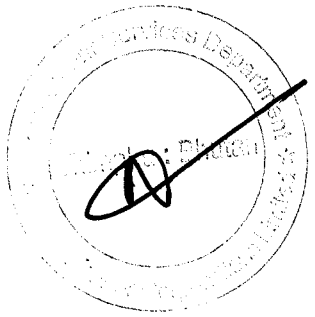
LOT 5B: LV ABC Fittings

Brand Restricted To: Sicamex Asia Pvt. Ltd., Singapore; Ensto India Pvt. Ltd., India; Niled Sa, France and Raychem RPG (P) Ltd., India; Axis Electrical; IAC Electricals

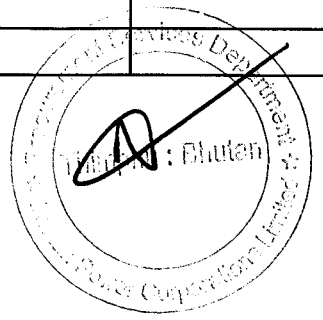
Sl. #	Parameters	Units	Bidders to fill up					
			Item No.1	Item No.2	Item No.3	Item No.4	Item No.5	Item No.6
			Hook Bolt Assembly for LV ABC	Hook Bracket assembly for LV ABC	Strain Clamp /dead end clamp (2Cx50 sq.mm) LV ABC	Strain Clamp /dead end clamp (4Cx50 sq.mm) LV ABC	Strain Clamp /dead end clamp (4Cx95 sq.mm) LV ABC	Strain Clamp /dead end clamp (4Cx120 sq.mm)
1	Name of manufacturer and country							
3	Applicable Standards							
4	Test voltage for 1 Min	kV						
5	Mechanical Tensile Miminum Load	kN						
6	Material used							

(Separate GTP sheet for IPC (Insulation Piericing Connectors))

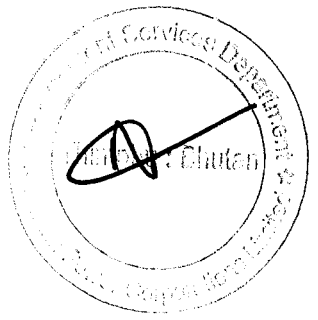
Sl. #	Parameters	Units	Bidders to fill up			
			Item No.23	Item No.24	Item No.25	Item No.26
			Insulation tension jointing sleeves for 50 sqmm	Suspension clamp-small angle for 4x50 sqmm LV ABC	Suspension clamp-large angle for 4x95 sqmm LV ABC	Suspension clamp (SA) for 4Cx120sqmm
1	Name of manufacturer and country					
3	Applicable Standards					
4	Test voltage for 1 Min	kV				
5	Mechanical Tensile Miminum Load	kN				
6	Material used					



Price Schedule							
Sl.No.	**Material No.**	**Description**	**UoM**	**Qty**	**Brand and Country of Origin**	**Unit Price DDP (Nu.)**	**Amount DDP (Nu.)**
Lot. 1 ABC & AAAC Conductors							
1	172	HV ABC 6.35/11kV grade 3 core, 95sqmm	KM	8.50			
2	5451	HV ABC 6.35/11kV grade 3 core, 50sqmm	KM	0.74			
3	174	LV ABC Conductor for 2x50 sqmm	KM	87.97			
4	175	LV ABC Conductor 2 core, 95sqmm	KM	2.00			
5	178	LV ABC Conductor for 4x50 sqmm	KM	106.36			
6	179	LV ABC Conductor for 4x95 sqmm	KM	39.87			
7	180	LV ABC Conductor 4 core, 120sqmm	KM	9.04			
8	629	Covered AAAC 111 sq.mm	KM	6.00			
Lot. 2 ACSR Conductors							
1	182	ACSR Conductor (Rabbit)-50sqmm	KM	145.32			
2	183	ACSR Conductor (Dog)-100sqmm	KM	22.57			
3	184	ACSR Conductor (Wolf)-150sqmm	KM	2.50			
Lot. 3 XLPE Cables							
1	3	Arm. Al cable 3Cx70sqmm, XLPE Ins, 11kV	M	30.00			
2	5	Arm. Al Cable 3Cx150sq.mm, XLPE Insulated	M ✓	5,155.00			
3	6	Arm. Al cable 3Cx185sqmm, XLPE Ins, 11kV	M	150.00			
4	8	Arm. Al Cable 3Cx300sq.mm, XLPE Insulated	M ✓	4,195.00			
5	62	Arm. Al Cable 3Cx150sq.mm, XLPE Insulated	M ✓	1,940.00			
6	990	Arm. Al cable 1Cx630sqmm, XLPE Ins, 33kV	M	250.00			



Price Schedule							
Sl.No.	**Material No.**	**Description**	**UoM**	**Qty**	**Brand and Country of Origin**	**Unit Price DDP (Nu.)**	**Amount DDP (Nu.)**
Lot. 4 PVC Cables							
1	25	Arm. Al Cable 4Cx16sqmm PVC Insulated	M	250.00			
2	26	Arm. Al Cable 4Cx25sqmm PVC Insulated	M	770.00			
3	28	Arm. Al Cable 4Cx50sqmm PVC Insulated	M	800.00			
4	30	Arm. Al Cable 4Cx70sqmm PVC Insulated	M	8,757.00			
5	32	Arm. Al Cable 4Cx95sqmm PVC Insulated	M	2,030.00			
6	34	Arm. Al Cable 4Cx120sqmm PVC Insulated	M	250.00			
7	35	Arm. Al Cable 4Cx150sqmm PVC Insulated	M	2,760.00			
8	38	Arm. Al Cable 4Cx240sqmm PVC Insulated	M	390.00			
9	39	Arm. Al Cable 4Cx300sqmm PVC Insulated	M	5,392.00			
10	40	Arm. Al Cable 4Cx400sqmm PVC Insulated	M	2,176.00			
11	956	Arm Al Cable 1 C, 400sqmm PVC Insulated	M	4,000.00			
12	81	Arm. Cu Cable 2Cx10sqmm PVC Insulated	M	13,080.00			
13	107	UnArm. Cu Cable 2Cx6sqmm PVC Insulated	M	691.00			



Guaranteed Technical Particulars (GTP) *is* required as follows:

Sl. No.	Item Description	Remarks
1	ABC & AAAC Conductors	*Yes*
2	ACSR Conductors	*Yes*
3	XLPE Cables	*Yes*
4	PVC Cables	*Yes*
5A	HV ABC Fittings	*Yes*
5B	LV ABC Fittings	*Yes*
6	Energy Meters	*Yes*
7	CT Ring	*Yes*
8	Cable Jointing Kits & Cable Glands	*yes*
9	Copper Wires	*No*
10	Paints	*Yes*
11	Transformer Spare Parts & Line Materials	*No*

a) The minimum technical specification (where ever required) as indicated in price schedule are detailed out in respective Annexure for respective items under the lot. Any technical deviation shall be brought out in the GTP forms for the items where GTP forms are provided and for the items where GTP forms are not required, the deviation shall be brought out in the deviation sheet provided. If the deviations are not mentioned in GTP and deviation sheet provided, the specification shall be considered as complied with the requirement.

b) The bid for that item(s)/Lot(s) shall be rejected if the GTP is not submitted as specified in Section V, Schedule of Supply where GTP Forms are provided. The catalogue/brochures of the items shall not be considered as GTP of the item.

d) For the item(s)/Lot(s) of which GTP forms are not provided in Section V, Schedule of Supply of the bidding document, the bidders are requested to submit the catalogue or drawings for individual items. The offered items shall be clearly indicated in the catalogue.

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Bhutan Power Corporation Limited
(An ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified Company)
Registered Office, Thimphu
Procurement Services Department
Thimphu: Bhutan

BPC/PSD/2021 Materials/2020/09/ 327 September 9, 2020

Subject: Addendum No. 2

Reference: BPC/PSD/2021 Materials/2020/09 dated August 15, 2020

Dear Sir,

This is to inform all the bidders that BPC would like to make the following amendments in the above referred bid document.

A. Bid Data Sheet:

1. Under ITB 20.2 (BDS), Guaranteed Technical Particulars is required as follows:

i. **For Lot # 5B (LV ABC Fittings)**: GTP is Required for all items except item no. 7 (Stainless Steel Strip), item # 8 (Stainless Steel Buckle, 20x0.7 mm) and item # 9 (Set of terminal caps for 120 sq.mm)

ii. **For Lot # 7 (CT Ring)**: GTP is Required for all items except item # 7 (Met Grip Seal)

iii. **For Lot # 8 (Cable Jointing Kits & Cable Gland):** Required for all items except item # 40 (11 kV cable route marker with nut and bolt), item # 41 (33 kV cable route marker with nut and bolt), item # 42 (Double Compression Gland for 4 core, 150 mm2 cable), item # 43 (Double Compression Gland for 4x185 mm2 cable), item # 44 (Double Compression Gland for 4x240 mm2 cable), item # 45 (Double Compression Gland for 4x300 mm2 cable) and item # 46 (Double Compression Gland for 4x400 mm2 cable)

2. Under ITB 25.1 (BDS), the bid submission date is extended to 24th September, 2020 at 10: 00 Hours

3. Under ITB 29.1 (BDS), the bid opening is extended to 24th September, 2020 at 10.30 Hours.

B. Price Schedule:

1. **For Lot # 6 (Energy Meters)**: The Avon Meters Pvt. Ltd. is included under the restricted brand for the lot.

Procurement Services Department ★ Thimphu : Bhutan ★ Bhutan Power Corporations Limited

Phone: +975-2-326289; Fax: +975-2-333583; Box 580; E-mail: psd@bpc.bt; web: www.bpc.bt

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Bhutan Power Corporation Limited
(An ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified Company)
Registered Office, Thimphu
Procurement Services Department
Thimphu: Bhutan

2. **For Lot # 8 (Cable Jointing Kits and Cable Gland):** Item # 46 – Double compression gland for 4 x 300 sq.mm has been deleted and the revised price schedule is attached as Annexure – I.

C. Instructions to Bidders:
1. The missed out ITB (Instructions to Bidders) is attached as annexure -II

Bidders are advised to note the above changes and quote accordingly. And all the other terms and condition shall remain same.

Yours sincerely,

(Nim Dorji)
General Manager

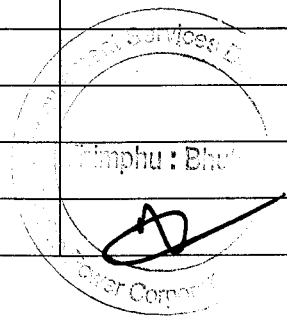
Procurement Services Department ★ Thimphu : Bhutan ★ Bhutan Power Corporations Limited

Phone: +975-2-326289; Fax: +975-2-333583; Box 580; E-mail: psd@bpc.bt; web: www.bpc.bt

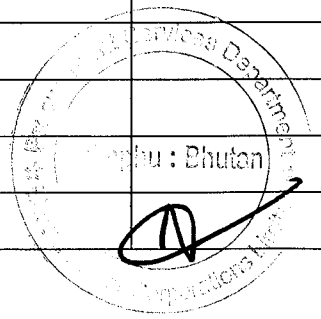
Annexure I

Price Schedule

Material No.	Sl. No.	Description	UoM	Qty	Brand and Country of Origin	Rate DDP (Nu.)	Amount DDP (Nu.)
Lot No. 8 (Cable Jointing Kits & Cable Glands)							
404	1	ID Termination kit for 3X50sqmm 11kV	SET	6.00			
405	2	ID Termination kit for 3X70sqmm 11kV	SET	21.00			
406	3	ID Termination kit for 3X95sqmm 11kV	SET	10.00			
410	4	Shrinkable cable termination kit 3cx150sqmm (ID) 11KV	SET	64.00			
412	5	ID Termination kit for 3X185sqmm 11kV	SET	8.00			
415	6	ID Termination kit for 3X300sqmm 11kV	SET	58.00			
409	7	ID Termination kit for 3X150sqmm 33kV	SET	26.00			
411	8	ID Termination kit for 3X185sqmm 33kV	SET	12.00			
414	9	ID Termination kit for 3X300sqmm 33kV	SET	16.00			
1527	10	I/D Termination Kit 1x630sqmm XLPE 33kV	NO	9.00			
422	11	OD Termination kit for 1X50sqmm 11kV	SET	6.00			
426	12	OD Termination kit for 3X70sqmm 11kV	SET	22.00			
427	13	OD Termination kit for 3X95sqmm 11kV	SET	10.00			
428	14	OD Termination kit for 3X95sqmm 11kV ABC	SET	48.00			
432	15	Shrinkable cable termination kit 3cx150sqmm (OD) 11KV	SET	55.00			
434	16	OD Termination kit for 3X185sqmm 11kV	SET	9.00			
435	17	OD Termination kit for 3X240 sqmm 11kV	SET	5.00			
437	18	OD Termination kit for 3X300sqmm 11kV	SET	77.00			
429	19	Shrinkable cable termination kit 3cx120 sqmm (OD) 33KV	SET	3.00			
431	20	OD Termination kit for 3X150sqmm 33kV	SET	45.00			



