Bharat Heavy Electricals Ltd.,

(A Government of India undertaking)

Electronics Division

PB No.2606, Mysore Road, Bangalore-560026, India

Quotations are invited under two part bid system for Supply of 3.3kV,1Cx400 sq mm Al,XLPE,Armoured cables for 100MW GSECL-Raghanesda 1&2 Solar Power project through e-procurement route.

Tender is procured through e-procurement route. Kindly refer Website https://eprocurebhel.co.in/nicgep/app/ for details.

RFQ NO and date	BKC0000063 dated 16.02.2021. (E-tender)
RFQ due date & time	01st March 2021 up to 13.00 hrs (IST)
Date, Time & Venue of Part-I Bid Opening	01.03.2021 after 13.30 hrs (IST) (E-tender) – Website - https://bhel.abcprocure.com
Date, Time & Venue of Price Bid opening	Will be intimated later for technically accepted vendors.
Address for Communication & Contact Person in BHEL	Engineering Department: Mr. Nanda Kishore (8197275295) Purchase Department: Mr. Chandan BK (9739252560) BHEL SBD, Malleswaram, opp IISC Bangalore-560 012. INDIA Email: chandanbk@bhel.in nandakishore@bhel.in
Name and address of the Independent External Monitor for this tender	IEM :Sh. Arun Chandra Verma, IPS (Retd.) and Sh Virendra Bahadur Singh, IPS (Retd.)

Any Deviations from or additions to the "General Conditions of Contract" or "Special Conditions of Contract" require BHEL's express written consent. The General Terms of Business or Sale of the Bidder shall not apply to this tender.

REQUEST FOR QUOTATION

MMI:PU:RF:003

BHARAT HEAVY ELECTRICALS LIMITED
Electronics Division
PB No. 2606, Mysore Road Bangalore - 560026
INDIA

RFQ NUMBER: BKC0000063

RFQ DATE : 16.02.2021

Due Date/Day: 01.03.2021 MON
Time : 13:00 HRS
E-TENDER

(address for communication) :

(for all correspondence)
Purchase Executive : CHANDAN BK
Phone : 080 26989608
Fax : 26989217
E-mail: chandanbk@bhel.in

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
1	PS0679082697 3.3KV 1CX400 sq.mm Al XLPE Armoured red * HSN/SAC : 8544 Test Certificate cable	187,000	M	67,000 120,000	02.06.2021 02.06.2021
2	PS0679082701 3.3KV 1CX400 sq.mm Al XLPE Armoured * HSN/SAC : 8544 Test Certificate black cable	187,000	M	67,000 120,000	02.06.2021 02.06.2021

Total Number of Items - 2

1.
2.

For and On behalf of BHEL.

CHANDAN BK
Semiconductors & Pho

* The HSN/SAC no mentioned against the line items in the RFQ are indicative only.

Quantity split for BKC0000063 for supply of 3.3kV,1Cx