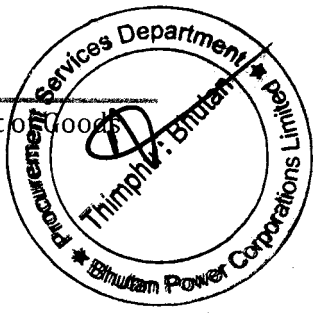
Material No.	Sl. No.	Description	UoM	Qty	Brand and Country of Origin	Rate DDP (Nu.)	Amount DDP (Nu.)
Lot No. 8 (Cable Jointing Kits & Cable Glands)							
433	21	OD Termination kit for 3X185sqmm 33kV	SET	11.00			
436	22	OD Termination kit for 3X300sqmm 33kV	SET	33.00			
1427	23	O/D Termination Kit 1x630sqmm XLPE 33kV	NO	9.00			
443	24	St. thr. Jointing kit for 3X70sqmm 11kV	SET	54.00			
444	25	ST.Through Jointing kit for 3X95sqmm 11kV	SET	65.00			
446	26	St. thr. Jointing kit for 3X150sqmm 11kV	SET	47.00			
448	27	St. thr. Jointing kit for 3X240qmm 11kV	SET	7.00			
450	28	St. thr. Jointing kit for 3X300sqmm 11kV	SET	57.00			
445	29	St. thr. Jointing kit for 3X150sqmm 33kV	SET	29.00			
447	30	St. thr. Jointing kit for 3X185sqmm 33kV	SET	3.00			
449	31	St. thr. Jointing kit for 3X300sqmm 33kV	SET	25.00			
455	32	St. through Jointing kit for 4X50sqmm	SET	5.00			
456	33	St. through Jointing kit for 4X70sqmm	SET	15.00			
457	34	St. through Jointing kit for 4X95sqmm	SET	16.00			
459	35	St. through Jointing kit for 4X150sqmm	SET	18.00			
460	36	St. through Jointing kit for 4X240sqmm	SET	8.00			
461	37	ST.Through Jointing kit for 4X300sqmm	SET	57.00			
462	38	St. through Jointing kit for 4X400sqmm	SET	40.00			
5550	39	St.through jointing kit 1CX400sqmm 1.1kV	SET	10.00			
419	40	11KV Cable route marker with nut & bolts	NO	152.00			
420	41	33KV Cable route marker with nut & bolts	NO	20.00			



Material No.	Sl. No.	Description	UoM	Qty	Brand and Country of Origin	Rate DDP (Nu.)	Amount DDP (Nu.)
Lot No. 8 (Cable Jointing Kits & Cable Glands)							
399	42	Double compression gland for 4 core 150 sq.mm cable	SET	110.00			
400	43	Double compression gland for 4x185 sq.mm cable	SET	2.00			
401	44	Double compression gland for 4x240 sq.mm cable	SET	2.00			
402	45	Double compression gland for 4x300 sq.mm cable	SET	150.00			
403	46	Double compression gland for 4x400 sq.mm cable	SET	50.00			
Total Amount (Nu.)							

Procurement Services Department
Thimphu : Bhutan
Power Corporation Limited

PART 1- Bidding Procedures



Section I. Instructions to Bidders

Table of Contents

Section I. Instructions to Bidders

A. General

1. Scope of Bid

1.1 The Purchaser, as indicated in the Bid Data Sheet (BDS), issues these Bidding Documents for the supply of Goods and Services incidental thereto as specified in Section V, Schedule of Supply. Tender number and tender description, lot numbers and lot description are provided in the BDS.

1.2 All bids are to be completed and returned to the Purchaser in accordance with these instructions to the bidders.

1.3 Throughout this Bidding Document :

a. the term "in writing" means communicated in written form with proof of receipt;

b. if the context so requires, singular means plural and vice versa; and

c. "day" means calendar day

2. Fraud and Corruption

2.1 It is Corporation policy to require that Purchasers, Bidders and Suppliers observe the highest standards of ethics during the procurement and execution of contracts.[1] In pursuance of this policy, the Corporation:

a. defines, for the purposes of this provision, the terms set forth below as follows:

i. "Corrupt practice"[2] is the offering, giving, receiving or soliciting, directly or indirectly, of anything of value[3] to influence improperly the actions of another party;

ii. "Fraudulent practice"[4] is any intentional act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

iii. "Collusive practice"[5] is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;

iv. "Coercive practice"[6] is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;

[1] In this context, any action taken by a Bidder, and Supplier to influence the procurement process or contract execution for undue advantage is improper.
[2] "another party" refers to a Corporation official acting in relation to the procurement process or contract execution. In this context, "Corporation official" includes employees of BPC taking or reviewing procurement decisions.
[3] "anything of value" includes, but is not limited to, any gift, loan, fee, commission, valuable security or other asset or interest in an asset; any office, employment or contract; any payment, discharge or liquidation of any loan, obligation or other liability whatsoever, whether in whole or in part; any other services, favour or advantage, including protection from any penalty or disability incurred or apprehended or from any action or proceeding of a disciplinary or penal nature, whether or not already instituted and including the exercise or the forbearance from the exercise of any right or any official power or duty.
[4] a "party" refers to a Corporation official; the terms "benefit" and "obligation" relate to the procurement process or contract execution; and the "act or omission" is intended to influence the procurement process or contract execution.
[5] "parties" refers to participants in the procurement process (including corporation officials) and an "improper purpose" includes attempting to establish bid prices at artificial, non-competitive levels.
[6] a "party" refers to a participant in the procurement process or contract execution.

		v.	"Obstructive practice" is	
			aa.	deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to impede any investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or
			bb.	acts intended materially to impede the exercise of the inspection and audit rights of the Purchaser or any person appointed by the Purchaser and/or any relevant agency provided for under ITB Sub-Clause 2.1 (d) below.
	b.	will reject a proposal for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive or obstructive practices in competing for the contract in question;		
	c.	will sanction a firm or individual, including declaring them ineligible, either indefinitely or for a stated period of time, to be awarded contract if it at any time determines that they have, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive or obstructive practices in competing for, or in executing contract;		
	d.	will have the right requiring Bidders and Suppliers to permit the Purchaser, any agency or person appointed by the Purchaser to inspect their accounts and records and other documents relating to their Bid submission and contract performance and to have them audited by auditors appointed by the Purchaser;		
	e.	requires that Bidders, as a condition of admission to eligibility, execute and attach to their bids an Integrity Pact Statement in the form provided in Section IV, Bidding Forms. Failure to provide a duly executed Integrity Pact Statement shall result in disqualification of the Bid; and		
	f.	will report any case of corrupt, fraudulent, collusive, coercive or obstructive practice to the relevant RGoB agencies, including but not limited to the Anti-corruption Commission (ACC) of Bhutan, for necessary action in accordance with the statutes and provisions of the relevant agency.		
3.	**Eligible Bidders**			
3.1	The Invitation for bids is open to all Manufacturers/Export House/Authorized Dealers from outside Bhutan and to Manufacturers/Authorized Dealers/National Suppliers licensed under the Ministry of Economic Affairs of Royal Government of Bhutan (Supporting evidence to corroborate the claim must be enclosed).			
3.2	A Bidder shall not be eligible who have a conflict of interest. All Bidders found to have a conflict of interest shall be disqualified. Bidders are considered to have a conflict of interest in this bidding process if they:			
	a.	are associated, or have been associated in the past, with a firm or any of its affiliates which has been engaged by the Purchaser to provide consulting services for the preparation of the design, specifications and/or other documents to be used for the procurement of the Goods to be purchased pursuant to these Bidding Documents, or		

	b.	employ or otherwise engage, either directly or through any of their affiliates, a family member of a Corporation who either is employed by the Purchaser or has an authority over it. For the purposes of this Sub-Clause a family member is defined as parents, spouse and children as mentioned in the Service Record of the employee.

4.	**Exclusion of Bidders**	
4.1	A bidder shall be excluded from participating in a procurement procedure under the following circumstances who:	
	a.	is suspended/debarred by any Statutory Agencies in Bhutan or in the region to Corporation's knowledge;
	b.	has been declared bankrupt, judgment or pending legal action that could impair operating as a going concern;
	c.	has been found guilty of professional misconduct by a recognised tribunal;
	d.	has not fulfilled his obligations with regard to any statutory dues;
	e.	is or has been guilty of serious misrepresentation in supplying information required under this Section.
	f.	is debarred from participation in any public procurement by any Competent Authority as per law;
	g.	does not qualify under the performance assessed through the Vendor Performance Management System of the Corporation;
	h.	as a matter of law or official regulation, Royal Government of Bhutan prohibits commercial relations with the country in which the Bidder is constituted, incorporated or registered.

5.	**Vendor Performance Management System (VPMS)**
5.1	The performance of the vendor shall be assessed as per the guidelines contained in the Vendor Performance Management System available in BPC website (www.bpc.bt) for the purpose of determining the eligibility in participating in subsequent tenders.
5.2	The VPMS acceptance form is provided in the Section IV, Bidding Forms of the bidding documents. The bidders are required to sign VPMS Acceptance Form agreeing to the applicability of VPMS. In case the VPMS Acceptance Form is not signed, the bid for that bidder shall be liable for rejection.

6.	**Joint Ventures (JV)**	
6.1	Bids submitted by a Joint Venture of two or more Companies as partners shall comply with the following requirements:	
	a.	the Bid, and in case of successful Bid, the Contract form, shall be signed so as to be legally binding on all partners;
	b.	one of the partners shall be authorized to be in charge; and this authority shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all the partners;
	c.	the partner in charge shall be authorized to incur liabilities, receive payments and receive instructions for and on behalf of any or all partners of the joint venture;

	d.	all partners of the joint venture shall be liable jointly and severally for the execution of the Contract in accordance with the Contract terms, and a relevant statement to this effect shall be included in the authorization mentioned under (b) above as well as in the Bid Form and the Form of Agreement (in case of a successful Bid); and
	e.	a copy of the registration certificate/license of joint venture shall be submitted with the Bid;

B. Contents of Bidding Documents

7. Sections of Bidding Documents	
7.1	The Bidding Document consist of Parts 1, 2, and 3, which include all the Sections indicated below, and should be read in conjunction with any Addenda issued in accordance with ITB 9.
	PART 1 Bidding Procedures • Section I. Instructions to Bidders (ITB) • Section II. Bid Data Sheet (BDS) • Section III. Evaluation and Qualification Criteria • Section IV. Bidding Forms **PART 2 Supply Requirements** • Section V. Schedule of Supply **PART 3 Conditions of Contract and Contract Forms** • Section VI. General Conditions of Contract (GCC) • Section VII. Special Conditions of Contract (SCC) • Section VIII. Contract Forms
7.2	The Purchaser is not responsible for the completeness of the Bidding Document and its addenda, if they were not obtained directly from the Purchaser.
7.3	The bidder is expected to examine the bidding documents, including all instructions, forms, terms and specifications. Failure to furnish all information required by the bidding documents or submission of a bid not substantially responsive to the Bidding Documents in every respect would result in the rejection of that Bid.
8. Clarification of Bidding Documents	
8.1	The bidders shall not be allowed to seek any clarifications on the bidding documents in person or through any verbal communications.
8.2	Prospective bidders requiring any further information or clarification of the bidding documents may notify the Purchaser in writing at the Purchaser's mailing address indicated in the BDS. The Purchaser will respond in writing to any request for information or clarification of the bidding documents, which it receives no later than 10

	(ten) days prior to the deadline for the submission of Bids prescribed by the Purchaser. The Purchaser's response (including an explanation of the query) will be sent in writing to all prospective bidders who have purchased the Bidding Documents.
8.3.	Pre bid meeting shall be conducted if necessary to clarify doubts and concerns of the bidders prior to submission of bids. Minutes of the pre bid meeting shall be circulated to all bidders that have purchased bidding documents and shall form an integral part of the bidding document.
9. Amendment of Bidding Documents	
9.1	At any time prior to the deadline for submission of bids, the Purchaser may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the Bidding Documents by addendum.
9.2	The addendum shall be part of the Bidding Documents and shall be notified in writing to all prospective bidders who have purchased the Bidding Documents. Such addendum shall be binding and shall require that prospective Bidders confirm receipt of it before the time established for the opening of Bids.
9.3	In order to afford prospective bidders reasonable time in which to take the addendum into account in preparing their Bids, the Purchaser may, at its discretion, extend the deadline for the submission of Bids.
9.4	Prospective bidders who may have downloaded the bidding documents from the website, the corrigendum to the bidding documents will also be published on the web site. It will be the responsibility of such bidders to regularly visit the website for any addendum to the bidding documents until the last date of bid submission. Purchaser shall in no way be responsible for any ignorance of the bidder about the addendum to the bidding documents.
C. Preparation of Bids	
10. Cost of Bidding Documents	
10.1	The bidder shall bear all costs associated with the preparation and delivery of its bid and the Purchaser will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.
10.2	Prospective bidders who may have downloaded the bidding documents from the web site should register with Purchaser on or before the closing of Bid Sale Date and make payment for the cost of the bid documents.
11. Language of Bid	
11.1	The Bid and all correspondence and documents relating to the Bid exchanged by the bidder and the Purchaser shall be written in the language specified in the BDS. Supporting documents and printed literature that are part of the Bid may be in another language provided they are accompanied by an accurate translation of the relevant passages in language specified in BDS, in which case, for purposes of interpretation of the Bid, *such* translation shall govern.
12. Documents Comprising the Bid	
12.1	The Bid shall comprise the following:
	a. Bid Form and Price Schedules completed in accordance with ITB13, 14,16 and 17;

	b.	Documentary evidence establishing in accordance with ITB 18, that the bidder is eligible to bid.
	c.	Documentary evidence establishing in accordance with ITB 19, that the bidder is qualified to perform the Contract if its Bid is accepted;
	d.	Documentary evidence establishing in accordance with ITB 20, that the goods to be supplied by the bidder conform to the Bidding Documents;
	e.	Bid security furnished in accordance with ITB 22;
	f.	Written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 23;
	g.	Alternative bids, if permissible, in accordance with ITB 15;
	h.	Integrity Pact Statement, in accordance with ITB 2.1(e);
	i.	VPMS acceptance form, in accordance with ITB 5; and
	j.	Any other document required as per the bidding documents.
13.	**Bid form**	
13.1	The bidder shall complete the Bid Form furnished in Section IV, Bidding Forms. 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. A bid in which the bid form is not duly filled, signed and sealed by the bidder shall be rejected.	
14.	**Price Schedules**	
14.1	The bidder shall complete the appropriate Price Schedule included herein, stating the unit prices, total price per item, the total amount and the expected countries of origin of the Goods to be supplied under the Contract. This Price Schedules form must be completed without any alterations to its format, and no substitutes shall be accepted.	
15.	**Alternative Bids**	
15.1	Unless otherwise indicated in the **BDS**, alternative bids shall not be considered.	
16.	**Bid Prices and Discounts**	
16.1	The prices and discounts quoted by the Bidder in the Bid Form and in the Price Schedules shall conform to the requirements specified below.	
16.2	All lots and items must be listed and priced separately in the Price Schedules.	
16.3	The price to be quoted in the Bid Form shall be the total price of the Bid excluding any discounts offered.	
16.4	The Bidder shall quote any unconditional discounts and the methodology for their application in the Bid Form. The discount letter offer shall be accepted only when enclosed inside the main envelope of the bidding document.	
16.5	The terms EXW, CIF, CIP, DDP and other similar terms shall be governed by the rules	

	prescribed in the current edition of Inco terms, published by The International Chamber of Commerce, at the date of the Invitation for Bids or as specified in the **BDS**.			
16.6	Prices shall be quoted as specified in each Price Schedule included in Section IV, Bidding Forms. The disaggregation of price components shall be solely for the purpose of facilitating the comparison of Bids by the Purchaser. This shall not in any way limit the Purchaser's right to contract on any of the terms offered:			
	a.	For Goods manufactured in Bhutan:		
		i.	the price of the Goods, quoted ex works, ex-factory, ex-warehouse, ex showroom or off-the-shelf, as applicable, including all Customs duties and sales and other taxes already paid or payable on the components and raw material used to manufacturer or assembly of Goods, if specified in BDS;	
		ii.	any Bhutan sales and other similar taxes which will be payable on the Goods if the contract is awarded to the Bidder, if specified in BDS; and	
		iii.	the total price for the item.	
	b.	For Goods to be offered from outside Bhutan:		
		i.	the price of the Goods, quoted CIP/DDP place of entry in Bhutan, as specified in BDS;	
		ii.	custom duties and any other taxes which will be payable on the Goods in Bhutan, if specified in BDS;	
		iii.	the cost of inland transportation, insurance and other local costs incidental to delivery of the Goods from the port of entry to their final destination, if specified in BDS; and	
		iv.	the total price for the item.	
	c.	For Related Services, other than inland transportation and other services required to convey the Goods to their final destination, whenever such Related Services are specified in Section V, Schedule of Supply:		
		i.	the price of each item compromising the Related Services (inclusive of any applicable taxes).	
16.7	Prices quoted by the Bidder shall be fixed during the Bidder's performance of the Contract and not subject to variation on any account, unless otherwise specified in the BDS. A bid submitted with an adjustable price quotation shall be treated as non-responsive and shall be rejected pursuant to ITB 33 unless adjustable price quotations are permitted by the BDS. If, in accordance to BDS, prices quoted by the Bidder shall be subject to adjustments during the performance of the Contract, a Bid submitted with a fixed price quotation shall not be rejected, but price adjustment shall be treated as zero.			
16.8	If so indicated pursuant to ITB 1.1, Bids are based on Lots/Packages, for which all goods are grouped in lots for easy identification. For the purpose of bidding and inventory management, related SKUS shall be grouped under specific lots like transformers, conductors, cables and fabrication items or in the manner most advantageous to the BPC for a particular tender. Bidders shall have the option of submitting a proposal on any or all LOTS. Each lot consists of items grouped in packages. Unless otherwise indicated in the BDS, prices quoted shall correspond to one hundred percent (100%) of the items specified for each lot and to one hundred percent (100%) of the quantities for each item of a lot. Bidders can offer any price reduction (discount) for any or all Lots and shall specify in their Bid the price reductions			

	applicable to each Lot, or for all the Lots. Price reductions or discounts shall be submitted in accordance with ITB 16.4.
17.	**Bid Currencies**
17.1	Bid Prices shall be quoted in Ngultrum for goods offered from Bhutan, in Indian Rupees for goods offered from India; and in US dollar/major foreign currencies for goods offered from other Countries. Bid Prices expressed in Indian currency and US Dollars/major foreign currencies shall be accepted and evaluated in accordance to ITB 37. For bid evaluation purpose the exchange rate will be based on the Telegraphic Transfer (TT) selling rate published by the Royal Monetary Authority of Bhutan on the day of bid opening. For bid expressed in Indian currency and US Dollars/major foreign currencies, payments shall be made in equivalent Ngultrum through banking channel and the responsibilities of payment transfer and transfer charges lie on the Suppliers.
18.	**Documents Establishing Eligibility of the Bidder**
18.1	The bidder shall furnish, as part of its Bid, certification establishing the bidder's eligibility to bid pursuant to ITB 3.
18.2	The necessary documents and literatures viz. ISO Certificate, Type Test Certificates and Lists of Past Performance Certificates from the users must be submitted for new makes/brands introduced in Bhutan.
18.3	If the Bidder is JV in accordance with ITB 6, a copy of the registration certificate/license shall be submitted.
19.	**Documents Establishing Qualifications of the Bidder.**
19.1	The documentary evidence of the Bidder's Qualification to Perform the Contract, if its bid is accepted, shall establish to the purchaser's satisfaction:
	a. That, if required by the BDS, a Bidder is not a manufacturer or otherwise produce the goods it offers to supply, shall submit the Manufacturer's Authorization using the form included in Section IV, Bidding Forms to demonstrate that it has been duly authorized by the' manufacturer or producer of the Goods to supply these Goods in Bhutan;
	b. That, if required by the BDS, in the case of a bidder not doing business in Bhutan, the Bidder is, or will be (if the contract is awarded to it), represented by authorised representative in Bhutan equipped and able to carry out the Supplier's maintenance, repair and spare parts-stocking obligations prescribed in the Conditions of Contracts and/or Technical Specifications.
	c. That the Bidder meets each of the qualification criteria specified in Section III, Evaluation and Qualification Criteria.
20.	**Documents Establishing the Goods' Conformity to the Bidding Documents.**
20.1	To establish the conformity of the Goods to the Bidding Documents, the Bidder shall furnish as a part of its Bid, the documentary evidence that the Goods conform to the technical specifications and standards specified in Section V, Schedule of Supply.

20.2	The documentary evidence may be in the form of literature, drawings or data, and shall consists of a detailed item by item description of the essential technical and performance characteristics of Goods. If required by the BDS, the bidders are required to confirm and sign on the guaranteed technical particulars of the goods (GTPS) that is indicated in the Section V, Schedule of Supply. Any deviations from the indicated specifications must be clearly indicated in the deviation schedule, Section IV, Bidding Form.
20.3	If required, the Bidder shall also furnish a list giving full particulars, including available sources and current prices, of all spare parts, special tools, etc., necessary for the proper and continuing functioning of the Goods.
20.4	Standards for workmanship, material and equipment, and references to brand names or catalogue numbers, specified by the Purchaser in Section V, Schedule of Supply, are intended to be descriptive only and not restrictive. The bidder may offer other standards of quality, brand names and/or catalogue numbers in its Bid, provided that it demonstrates to the Purchaser's satisfaction that the substitutions are equivalent or superior to those designated in Section V, Schedule of Supply with the exception in strategic critical and strategic security items category.
20.5	In order to prove that the Goods offered are of acceptable quality and standard, the bidders shall furnish the documentary evidence that the Goods offered have been in production and all relevant catalogues, test certificates, ISO certificates, list of previous clients, value of business and company or manufacturer profile for all new brands are submitted.
21.	**Period of Validity of Bids**
21.1	Bids shall remain valid for the period specified in the BDS days from the date of bid opening prescribed by the Purchaser, pursuant to ITB 28. A bid valid for a shorter period shall be rejected by the Purchaser as non-responsive.
21.2	In exceptional circumstances, prior to the expiration of the bid validity period, the Purchaser may solicit bidder's consent to an extension of the period of bid validity. The request and the responses thereto shall be made in writing. If the bidder agrees to the extension request, the validity of the bid security provided under ITB 22 shall also be suitably extended. In the event the Bidder refuses the request, the bid shall be disqualified without forfeiting the bid security. Bidders granting the request shall not be required or permitted to modify its Bid.
22.	**Bid Security**
22.1	The bidder shall furnish, as part of its Bid, a Bid Security in original form, denominated in Ngultrum or a freely convertible currency and in amount specified in the BDS.
22.2	The Bid Security shall be in one of the following forms acceptable to the purchasers:
	a. Unconditional bank guarantee issued by a reputed Financial Institution acceptable to the Purchaser in the Bid Security Form included in Section IV Bidding Form or another form acceptable to the Purchaser.
	b. Banker's cheque/ cash warrant.

	c.	Demand draft.	
	d.	If the institution issuing the Bid Security furnished by the Bidder is located outside the Purchaser's country, the Bid Security shall be counter guaranteed by a correspondent financial institution located in the Purchaser's country to make it enforceable,	
22.3	The Bid Security shall be valid for period of thirty (30) days beyond the validity period of the Bids as specified in BDS.		
22.4	Any Bid not secured in accordance with ITB 22.1, 22.2 and 22.3 above shall be rejected by the Purchaser as non-responsive.		
22.5	An unsuccessful bidder's bid security will be discharged/returned within fifteen (15) days after signing of the Contract with the successful Bidder.		
22.6	The successful bidder's bid security will be discharged/returned upon furnishing the performance security, pursuant to ITB 46 and the bidder's executing the Contract, pursuant to ITB 47 .		
22.7	The bid security may be forfeited:		
	a.	If a bidder withdraws its Bid during the period of bid validity specified by the bidder on the Bid Form, except as provided in ITB 21.2;	
	b.	If a bidder does not accept arithmetical corrections of its bid price;	
	c.	In the case of a successful bidder, if the bidder fails	
		i.	To sign the Contract in accordance with ITB 47; or
		ii.	To furnish the performance security in accordance with ITB 48.
22.8	The Bid Security of a JV must be from the JV that submits the Bid.		
23.	**Formats and Signing of Bid**		
23.1	The Bidder shall prepare one original of the documents comprising the Bid as described in ITB 12 and clearly mark it as "Original ". In addition, the Bidder shall submit copies of the Bid, in the number specified in the BDS and clearly mark them "COPY". In the event of any discrepancy between the original and the copies, the original shall prevail.		
23.2	The original and all copies of the Bid shall be typed or written in indelible ink and shall be signed by the bidder or a person(s) duly authorized to sign on behalf of the bidder. Written power-of-attorney shall indicate such authorization and shall be attached to the Bid. The name and position held by each person signing must be typed or printed below the signature.		
23.3	The Bid shall contain no interlineations, erasures or overwriting except as necessary to correct errors made by the bidder, in which case such correction shall be initialled by the person or persons signing the Bid.		

D. Submission and Opening of Bids

24. Submission, Sealing and Marking of Bids

24.1 Bids shall be delivered by hand, courier or registered post. The Bidder shall seal the original of the Bid and the number of copies stipulated in the BDS, including alternative Bids if permitted in accordance with ITB 15 in separate inner envelopes contained within one outer envelope. All envelopes shall be sealed with adhesive or other sealant to prevent reopening.

24.2 The inner envelopes shall:

a. Be sealed and bear the name of the Bidder.

b. Be marked "ORIGINAL", "ALTERNATIVE" (if any) and "COPY".

24.3 The outer envelope shall:

a. Be marked "Confidential";

b. Bear the name and address of the Bidder;

c. Be addressed to the Purchaser in accordance with ITB 25.1;

d. Bear the identification number pursuant to ITB 1.1 and any additional identification marks as specified in the BDS; and

e. Bear a warning not to open before the time and date for bid opening, in accordance with ITB 29.1.

24.4 If the outer envelope is not sealed and marked as required by ITB 24.3, the Purchaser will assume no responsibility for the bid misplacement or premature opening.

25. Deadline for submission of Bids

25.1 Bids shall be delivered by hand, courier or registered post to the Purchaser at the address and no later than the date and time indicated in BDS.

25.2 The Purchaser may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Documents in accordance with ITB 9, in which case all right and obligations of the Purchaser and bidders previously subject to the deadline will thereafter be subject to the deadline as extended.

26. One Bid per Bidder

26.1 Each bidder shall submit only one Bid either by itself, or as a partner in a joint venture or as a responsible officer in the management of the company. A bidder who submits or participates in more than one Bid (except alternative Bids if allowed, pursuant to ITB 15) shall be disqualified.

27. Late Bids

27.1 Any Bid received by the Purchaser after the deadline for Submission of Bids prescribed by the Purchaser, pursuant to ITB 25, shall be declared "Late" and rejected and returned unopened to the bidder.

28.	**Modification, Substitution and withdrawal of Bids**	
28.1	The bidder may modify or substitute its Bid after it has been submitted by sending a written notice in accordance with the ITB 24, duly signed by an authorized representative, and shall include a copy of authorization in accordance with ITB 23.2. The corresponding substitution or modification of the Bid must accompany the respective written notice. All notices must be:	
	a.	Submitted in accordance with ITB 23 and 24, and in addition, the respective envelops shall be clearly marked "SUBSTITUTION" or "MODIFICATION;' and
	b.	Received by the Purchaser prior to the deadline prescribed for the submission of Bids, in accordance with ITB 25.
28.2	The bidder may withdraw its Bid after it has been submitted by sending a written notice prior to the deadline prescribed for the submission of Bids, in accordance with ITB 25, duly signed by an authorized representative, and shall include a copy of authorization in accordance with ITB 23.2. The Purchaser then shall mark the envelope as "WITHDRAWN".	
28.3	No Bid may be modified, substituted or withdrawn in the interval between the deadline for submission of Bids and the expiration of the period of bid validity specified by the bidder on the Bid Form or any extension thereof, neither any modification shall be accepted.	
29.	**Bid Opening**	
29.1	The Purchaser shall conduct the bid opening in the place at the address, date and time specified in the BDS in the presence of bidders or bidders' authorized representatives who choose to attend.	
29.2	The bidder's authorized representatives attending the bid opening shall have an Authorization Letter from the bidder. Only the authorized representative shall attend the bid opening.	
29.3	The bidders or bidder's authorized representatives shall not be permitted to approach the members of the Bid Opening Committee or any of the officials.	
29.4	The bidders or bidder's authorized representatives who are present shall sign a bidder's attendance sheet evidencing their attendance.	
29.5	First, envelopes marked as "WITHDRAWN" shall be read out and returned unopened to the Bidder. Next, envelopes marked "SUBSTITUTION" shall be opened and read out and exchanged with the corresponding Bid being substituted. The substituted Bid shall not be opened, but shall be returned to the Bidder. Envelopes marked "MODIFICATION" shall be opened and read out with the corresponding Bid. Only envelopes that are opened, read out and recorded at Bid Opening shall be considered.	
29.6	All other envelopes shall be opened one at a time, and the following read out and recorded: the	

	name of the Bidder and whether there is a modification; the Bid Prices (per lot if applicable), any discounts and alternative offers; the presence of a Bid Security, if required; and any other details as the Purchaser may consider appropriate. Only discounts and alternative offers read out and recorded at bid opening shall be considered for evaluation. No Bid shall be rejected at bid opening except for late bids, in accordance with ITB 27.1.	
29.7	The Purchaser shall prepare a record of the Bid Opening, which shall include the information disclosed to those present in accordance with ITB 29.6. The minutes shall include, as a minimum:	
	a.	The Tender Number and Description;
	b.	The name of the Bidder, Bid number and whether there is a withdrawal, substitution or modification;
	c.	The Bid deadline date and time;
	d.	The date, time and place of Bid Opening;
	e.	Bid prices, per lot if applicable, offered by the Bidders, including any discounts and alternative offers;
	f.	The presence or absence of Bid Security and, if present, its amount;
	g.	The names of Bidders at the Bid Opening, and of the Bidders authorized representatives (if any);
	h.	Details of any feedbacks or other comments made by Bidders/Bidders authorized representatives attending the Bid Opening, including the names and signatures of the Bidders/Bidders authorized representatives making the feedback(s) and/or comment(s); and
	i.	The names, designations and signatures of the members of the Bid Opening Committee.
	The Bidders/Bidders authorized representatives who are present shall sign the record. The omission of a Bidders/Bidders authorized representative's signature on the record shall not invalidate the contents and effect of the record.	

E. Evaluation and Comparison of Bids

30. Confidentiality

30.1	Information relating to the examination, clarification, evaluation and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process.

30.2	Any effort by a Bidder to influence the Purchaser's processing of Bids or award decisions may result in the rejection of the bidder's Bid.	
31.	**Clarification of Bids**	
31.1	To assist in the examination, evaluation and comparison of Bids, the Purchaser may, at its discretion, ask the bidder for a clarification of its Bid. Any clarification submitted by a Bidder with regard to its Bid and that is not in response to a request by the Purchaser shall not be considered. The Purchaser's requests for clarification and the response shall be in writing. No change in the price or substances of the Bid shall be sought, offered or permitted, except to confirm the correction of arithmetic errors discovered by the Purchaser in the evaluation of the Bids, in accordance with ITB 34.	
32.	**Deviations, Reservations, and Omissions**	
32.1	During the evaluation of bids, the following definitions shall apply:	
	a.	"Deviation" is a departure from the requirements specified in the Bidding Document. Any comments, remarks, observations and feedbacks will constitute as deviation and shall be indicated in the deviation sheet;
	b.	"Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document; and
	c.	"Omission" is the failure to submit part or all of the information or documentation required in the Bidding Document.
33.	**Responsiveness of Bids**	
33.1	The Purchaser's determination of a Bid's responsiveness shall be based on the contents of the Bid itself, and is to determine which of the Bids received are responsive and thereafter to compare the responsive Bids against each other to select the lowest evaluated Bid.	
33.2	A substantially responsive Bid is one that conforms to all the terms, conditions and specifications of the Bidding Documents without material deviation, reservation or omission. A material deviation, reservation or omission is one that:	
	a.	Effects in any substantial way the scope, quality or performance of the supplies; or
	b.	Limits or is inconsistent with the bidding documents in a substantial way, the Purchaser's rights or the bidder's obligations under the Contract; or
	c.	Whose rectification would affect unfairly the competitive position of other Bidders presenting substantially responsive Bids.
33.3	If a Bid is not substantially responsive to the Bidding Documents, it shall be rejected by the Purchaser and may not subsequently be made responsive by the bidder by correction of the material deviation, reservation or omission.	

34.	**Nonconformities, Errors and Omissions**	
34.1	Provided that a Bid is substantially responsive, the Purchaser may waive any non-conformities or omissions in the Bid that do not constitute a material deviation.	
34.2	Provided that a Bid is substantially responsive, the Purchaser may request that the Bidder submit the necessary information or documentation within a reasonable period of time, to rectify nonmaterial nonconformities or omissions in the Bid related to documentation requirements. Such omission shall not be related to any aspect of the price of the Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.	
34.3	Provided that the Bid is substantially responsive, the Purchaser shall correct arithmetical errors on the following basis:	
	a.	If there is a discrepancy between the unit price and the total price per item that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price per item will be corrected unless in the opinion of the Purchaser there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected.
	b.	If there is a discrepancy between the Total Amount and the sum of the Total price per item, the sum of the total price per item shall prevail and the Total Amount will be corrected.
34.4	If the Bidder that submitted the lowest evaluated Bid does not accept the correction of errors, its Bid shall be disqualified and its Bid Security shall be forfeited.	
35.	**Preliminary Examination of Bids**	
35.1	The Purchaser shall examine and confirm that the following documents and information have been provided in the Bid. If any of these documents or information is missing, the Bid shall be rejected.	
	a.	Bid Form, in accordance with ITB 12.1 (a);
	b.	Price Schedules, in accordance with ITB 12.1 (a);
	c.	Bid Security, in accordance with ITB 22.
36.	**Examination of Terms and Conditions; Technical Evaluation**	
36.1	The Purchaser shall examine the Bid to confirm that all terms and conditions specified in the GCC and the SCC have been accepted by the Bidder without any material deviation or reservation.	
36.2	The Purchaser shall evaluate the technical features of the Bid submitted in accordance with ITB 20, to confirm that all requirements specified in Section V, Schedule of Supply of the Bidding Documents have been met without any material deviation or reservation.	
36.3	If, after the examination of the terms and conditions and the technical evaluation, the Purchaser determines that the Bid is not substantially responsive in accordance with ITB 33, the Bid shall be rejected.	

36.4	No conditional offer(s) shall be allowed. A bid with conditional offers shall be rejected	
37.	**Conversion to Single Currency**	
37.1	For evaluation and comparison purposes, the Purchaser shall convert all bid prices, expressed in amounts in various currencies into a single currency and use the exchange rates specified in the BDS.	
38.	**Margin of Preference**	
38.1	A margin of preference may apply to domestic goods manufactured in Bhutan as provided for in the BDS. To avail a margin of preference, the Bidder shall provide a value addition certificate from the Ministry of Economic Affairs.	
39.	**Detail Evaluation of Bids**	
39.1	The Purchaser shall evaluate each Bid that has been determined, up to this stage of evaluation, to be substantially responsive.	
39.2	To evaluate a Bid, the Purchaser shall only use all the factors, methodologies and criteria defined in this ITB 39.No other criteria or methodology shall be permitted.	
39.3	To evaluate a Bid, the Purchaser shall consider the following:	
	a.	Evaluation shall be done for Items or Lots, as specified in the BDS;
	b.	The Bid Price, as quoted in accordance with ITB Clause 16;
	c.	Price adjustment for correction of arithmetic errors in accordance with ITB 34.3;
	d.	Price adjustment due to discounts offered in accordance with ITB Clause 16.4;
	e.	Adjustments due to the application of the evaluation criteria specified in the BDS from amongst those set out in Section III, Evaluation and Qualification Criteria; and
	f.	Adjustments due to the application of a margin of preference, in accordance with ITB Clause 38, if applicable.
39.4	The Purchaser's evaluation of a Bid shall exclude and not take into account any allowance for price adjustment during the period of execution of the contract, if provided in the bid.	
39.5	The Purchaser's evaluation of a Bid may require the consideration of other factors in addition to the Bid Price quoted in accordance with ITB Clause 16. These factors may be related to the characteristics, performance, and terms and conditions of purchase of the Goods and Related Services. The effect of the factors selected, if any, shall be expressed in monetary terms to facilitate comparison of Bids, unless otherwise specified in Section III, Evaluation and Qualification Criteria. The factors, criteria and the methodology of application shall be	

	as specified in ITB 39.3 (e).
39.6	If so specified in BDS, Goods are grouped in two or more lots, the Purchaser will evaluate Bids on the basis of LOT WISE or a combination of Lots and the Purchaser shall award one or multiple lots to more than one Bidder.
40.	**Comparison of Bids**
40.1	The Purchaser shall compare all substantially responsive Bids to determine the lowest evaluated Bid, in accordance with ITB 39.
40.2	If the Bid price of the lowest evaluated Bid appears abnormally low, high and/or seriously unbalanced price as compared to other Bidders or past rates, then the Purchaser may require the Bidder to produce written explanations of, justifications and detailed price analyses for any or all items offered. Such explanations may include, but are not limited to, details of the method by which the Goods and Related Services are to be provided, the technical solutions chosen, exceptionally favorable conditions available to the Bidder for the execution of the Contract, and the originality of the Goods proposed by the Bidder. After objective evaluation of the explanations, justifications and price analyses, if the Purchaser decides to accept the Bid with an abnormally low and/or seriously unbalanced price, the Purchaser shall require that the amount of the Performance Security stipulated in ITB 48 be increased at the expense of the Bidder to a level sufficient to protect the Purchaser against financial loss in the event of default of the successful Bidder under the Contract.
41.	**Post qualification of the Bidder**
41.1	The Purchaser will determine to its satisfaction whether the bidder selected as having submitted the lowest-evaluated and substantially responsive Bid is qualified to satisfactorily perform the Contract.
41.2	The Purchaser will determine the reasonability of the Bid Prices based on the past purchase rate and the prevailing market rate during the evaluation.
41.3	The determination based upon an examination of the documentary evidence of the bidder's qualifications submitted by the bidder, pursuant to ITB 19, as well as such other information as the Purchaser deems necessary and appropriate.
41.4	If required, the Purchase may carry out the inspections of the Bidder's factories to assess the production, technical, financial, and manpower capacity of the Bidder to perform the Contract. The Purchaser shall notify in advance of the date in writing on which the inspection will be made. If the Bidder does not meet the required capacity as assessed by the inspection team, the bid shall be rejected
41.5	An affirmative determination shall be a prerequisite for award of the Contract to the bidder. A negative determination will result in rejection of the bidder's Bid, in which event the Purchaser shall proceed to the next lowest evaluated Bid to make a similar determination of that Bidder's capabilities to perform satisfactorily.

42.	**Contacting the Purchaser**	
42.1	Subject to ITB 31, no bidder shall contact the Purchaser on any matter relating to its Bid, from the time of bid opening to the time the Contract is awarded.	
42.2	Any effort by a Bidder to influence the Purchaser in the Purchaser's decisions in respect of bid evaluation, bid comparison or Contract awards will result in the rejection of the bidder's Bid.	
43.	**Purchaser's Right to Accept Any Bid and to Reject Any or All Bids**	
43.1	The Purchaser reserves the right to accept or reject any Bid and to annul the bidding process and reject all Bids at any time prior to award of Contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the ground for the Purchaser's action.	
	F. Award of Contract	
44.	**Award Criteria**	
44.1	The Purchaser will award the Contract to the successful bidder whose Bid has been determined to be the lowest-evaluated responsive Bid, provided further that the bidder is determined to be qualified to satisfactorily perform the Contract.	
45.	**Purchasers Right to Vary Quantities at Time of Award**	
45.1	At the time the Contract is awarded, the Purchaser reserves the right to increase or decrease the quantity of Goods and Related Services specified in Section V, Schedule of Supply, provided this does not exceed the percentages indicated in the BDS, and without any change in the unit prices or other terms and conditions of the Bid.	
46.	**Notification of Award**	
46.1	The Purchaser will notify the successful bidder in writing that its Bid has been accepted.	
46.2	Until a formal Contract is prepared and executed, the notification of award shall be binding on the Supplier.	
47.	**Signing of Contract**	
47.1	Within 15 (Fifteen) days from the date of issue of the notification of award of contract, the successful bidder are required to come and sign, date and seal the contract agreement at the office as specified in BDS.	
47.2	Where the contract is not signed by both parties simultaneously:	
	a.	The Purchaser shall send to the successful bidder two original copies of (1) the full agreed contract and (2) the letter of acceptance, each copy to be signed by the bidder or its duly authorized representative, together with the date of signature;
	b.	The letter of acceptance shall indicate the deadline by which it must be accepted as specified in BDS;

	c.	The successful bidder, if agrees to conclude the contract, must sign and date all original copies of the contract and letter of acceptance and return one copy of each to the Purchaser before the expiry of the deadline indicated in the letter of acceptance;
	d.	Failure of the successful bidder to accept the award/ sign the contract shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security.
47.3	Notwithstanding ITB 47.1 above, in case signing of the Contract Agreement is prevented by any export restrictions attributable to the Purchaser, to Bhutan, or to the use of the products/Goods, systems or services to be supplied, where such export restrictions arise from trade regulations from a country supplying those products/Goods, systems or services, the Bidder shall not be bound by its Bid, always provided, however, that the Bidder can demonstrate to the satisfaction of the Purchaser that signing of the Contact Agreement has not been prevented by any lack of diligence on the part of the Bidder in completing any formalities, including applying for permits, authorizations and/or licenses necessary for the export of the products/Goods, systems or services under the terms of the Contract.	
48.	**Performance Security**	
48.1	Within 15 (Fifteen) working days of the receipt of notification of award of contract, the successful bidder shall furnish the performance security, in accordance with the Conditions of Contract.	
48.2	The Performance Security @10% of the supply contract value shall be furnished by the successful bidder in one of the following forms:	
	a.	Unconditional bank guarantee issued by the reputed Financial Institution in the form provided for in Section VIII, Contract Forms or another form acceptable to the Purchaser; or
	b.	Banker's Cheque/Cash Warrant, or
	c.	Demand Draft.
48.3	If the institution issuing the Performance Security furnished by the Bidder is located outside the Purchaser's country, the Performance Security shall be counter guaranteed by a correspondent Financial Institutions located in the Purchaser's country to make it enforceable.	
48.4	Failure by the successful Bidder to submit the above-mentioned Performance Security shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security. In that event the Purchaser may award the Contract to the next lowest evaluated Bidder whose offer is substantially responsive and is determined by the Purchaser to be qualified to perform the Contract satisfactorily. Such a failure shall be considered as default and all relevant clauses shall apply.	

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Bhutan Power Corporation Limited
(An ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified Company)
Registered Office, Thimphu
Procurement Services Department
Thimphu: Bhutan

BPC/PSD/2021 Materials/2020/09/ 327 September 9, 2020

Subject: Addendum No. 2

Reference: BPC/PSD/2021 Materials/2020/09 dated August 15, 2020

Dear Sir,

This is to inform all the bidders that BPC would like to make the following amendments in the above referred bid document.

A. Bid Data Sheet:

1. Under ITB 20.2 (BDS), Guaranteed Technical Particulars is required as follows:

i. **For Lot # 5B (LV ABC Fittings)**: GTP is Required for all items except item no. 7 (Stainless Steel Strip), item # 8 (Stainless Steel Buckle, 20x0.7 mm) and item # 9 (Set of terminal caps for 120 sq.mm)

ii. **For Lot # 7 (CT Ring)**: GTP is Required for all items except item # 7 (Met Grip Seal)

iii. **For Lot # 8 (Cable Jointing Kits & Cable Gland):** Required for all items except item # 40 (11 kV cable route marker with nut and bolt), item # 41 (33 kV cable route marker with nut and bolt), item # 42 (Double Compression Gland for 4 core, 150 mm2 cable), item # 43 (Double Compression Gland for 4x185 mm2 cable), item # 44 (Double Compression Gland for 4x240 mm2 cable), item # 45 (Double Compression Gland for 4x300 mm2 cable) and item # 46 (Double Compression Gland for 4x400 mm2 cable)

2. Under ITB 25.1 (BDS), the bid submission date is extended to 24th September, 2020 at 10: 00 Hours

3. Under ITB 29.1 (BDS), the bid opening is extended to 24th September, 2020 at 10.30 Hours.

B. Price Schedule:

1. **For Lot # 6 (Energy Meters)**: The Avon Meters Pvt. Ltd. is included under the restricted brand for the lot.

Procurement Services Department ★ Thimphu : Bhutan ★ Bhutan Power Corporations Limited

Phone: +975-2-326289; Fax: +975-2-333583; Box 580; E-mail: psd@bpc.bt; web: www.bpc.bt

འབྲུག་གློག་མེ་ལས་འཛིན།།

Bhutan Power Corporation Limited
(An ISO 9001:2015, ISO 14001:2015 & OHSAS 18001:2007 Certified Company)
Registered Office, Thimphu
Procurement Services Department
Thimphu: Bhutan

2. **For Lot # 8 (Cable Jointing Kits and Cable Gland):** Item # 46 – Double compression gland for 4 x 300 sq.mm has been deleted and the revised price schedule is attached as Annexure – I.

C. Instructions to Bidders:
1. The missed out ITB (Instructions to Bidders) is attached as annexure -II

Bidders are advised to note the above changes and quote accordingly. And all the other terms and condition shall remain same.

Yours sincerely,

(Nim Dorji)
General Manager

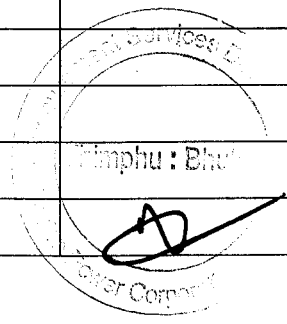
Procurement Services Department ★ Thimphu : Bhutan ★ Bhutan Power Corporations Limited

Phone: +975-2-326289; Fax: +975-2-333583; Box 580; E-mail: psd@bpc.bt; web: www.bpc.bt

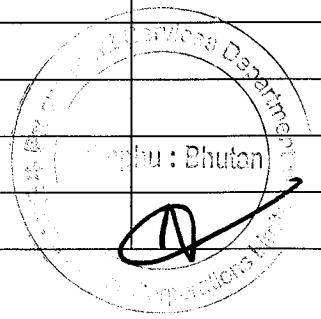
Annexure I

Price Schedule

Material No.	Sl. No.	Description	UoM	Qty	Brand and Country of Origin	Rate DDP (Nu.)	Amount DDP (Nu.)
Lot No. 8 (Cable Jointing Kits & Cable Glands)							
404	1	ID Termination kit for 3X50sqmm 11kV	SET	6.00			
405	2	ID Termination kit for 3X70sqmm 11kV	SET	21.00			
406	3	ID Termination kit for 3X95sqmm 11kV	SET	10.00			
410	4	Shrinkable cable termination kit 3cx150sqmm (ID) 11KV	SET	64.00			
412	5	ID Termination kit for 3X185sqmm 11kV	SET	8.00			
415	6	ID Termination kit for 3X300sqmm 11kV	SET	58.00			
409	7	ID Termination kit for 3X150sqmm 33kV	SET	26.00			
411	8	ID Termination kit for 3X185sqmm 33kV	SET	12.00			
414	9	ID Termination kit for 3X300sqmm 33kV	SET	16.00			
1527	10	I/D Termination Kit 1x630sqmm XLPE 33kV	NO	9.00			
422	11	OD Termination kit for 1X50sqmm 11kV	SET	6.00			
426	12	OD Termination kit for 3X70sqmm 11kV	SET	22.00			
427	13	OD Termination kit for 3X95sqmm 11kV	SET	10.00			
428	14	OD Termination kit for 3X95sqmm 11kV ABC	SET	48.00			
432	15	Shrinkable cable termination kit 3cx150sqmm (OD) 11KV	SET	55.00			
434	16	OD Termination kit for 3X185sqmm 11kV	SET	9.00			
435	17	OD Termination kit for 3X240 sqmm 11kV	SET	5.00			
437	18	OD Termination kit for 3X300sqmm 11kV	SET	77.00			
429	19	Shrinkable cable termination kit 3cx120 sqmm (OD) 33KV	SET	3.00			
431	20	OD Termination kit for 3X150sqmm 33kV	SET	45.00			



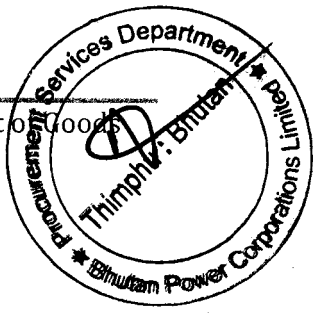
Material No.	Sl. No.	Description	UoM	Qty	Brand and Country of Origin	Rate DDP (Nu.)	Amount DDP (Nu.)
Lot No. 8 (Cable Jointing Kits & Cable Glands)							
433	21	OD Termination kit for 3X185sqmm 33kV	SET	11.00			
436	22	OD Termination kit for 3X300sqmm 33kV	SET	33.00			
1427	23	O/D Termination Kit 1x630sqmm XLPE 33kV	NO	9.00			
443	24	St. thr. Jointing kit for 3X70sqmm 11kV	SET	54.00			
444	25	ST.Through Jointing kit for 3X95sqmm 11kV	SET	65.00			
446	26	St. thr. Jointing kit for 3X150sqmm 11kV	SET	47.00			
448	27	St. thr. Jointing kit for 3X240qmm 11kV	SET	7.00			
450	28	St. thr. Jointing kit for 3X300sqmm 11kV	SET	57.00			
445	29	St. thr. Jointing kit for 3X150sqmm 33kV	SET	29.00			
447	30	St. thr. Jointing kit for 3X185sqmm 33kV	SET	3.00			
449	31	St. thr. Jointing kit for 3X300sqmm 33kV	SET	25.00			
455	32	St. through Jointing kit for 4X50sqmm	SET	5.00			
456	33	St. through Jointing kit for 4X70sqmm	SET	15.00			
457	34	St. through Jointing kit for 4X95sqmm	SET	16.00			
459	35	St. through Jointing kit for 4X150sqmm	SET	18.00			
460	36	St. through Jointing kit for 4X240sqmm	SET	8.00			
461	37	ST.Through Jointing kit for 4X300sqmm	SET	57.00			
462	38	St. through Jointing kit for 4X400sqmm	SET	40.00			
5550	39	St.through jointing kit 1CX400sqmm 1.1kV	SET	10.00			
419	40	11KV Cable route marker with nut & bolts	NO	152.00			
420	41	33KV Cable route marker with nut & bolts	NO	20.00			



Material No.	Sl. No.	Description	UoM	Qty	Brand and Country of Origin	Rate DDP (Nu.)	Amount DDP (Nu.)
Lot No. 8 (Cable Jointing Kits & Cable Glands)							
399	42	Double compression gland for 4 core 150 sq.mm cable	SET	110.00			
400	43	Double compression gland for 4x185 sq.mm cable	SET	2.00			
401	44	Double compression gland for 4x240 sq.mm cable	SET	2.00			
402	45	Double compression gland for 4x300 sq.mm cable	SET	150.00			
403	46	Double compression gland for 4x400 sq.mm cable	SET	50.00			
Total Amount (Nu.)							

Procurement Services Department
Thimphu : Bhutan
Power Corporation Limited

PART 1- Bidding Procedures



Section I. Instructions to Bidders

Table of Contents

Section I. Instructions to Bidders

A. General

1. Scope of Bid

1.1 The Purchaser, as indicated in the Bid Data Sheet (BDS), issues these Bidding Documents for the supply of Goods and Services incidental thereto as specified in Section V, Schedule of Supply. Tender number and tender description, lot numbers and lot description are provided in the BDS.

1.2 All bids are to be completed and returned to the Purchaser in accordance with these instructions to the bidders.

1.3 Throughout this Bidding Document :

a. the term "in writing" means communicated in written form with proof of receipt;

b. if the context so requires, singular means plural and vice versa; and

c. "day" means calendar day

2. Fraud and Corruption

2.1 It is Corporation policy to require that Purchasers, Bidders and Suppliers observe the highest standards of ethics during the procurement and execution of contracts.[1] In pursuance of this policy, the Corporation:

a. defines, for the purposes of this provision, the terms set forth below as follows:

i. "Corrupt practice"[2] is the offering, giving, receiving or soliciting, directly or indirectly, of anything of value[3] to influence improperly the actions of another party;

ii. "Fraudulent practice"[4] is any intentional act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

iii. "Collusive practice"[5] is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;

iv. "Coercive practice"[6] is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;

[1] In this context, any action taken by a Bidder, and Supplier to influence the procurement process or contract execution for undue advantage is improper.
[2] "another party" refers to a Corporation official acting in relation to the procurement process or contract execution. In this context, "Corporation official" includes employees of BPC taking or reviewing procurement decisions.
[3] "anything of value" includes, but is not limited to, any gift, loan, fee, commission, valuable security or other asset or interest in an asset; any office, employment or contract; any payment, discharge or liquidation of any loan, obligation or other liability whatsoever, whether in whole or in part; any other services, favour or advantage, including protection from any penalty or disability incurred or apprehended or from any action or proceeding of a disciplinary or penal nature, whether or not already instituted and including the exercise or the forbearance from the exercise of any right or any official power or duty.
[4] a "party" refers to a Corporation official; the terms "benefit" and "obligation" relate to the procurement process or contract execution; and the "act or omission" is intended to influence the procurement process or contract execution.
[5] "parties" refers to participants in the procurement process (including corporation officials) and an "improper purpose" includes attempting to establish bid prices at artificial, non-competitive levels.
[6] a "party" refers to a participant in the procurement process or contract execution.

		v.	"Obstructive practice" is	
			aa.	deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to impede any investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or
			bb.	acts intended materially to impede the exercise of the inspection and audit rights of the Purchaser or any person appointed by the Purchaser and/or any relevant agency provided for under ITB Sub-Clause 2.1 (d) below.
	b.	will reject a proposal for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive or obstructive practices in competing for the contract in question;		
	c.	will sanction a firm or individual, including declaring them ineligible, either indefinitely or for a stated period of time, to be awarded contract if it at any time determines that they have, directly or through an agent, engaged in corrupt, fraudulent, collusive, coercive or obstructive practices in competing for, or in executing contract;		
	d.	will have the right requiring Bidders and Suppliers to permit the Purchaser, any agency or person appointed by the Purchaser to inspect their accounts and records and other documents relating to their Bid submission and contract performance and to have them audited by auditors appointed by the Purchaser;		
	e.	requires that Bidders, as a condition of admission to eligibility, execute and attach to their bids an Integrity Pact Statement in the form provided in Section IV, Bidding Forms. Failure to provide a duly executed Integrity Pact Statement shall result in disqualification of the Bid; and		
	f.	will report any case of corrupt, fraudulent, collusive, coercive or obstructive practice to the relevant RGoB agencies, including but not limited to the Anti-corruption Commission (ACC) of Bhutan, for necessary action in accordance with the statutes and provisions of the relevant agency.		
3.	**Eligible Bidders**			
3.1	The Invitation for bids is open to all Manufacturers/Export House/Authorized Dealers from outside Bhutan and to Manufacturers/Authorized Dealers/National Suppliers licensed under the Ministry of Economic Affairs of Royal Government of Bhutan (Supporting evidence to corroborate the claim must be enclosed).			
3.2	A Bidder shall not be eligible who have a conflict of interest. All Bidders found to have a conflict of interest shall be disqualified. Bidders are considered to have a conflict of interest in this bidding process if they:			
	a.	are associated, or have been associated in the past, with a firm or any of its affiliates which has been engaged by the Purchaser to provide consulting services for the preparation of the design, specifications and/or other documents to be used for the procurement of the Goods to be purchased pursuant to these Bidding Documents, or		

	b.	employ or otherwise engage, either directly or through any of their affiliates, a family member of a Corporation who either is employed by the Purchaser or has an authority over it. For the purposes of this Sub-Clause a family member is defined as parents, spouse and children as mentioned in the Service Record of the employee.

4.	**Exclusion of Bidders**	
4.1	A bidder shall be excluded from participating in a procurement procedure under the following circumstances who:	
	a.	is suspended/debarred by any Statutory Agencies in Bhutan or in the region to Corporation's knowledge;
	b.	has been declared bankrupt, judgment or pending legal action that could impair operating as a going concern;
	c.	has been found guilty of professional misconduct by a recognised tribunal;
	d.	has not fulfilled his obligations with regard to any statutory dues;
	e.	is or has been guilty of serious misrepresentation in supplying information required under this Section.
	f.	is debarred from participation in any public procurement by any Competent Authority as per law;
	g.	does not qualify under the performance assessed through the Vendor Performance Management System of the Corporation;
	h.	as a matter of law or official regulation, Royal Government of Bhutan prohibits commercial relations with the country in which the Bidder is constituted, incorporated or registered.

5.	**Vendor Performance Management System (VPMS)**
5.1	The performance of the vendor shall be assessed as per the guidelines contained in the Vendor Performance Management System available in BPC website (www.bpc.bt) for the purpose of determining the eligibility in participating in subsequent tenders.
5.2	The VPMS acceptance form is provided in the Section IV, Bidding Forms of the bidding documents. The bidders are required to sign VPMS Acceptance Form agreeing to the applicability of VPMS. In case the VPMS Acceptance Form is not signed, the bid for that bidder shall be liable for rejection.

6.	**Joint Ventures (JV)**	
6.1	Bids submitted by a Joint Venture of two or more Companies as partners shall comply with the following requirements:	
	a.	the Bid, and in case of successful Bid, the Contract form, shall be signed so as to be legally binding on all partners;
	b.	one of the partners shall be authorized to be in charge; and this authority shall be evidenced by submitting a power of attorney signed by legally authorized signatories of all the partners;
	c.	the partner in charge shall be authorized to incur liabilities, receive payments and receive instructions for and on behalf of any or all partners of the joint venture;

	d.	all partners of the joint venture shall be liable jointly and severally for the execution of the Contract in accordance with the Contract terms, and a relevant statement to this effect shall be included in the authorization mentioned under (b) above as well as in the Bid Form and the Form of Agreement (in case of a successful Bid); and
	e.	a copy of the registration certificate/license of joint venture shall be submitted with the Bid;

B. Contents of Bidding Documents

7. Sections of Bidding Documents	
7.1	The Bidding Document consist of Parts 1, 2, and 3, which include all the Sections indicated below, and should be read in conjunction with any Addenda issued in accordance with ITB 9.
	PART 1 Bidding Procedures • Section I. Instructions to Bidders (ITB) • Section II. Bid Data Sheet (BDS) • Section III. Evaluation and Qualification Criteria • Section IV. Bidding Forms **PART 2 Supply Requirements** • Section V. Schedule of Supply **PART 3 Conditions of Contract and Contract Forms** • Section VI. General Conditions of Contract (GCC) • Section VII. Special Conditions of Contract (SCC) • Section VIII. Contract Forms
7.2	The Purchaser is not responsible for the completeness of the Bidding Document and its addenda, if they were not obtained directly from the Purchaser.
7.3	The bidder is expected to examine the bidding documents, including all instructions, forms, terms and specifications. Failure to furnish all information required by the bidding documents or submission of a bid not substantially responsive to the Bidding Documents in every respect would result in the rejection of that Bid.
8. Clarification of Bidding Documents	
8.1	The bidders shall not be allowed to seek any clarifications on the bidding documents in person or through any verbal communications.
8.2	Prospective bidders requiring any further information or clarification of the bidding documents may notify the Purchaser in writing at the Purchaser's mailing address indicated in the BDS. The Purchaser will respond in writing to any request for information or clarification of the bidding documents, which it receives no later than 10

	(ten) days prior to the deadline for the submission of Bids prescribed by the Purchaser. The Purchaser's response (including an explanation of the query) will be sent in writing to all prospective bidders who have purchased the Bidding Documents.
8.3.	Pre bid meeting shall be conducted if necessary to clarify doubts and concerns of the bidders prior to submission of bids. Minutes of the pre bid meeting shall be circulated to all bidders that have purchased bidding documents and shall form an integral part of the bidding document.
9. Amendment of Bidding Documents	
9.1	At any time prior to the deadline for submission of bids, the Purchaser may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the Bidding Documents by addendum.
9.2	The addendum shall be part of the Bidding Documents and shall be notified in writing to all prospective bidders who have purchased the Bidding Documents. Such addendum shall be binding and shall require that prospective Bidders confirm receipt of it before the time established for the opening of Bids.
9.3	In order to afford prospective bidders reasonable time in which to take the addendum into account in preparing their Bids, the Purchaser may, at its discretion, extend the deadline for the submission of Bids.
9.4	Prospective bidders who may have downloaded the bidding documents from the website, the corrigendum to the bidding documents will also be published on the web site. It will be the responsibility of such bidders to regularly visit the website for any addendum to the bidding documents until the last date of bid submission. Purchaser shall in no way be responsible for any ignorance of the bidder about the addendum to the bidding documents.
C. Preparation of Bids	
10. Cost of Bidding Documents	
10.1	The bidder shall bear all costs associated with the preparation and delivery of its bid and the Purchaser will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.
10.2	Prospective bidders who may have downloaded the bidding documents from the web site should register with Purchaser on or before the closing of Bid Sale Date and make payment for the cost of the bid documents.
11. Language of Bid	
11.1	The Bid and all correspondence and documents relating to the Bid exchanged by the bidder and the Purchaser shall be written in the language specified in the BDS. Supporting documents and printed literature that are part of the Bid may be in another language provided they are accompanied by an accurate translation of the relevant passages in language specified in BDS, in which case, for purposes of interpretation of the Bid, *such* translation shall govern.
12. Documents Comprising the Bid	
12.1	The Bid shall comprise the following:
	a. Bid Form and Price Schedules completed in accordance with ITB13, 14,16 and 17;

	b.	Documentary evidence establishing in accordance with ITB 18, that the bidder is eligible to bid.
	c.	Documentary evidence establishing in accordance with ITB 19, that the bidder is qualified to perform the Contract if its Bid is accepted;
	d.	Documentary evidence establishing in accordance with ITB 20, that the goods to be supplied by the bidder conform to the Bidding Documents;
	e.	Bid security furnished in accordance with ITB 22;
	f.	Written confirmation authorizing the signatory of the Bid to commit the Bidder, in accordance with ITB 23;
	g.	Alternative bids, if permissible, in accordance with ITB 15;
	h.	Integrity Pact Statement, in accordance with ITB 2.1(e);
	i.	VPMS acceptance form, in accordance with ITB 5; and
	j.	Any other document required as per the bidding documents.
13.	**Bid form**	
13.1	The bidder shall complete the Bid Form furnished in Section IV, Bidding Forms. 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. A bid in which the bid form is not duly filled, signed and sealed by the bidder shall be rejected.	
14.	**Price Schedules**	
14.1	The bidder shall complete the appropriate Price Schedule included herein, stating the unit prices, total price per item, the total amount and the expected countries of origin of the Goods to be supplied under the Contract. This Price Schedules form must be completed without any alterations to its format, and no substitutes shall be accepted.	
15.	**Alternative Bids**	
15.1	Unless otherwise indicated in the **BDS**, alternative bids shall not be considered.	
16.	**Bid Prices and Discounts**	
16.1	The prices and discounts quoted by the Bidder in the Bid Form and in the Price Schedules shall conform to the requirements specified below.	
16.2	All lots and items must be listed and priced separately in the Price Schedules.	
16.3	The price to be quoted in the Bid Form shall be the total price of the Bid excluding any discounts offered.	
16.4	The Bidder shall quote any unconditional discounts and the methodology for their application in the Bid Form. The discount letter offer shall be accepted only when enclosed inside the main envelope of the bidding document.	
16.5	The terms EXW, CIF, CIP, DDP and other similar terms shall be governed by the rules	

	prescribed in the current edition of Inco terms, published by The International Chamber of Commerce, at the date of the Invitation for Bids or as specified in the **BDS**.			
16.6	Prices shall be quoted as specified in each Price Schedule included in Section IV, Bidding Forms. The disaggregation of price components shall be solely for the purpose of facilitating the comparison of Bids by the Purchaser. This shall not in any way limit the Purchaser's right to contract on any of the terms offered:			
	a.	For Goods manufactured in Bhutan:		
		i.	the price of the Goods, quoted ex works, ex-factory, ex-warehouse, ex showroom or off-the-shelf, as applicable, including all Customs duties and sales and other taxes already paid or payable on the components and raw material used to manufacturer or assembly of Goods, if specified in BDS;	
		ii.	any Bhutan sales and other similar taxes which will be payable on the Goods if the contract is awarded to the Bidder, if specified in BDS; and	
		iii.	the total price for the item.	
	b.	For Goods to be offered from outside Bhutan:		
		i.	the price of the Goods, quoted CIP/DDP place of entry in Bhutan, as specified in BDS;	
		ii.	custom duties and any other taxes which will be payable on the Goods in Bhutan, if specified in BDS;	
		iii.	the cost of inland transportation, insurance and other local costs incidental to delivery of the Goods from the port of entry to their final destination, if specified in BDS; and	
		iv.	the total price for the item.	
	c.	For Related Services, other than inland transportation and other services required to convey the Goods to their final destination, whenever such Related Services are specified in Section V, Schedule of Supply:		
		i.	the price of each item compromising the Related Services (inclusive of any applicable taxes).	
16.7	Prices quoted by the Bidder shall be fixed during the Bidder's performance of the Contract and not subject to variation on any account, unless otherwise specified in the BDS. A bid submitted with an adjustable price quotation shall be treated as non-responsive and shall be rejected pursuant to ITB 33 unless adjustable price quotations are permitted by the BDS. If, in accordance to BDS, prices quoted by the Bidder shall be subject to adjustments during the performance of the Contract, a Bid submitted with a fixed price quotation shall not be rejected, but price adjustment shall be treated as zero.			
16.8	If so indicated pursuant to ITB 1.1, Bids are based on Lots/Packages, for which all goods are grouped in lots for easy identification. For the purpose of bidding and inventory management, related SKUS shall be grouped under specific lots like transformers, conductors, cables and fabrication items or in the manner most advantageous to the BPC for a particular tender. Bidders shall have the option of submitting a proposal on any or all LOTS. Each lot consists of items grouped in packages. Unless otherwise indicated in the BDS, prices quoted shall correspond to one hundred percent (100%) of the items specified for each lot and to one hundred percent (100%) of the quantities for each item of a lot. Bidders can offer any price reduction (discount) for any or all Lots and shall specify in their Bid the price reductions			

	applicable to each Lot, or for all the Lots. Price reductions or discounts shall be submitted in accordance with ITB 16.4.
17.	**Bid Currencies**
17.1	Bid Prices shall be quoted in Ngultrum for goods offered from Bhutan, in Indian Rupees for goods offered from India; and in US dollar/major foreign currencies for goods offered from other Countries. Bid Prices expressed in Indian currency and US Dollars/major foreign currencies shall be accepted and evaluated in accordance to ITB 37. For bid evaluation purpose the exchange rate will be based on the Telegraphic Transfer (TT) selling rate published by the Royal Monetary Authority of Bhutan on the day of bid opening. For bid expressed in Indian currency and US Dollars/major foreign currencies, payments shall be made in equivalent Ngultrum through banking channel and the responsibilities of payment transfer and transfer charges lie on the Suppliers.
18.	**Documents Establishing Eligibility of the Bidder**
18.1	The bidder shall furnish, as part of its Bid, certification establishing the bidder's eligibility to bid pursuant to ITB 3.
18.2	The necessary documents and literatures viz. ISO Certificate, Type Test Certificates and Lists of Past Performance Certificates from the users must be submitted for new makes/brands introduced in Bhutan.
18.3	If the Bidder is JV in accordance with ITB 6, a copy of the registration certificate/license shall be submitted.
19.	**Documents Establishing Qualifications of the Bidder.**
19.1	The documentary evidence of the Bidder's Qualification to Perform the Contract, if its bid is accepted, shall establish to the purchaser's satisfaction:
	a. That, if required by the BDS, a Bidder is not a manufacturer or otherwise produce the goods it offers to supply, shall submit the Manufacturer's Authorization using the form included in Section IV, Bidding Forms to demonstrate that it has been duly authorized by the' manufacturer or producer of the Goods to supply these Goods in Bhutan;
	b. That, if required by the BDS, in the case of a bidder not doing business in Bhutan, the Bidder is, or will be (if the contract is awarded to it), represented by authorised representative in Bhutan equipped and able to carry out the Supplier's maintenance, repair and spare parts-stocking obligations prescribed in the Conditions of Contracts and/or Technical Specifications.
	c. That the Bidder meets each of the qualification criteria specified in Section III, Evaluation and Qualification Criteria.
20.	**Documents Establishing the Goods' Conformity to the Bidding Documents.**
20.1	To establish the conformity of the Goods to the Bidding Documents, the Bidder shall furnish as a part of its Bid, the documentary evidence that the Goods conform to the technical specifications and standards specified in Section V, Schedule of Supply.

20.2	The documentary evidence may be in the form of literature, drawings or data, and shall consists of a detailed item by item description of the essential technical and performance characteristics of Goods. If required by the BDS, the bidders are required to confirm and sign on the guaranteed technical particulars of the goods (GTPS) that is indicated in the Section V, Schedule of Supply. Any deviations from the indicated specifications must be clearly indicated in the deviation schedule, Section IV, Bidding Form.
20.3	If required, the Bidder shall also furnish a list giving full particulars, including available sources and current prices, of all spare parts, special tools, etc., necessary for the proper and continuing functioning of the Goods.
20.4	Standards for workmanship, material and equipment, and references to brand names or catalogue numbers, specified by the Purchaser in Section V, Schedule of Supply, are intended to be descriptive only and not restrictive. The bidder may offer other standards of quality, brand names and/or catalogue numbers in its Bid, provided that it demonstrates to the Purchaser's satisfaction that the substitutions are equivalent or superior to those designated in Section V, Schedule of Supply with the exception in strategic critical and strategic security items category.
20.5	In order to prove that the Goods offered are of acceptable quality and standard, the bidders shall furnish the documentary evidence that the Goods offered have been in production and all relevant catalogues, test certificates, ISO certificates, list of previous clients, value of business and company or manufacturer profile for all new brands are submitted.
21.	**Period of Validity of Bids**
21.1	Bids shall remain valid for the period specified in the BDS days from the date of bid opening prescribed by the Purchaser, pursuant to ITB 28. A bid valid for a shorter period shall be rejected by the Purchaser as non-responsive.
21.2	In exceptional circumstances, prior to the expiration of the bid validity period, the Purchaser may solicit bidder's consent to an extension of the period of bid validity. The request and the responses thereto shall be made in writing. If the bidder agrees to the extension request, the validity of the bid security provided under ITB 22 shall also be suitably extended. In the event the Bidder refuses the request, the bid shall be disqualified without forfeiting the bid security. Bidders granting the request shall not be required or permitted to modify its Bid.
22.	**Bid Security**
22.1	The bidder shall furnish, as part of its Bid, a Bid Security in original form, denominated in Ngultrum or a freely convertible currency and in amount specified in the BDS.
22.2	The Bid Security shall be in one of the following forms acceptable to the purchasers:
	a. Unconditional bank guarantee issued by a reputed Financial Institution acceptable to the Purchaser in the Bid Security Form included in Section IV Bidding Form or another form acceptable to the Purchaser.
	b. Banker's cheque/ cash warrant.

	c.	Demand draft.	
	d.	If the institution issuing the Bid Security furnished by the Bidder is located outside the Purchaser's country, the Bid Security shall be counter guaranteed by a correspondent financial institution located in the Purchaser's country to make it enforceable,	
22.3	The Bid Security shall be valid for period of thirty (30) days beyond the validity period of the Bids as specified in BDS.		
22.4	Any Bid not secured in accordance with ITB 22.1, 22.2 and 22.3 above shall be rejected by the Purchaser as non-responsive.		
22.5	An unsuccessful bidder's bid security will be discharged/returned within fifteen (15) days after signing of the Contract with the successful Bidder.		
22.6	The successful bidder's bid security will be discharged/returned upon furnishing the performance security, pursuant to ITB 46 and the bidder's executing the Contract, pursuant to ITB 47 .		
22.7	The bid security may be forfeited:		
	a.	If a bidder withdraws its Bid during the period of bid validity specified by the bidder on the Bid Form, except as provided in ITB 21.2;	
	b.	If a bidder does not accept arithmetical corrections of its bid price;	
	c.	In the case of a successful bidder, if the bidder fails	
		i.	To sign the Contract in accordance with ITB 47; or
		ii.	To furnish the performance security in accordance with ITB 48.
22.8	The Bid Security of a JV must be from the JV that submits the Bid.		
23.	**Formats and Signing of Bid**		
23.1	The Bidder shall prepare one original of the documents comprising the Bid as described in ITB 12 and clearly mark it as "Original ". In addition, the Bidder shall submit copies of the Bid, in the number specified in the BDS and clearly mark them "COPY". In the event of any discrepancy between the original and the copies, the original shall prevail.		
23.2	The original and all copies of the Bid shall be typed or written in indelible ink and shall be signed by the bidder or a person(s) duly authorized to sign on behalf of the bidder. Written power-of-attorney shall indicate such authorization and shall be attached to the Bid. The name and position held by each person signing must be typed or printed below the signature.		
23.3	The Bid shall contain no interlineations, erasures or overwriting except as necessary to correct errors made by the bidder, in which case such correction shall be initialled by the person or persons signing the Bid.		

D. Submission and Opening of Bids

24. Submission, Sealing and Marking of Bids

24.1 Bids shall be delivered by hand, courier or registered post. The Bidder shall seal the original of the Bid and the number of copies stipulated in the BDS, including alternative Bids if permitted in accordance with ITB 15 in separate inner envelopes contained within one outer envelope. All envelopes shall be sealed with adhesive or other sealant to prevent reopening.

24.2 The inner envelopes shall:

a. Be sealed and bear the name of the Bidder.

b. Be marked "ORIGINAL", "ALTERNATIVE" (if any) and "COPY".

24.3 The outer envelope shall:

a. Be marked "Confidential";

b. Bear the name and address of the Bidder;

c. Be addressed to the Purchaser in accordance with ITB 25.1;

d. Bear the identification number pursuant to ITB 1.1 and any additional identification marks as specified in the BDS; and

e. Bear a warning not to open before the time and date for bid opening, in accordance with ITB 29.1.

24.4 If the outer envelope is not sealed and marked as required by ITB 24.3, the Purchaser will assume no responsibility for the bid misplacement or premature opening.

25. Deadline for submission of Bids

25.1 Bids shall be delivered by hand, courier or registered post to the Purchaser at the address and no later than the date and time indicated in BDS.

25.2 The Purchaser may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Documents in accordance with ITB 9, in which case all right and obligations of the Purchaser and bidders previously subject to the deadline will thereafter be subject to the deadline as extended.

26. One Bid per Bidder

26.1 Each bidder shall submit only one Bid either by itself, or as a partner in a joint venture or as a responsible officer in the management of the company. A bidder who submits or participates in more than one Bid (except alternative Bids if allowed, pursuant to ITB 15) shall be disqualified.

27. Late Bids

27.1 Any Bid received by the Purchaser after the deadline for Submission of Bids prescribed by the Purchaser, pursuant to ITB 25, shall be declared "Late" and rejected and returned unopened to the bidder.

28.	**Modification, Substitution and withdrawal of Bids**	
28.1	The bidder may modify or substitute its Bid after it has been submitted by sending a written notice in accordance with the ITB 24, duly signed by an authorized representative, and shall include a copy of authorization in accordance with ITB 23.2. The corresponding substitution or modification of the Bid must accompany the respective written notice. All notices must be:	
	a.	Submitted in accordance with ITB 23 and 24, and in addition, the respective envelops shall be clearly marked "SUBSTITUTION" or "MODIFICATION;' and
	b.	Received by the Purchaser prior to the deadline prescribed for the submission of Bids, in accordance with ITB 25.
28.2	The bidder may withdraw its Bid after it has been submitted by sending a written notice prior to the deadline prescribed for the submission of Bids, in accordance with ITB 25, duly signed by an authorized representative, and shall include a copy of authorization in accordance with ITB 23.2. The Purchaser then shall mark the envelope as "WITHDRAWN".	
28.3	No Bid may be modified, substituted or withdrawn in the interval between the deadline for submission of Bids and the expiration of the period of bid validity specified by the bidder on the Bid Form or any extension thereof, neither any modification shall be accepted.	
29.	**Bid Opening**	
29.1	The Purchaser shall conduct the bid opening in the place at the address, date and time specified in the BDS in the presence of bidders or bidders' authorized representatives who choose to attend.	
29.2	The bidder's authorized representatives attending the bid opening shall have an Authorization Letter from the bidder. Only the authorized representative shall attend the bid opening.	
29.3	The bidders or bidder's authorized representatives shall not be permitted to approach the members of the Bid Opening Committee or any of the officials.	
29.4	The bidders or bidder's authorized representatives who are present shall sign a bidder's attendance sheet evidencing their attendance.	
29.5	First, envelopes marked as "WITHDRAWN" shall be read out and returned unopened to the Bidder. Next, envelopes marked "SUBSTITUTION" shall be opened and read out and exchanged with the corresponding Bid being substituted. The substituted Bid shall not be opened, but shall be returned to the Bidder. Envelopes marked "MODIFICATION" shall be opened and read out with the corresponding Bid. Only envelopes that are opened, read out and recorded at Bid Opening shall be considered.	
29.6	All other envelopes shall be opened one at a time, and the following read out and recorded: the	

	name of the Bidder and whether there is a modification; the Bid Prices (per lot if applicable), any discounts and alternative offers; the presence of a Bid Security, if required; and any other details as the Purchaser may consider appropriate. Only discounts and alternative offers read out and recorded at bid opening shall be considered for evaluation. No Bid shall be rejected at bid opening except for late bids, in accordance with ITB 27.1.	
29.7	The Purchaser shall prepare a record of the Bid Opening, which shall include the information disclosed to those present in accordance with ITB 29.6. The minutes shall include, as a minimum:	
	a.	The Tender Number and Description;
	b.	The name of the Bidder, Bid number and whether there is a withdrawal, substitution or modification;
	c.	The Bid deadline date and time;
	d.	The date, time and place of Bid Opening;
	e.	Bid prices, per lot if applicable, offered by the Bidders, including any discounts and alternative offers;
	f.	The presence or absence of Bid Security and, if present, its amount;
	g.	The names of Bidders at the Bid Opening, and of the Bidders authorized representatives (if any);
	h.	Details of any feedbacks or other comments made by Bidders/Bidders authorized representatives attending the Bid Opening, including the names and signatures of the Bidders/Bidders authorized representatives making the feedback(s) and/or comment(s); and
	i.	The names, designations and signatures of the members of the Bid Opening Committee.
	The Bidders/Bidders authorized representatives who are present shall sign the record. The omission of a Bidders/Bidders authorized representative's signature on the record shall not invalidate the contents and effect of the record.	

E. Evaluation and Comparison of Bids

30. Confidentiality

30.1	Information relating to the examination, clarification, evaluation and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process.

30.2	Any effort by a Bidder to influence the Purchaser's processing of Bids or award decisions may result in the rejection of the bidder's Bid.	
31.	**Clarification of Bids**	
31.1	To assist in the examination, evaluation and comparison of Bids, the Purchaser may, at its discretion, ask the bidder for a clarification of its Bid. Any clarification submitted by a Bidder with regard to its Bid and that is not in response to a request by the Purchaser shall not be considered. The Purchaser's requests for clarification and the response shall be in writing. No change in the price or substances of the Bid shall be sought, offered or permitted, except to confirm the correction of arithmetic errors discovered by the Purchaser in the evaluation of the Bids, in accordance with ITB 34.	
32.	**Deviations, Reservations, and Omissions**	
32.1	During the evaluation of bids, the following definitions shall apply:	
	a.	"Deviation" is a departure from the requirements specified in the Bidding Document. Any comments, remarks, observations and feedbacks will constitute as deviation and shall be indicated in the deviation sheet;
	b.	"Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirements specified in the Bidding Document; and
	c.	"Omission" is the failure to submit part or all of the information or documentation required in the Bidding Document.
33.	**Responsiveness of Bids**	
33.1	The Purchaser's determination of a Bid's responsiveness shall be based on the contents of the Bid itself, and is to determine which of the Bids received are responsive and thereafter to compare the responsive Bids against each other to select the lowest evaluated Bid.	
33.2	A substantially responsive Bid is one that conforms to all the terms, conditions and specifications of the Bidding Documents without material deviation, reservation or omission. A material deviation, reservation or omission is one that:	
	a.	Effects in any substantial way the scope, quality or performance of the supplies; or
	b.	Limits or is inconsistent with the bidding documents in a substantial way, the Purchaser's rights or the bidder's obligations under the Contract; or
	c.	Whose rectification would affect unfairly the competitive position of other Bidders presenting substantially responsive Bids.
33.3	If a Bid is not substantially responsive to the Bidding Documents, it shall be rejected by the Purchaser and may not subsequently be made responsive by the bidder by correction of the material deviation, reservation or omission.	

34.	**Nonconformities, Errors and Omissions**	
34.1	Provided that a Bid is substantially responsive, the Purchaser may waive any non-conformities or omissions in the Bid that do not constitute a material deviation.	
34.2	Provided that a Bid is substantially responsive, the Purchaser may request that the Bidder submit the necessary information or documentation within a reasonable period of time, to rectify nonmaterial nonconformities or omissions in the Bid related to documentation requirements. Such omission shall not be related to any aspect of the price of the Bid. Failure of the Bidder to comply with the request may result in the rejection of its Bid.	
34.3	Provided that the Bid is substantially responsive, the Purchaser shall correct arithmetical errors on the following basis:	
	a.	If there is a discrepancy between the unit price and the total price per item that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price per item will be corrected unless in the opinion of the Purchaser there is an obvious misplacement of the decimal point in the unit price, in which case the total price as quoted shall govern and the unit price shall be corrected.
	b.	If there is a discrepancy between the Total Amount and the sum of the Total price per item, the sum of the total price per item shall prevail and the Total Amount will be corrected.
34.4	If the Bidder that submitted the lowest evaluated Bid does not accept the correction of errors, its Bid shall be disqualified and its Bid Security shall be forfeited.	
35.	**Preliminary Examination of Bids**	
35.1	The Purchaser shall examine and confirm that the following documents and information have been provided in the Bid. If any of these documents or information is missing, the Bid shall be rejected.	
	a.	Bid Form, in accordance with ITB 12.1 (a);
	b.	Price Schedules, in accordance with ITB 12.1 (a);
	c.	Bid Security, in accordance with ITB 22.
36.	**Examination of Terms and Conditions; Technical Evaluation**	
36.1	The Purchaser shall examine the Bid to confirm that all terms and conditions specified in the GCC and the SCC have been accepted by the Bidder without any material deviation or reservation.	
36.2	The Purchaser shall evaluate the technical features of the Bid submitted in accordance with ITB 20, to confirm that all requirements specified in Section V, Schedule of Supply of the Bidding Documents have been met without any material deviation or reservation.	
36.3	If, after the examination of the terms and conditions and the technical evaluation, the Purchaser determines that the Bid is not substantially responsive in accordance with ITB 33, the Bid shall be rejected.	

36.4	No conditional offer(s) shall be allowed. A bid with conditional offers shall be rejected	
37.	**Conversion to Single Currency**	
37.1	For evaluation and comparison purposes, the Purchaser shall convert all bid prices, expressed in amounts in various currencies into a single currency and use the exchange rates specified in the BDS.	
38.	**Margin of Preference**	
38.1	A margin of preference may apply to domestic goods manufactured in Bhutan as provided for in the BDS. To avail a margin of preference, the Bidder shall provide a value addition certificate from the Ministry of Economic Affairs.	
39.	**Detail Evaluation of Bids**	
39.1	The Purchaser shall evaluate each Bid that has been determined, up to this stage of evaluation, to be substantially responsive.	
39.2	To evaluate a Bid, the Purchaser shall only use all the factors, methodologies and criteria defined in this ITB 39.No other criteria or methodology shall be permitted.	
39.3	To evaluate a Bid, the Purchaser shall consider the following:	
	a.	Evaluation shall be done for Items or Lots, as specified in the BDS;
	b.	The Bid Price, as quoted in accordance with ITB Clause 16;
	c.	Price adjustment for correction of arithmetic errors in accordance with ITB 34.3;
	d.	Price adjustment due to discounts offered in accordance with ITB Clause 16.4;
	e.	Adjustments due to the application of the evaluation criteria specified in the BDS from amongst those set out in Section III, Evaluation and Qualification Criteria; and
	f.	Adjustments due to the application of a margin of preference, in accordance with ITB Clause 38, if applicable.
39.4	The Purchaser's evaluation of a Bid shall exclude and not take into account any allowance for price adjustment during the period of execution of the contract, if provided in the bid.	
39.5	The Purchaser's evaluation of a Bid may require the consideration of other factors in addition to the Bid Price quoted in accordance with ITB Clause 16. These factors may be related to the characteristics, performance, and terms and conditions of purchase of the Goods and Related Services. The effect of the factors selected, if any, shall be expressed in monetary terms to facilitate comparison of Bids, unless otherwise specified in Section III, Evaluation and Qualification Criteria. The factors, criteria and the methodology of application shall be	

	as specified in ITB 39.3 (e).
39.6	If so specified in BDS, Goods are grouped in two or more lots, the Purchaser will evaluate Bids on the basis of LOT WISE or a combination of Lots and the Purchaser shall award one or multiple lots to more than one Bidder.
40.	**Comparison of Bids**
40.1	The Purchaser shall compare all substantially responsive Bids to determine the lowest evaluated Bid, in accordance with ITB 39.
40.2	If the Bid price of the lowest evaluated Bid appears abnormally low, high and/or seriously unbalanced price as compared to other Bidders or past rates, then the Purchaser may require the Bidder to produce written explanations of, justifications and detailed price analyses for any or all items offered. Such explanations may include, but are not limited to, details of the method by which the Goods and Related Services are to be provided, the technical solutions chosen, exceptionally favorable conditions available to the Bidder for the execution of the Contract, and the originality of the Goods proposed by the Bidder. After objective evaluation of the explanations, justifications and price analyses, if the Purchaser decides to accept the Bid with an abnormally low and/or seriously unbalanced price, the Purchaser shall require that the amount of the Performance Security stipulated in ITB 48 be increased at the expense of the Bidder to a level sufficient to protect the Purchaser against financial loss in the event of default of the successful Bidder under the Contract.
41.	**Post qualification of the Bidder**
41.1	The Purchaser will determine to its satisfaction whether the bidder selected as having submitted the lowest-evaluated and substantially responsive Bid is qualified to satisfactorily perform the Contract.
41.2	The Purchaser will determine the reasonability of the Bid Prices based on the past purchase rate and the prevailing market rate during the evaluation.
41.3	The determination based upon an examination of the documentary evidence of the bidder's qualifications submitted by the bidder, pursuant to ITB 19, as well as such other information as the Purchaser deems necessary and appropriate.
41.4	If required, the Purchase may carry out the inspections of the Bidder's factories to assess the production, technical, financial, and manpower capacity of the Bidder to perform the Contract. The Purchaser shall notify in advance of the date in writing on which the inspection will be made. If the Bidder does not meet the required capacity as assessed by the inspection team, the bid shall be rejected
41.5	An affirmative determination shall be a prerequisite for award of the Contract to the bidder. A negative determination will result in rejection of the bidder's Bid, in which event the Purchaser shall proceed to the next lowest evaluated Bid to make a similar determination of that Bidder's capabilities to perform satisfactorily.

42.	**Contacting the Purchaser**	
42.1	Subject to ITB 31, no bidder shall contact the Purchaser on any matter relating to its Bid, from the time of bid opening to the time the Contract is awarded.	
42.2	Any effort by a Bidder to influence the Purchaser in the Purchaser's decisions in respect of bid evaluation, bid comparison or Contract awards will result in the rejection of the bidder's Bid.	
43.	**Purchaser's Right to Accept Any Bid and to Reject Any or All Bids**	
43.1	The Purchaser reserves the right to accept or reject any Bid and to annul the bidding process and reject all Bids at any time prior to award of Contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the ground for the Purchaser's action.	
	F. Award of Contract	
44.	**Award Criteria**	
44.1	The Purchaser will award the Contract to the successful bidder whose Bid has been determined to be the lowest-evaluated responsive Bid, provided further that the bidder is determined to be qualified to satisfactorily perform the Contract.	
45.	**Purchasers Right to Vary Quantities at Time of Award**	
45.1	At the time the Contract is awarded, the Purchaser reserves the right to increase or decrease the quantity of Goods and Related Services specified in Section V, Schedule of Supply, provided this does not exceed the percentages indicated in the BDS, and without any change in the unit prices or other terms and conditions of the Bid.	
46.	**Notification of Award**	
46.1	The Purchaser will notify the successful bidder in writing that its Bid has been accepted.	
46.2	Until a formal Contract is prepared and executed, the notification of award shall be binding on the Supplier.	
47.	**Signing of Contract**	
47.1	Within 15 (Fifteen) days from the date of issue of the notification of award of contract, the successful bidder are required to come and sign, date and seal the contract agreement at the office as specified in BDS.	
47.2	Where the contract is not signed by both parties simultaneously:	
	a.	The Purchaser shall send to the successful bidder two original copies of (1) the full agreed contract and (2) the letter of acceptance, each copy to be signed by the bidder or its duly authorized representative, together with the date of signature;
	b.	The letter of acceptance shall indicate the deadline by which it must be accepted as specified in BDS;

	c.	The successful bidder, if agrees to conclude the contract, must sign and date all original copies of the contract and letter of acceptance and return one copy of each to the Purchaser before the expiry of the deadline indicated in the letter of acceptance;
	d.	Failure of the successful bidder to accept the award/ sign the contract shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security.
47.3	Notwithstanding ITB 47.1 above, in case signing of the Contract Agreement is prevented by any export restrictions attributable to the Purchaser, to Bhutan, or to the use of the products/Goods, systems or services to be supplied, where such export restrictions arise from trade regulations from a country supplying those products/Goods, systems or services, the Bidder shall not be bound by its Bid, always provided, however, that the Bidder can demonstrate to the satisfaction of the Purchaser that signing of the Contact Agreement has not been prevented by any lack of diligence on the part of the Bidder in completing any formalities, including applying for permits, authorizations and/or licenses necessary for the export of the products/Goods, systems or services under the terms of the Contract.	
48.	**Performance Security**	
48.1	Within 15 (Fifteen) working days of the receipt of notification of award of contract, the successful bidder shall furnish the performance security, in accordance with the Conditions of Contract.	
48.2	The Performance Security @10% of the supply contract value shall be furnished by the successful bidder in one of the following forms:	
	a.	Unconditional bank guarantee issued by the reputed Financial Institution in the form provided for in Section VIII, Contract Forms or another form acceptable to the Purchaser; or
	b.	Banker's Cheque/Cash Warrant, or
	c.	Demand Draft.
48.3	If the institution issuing the Performance Security furnished by the Bidder is located outside the Purchaser's country, the Performance Security shall be counter guaranteed by a correspondent Financial Institutions located in the Purchaser's country to make it enforceable.	
48.4	Failure by the successful Bidder to submit the above-mentioned Performance Security shall constitute sufficient grounds for the annulment of the award and forfeiture of the Bid Security. In that event the Purchaser may award the Contract to the next lowest evaluated Bidder whose offer is substantially responsive and is determined by the Purchaser to be qualified to perform the Contract satisfactorily. Such a failure shall be considered as default and all relevant clauses shall apply.	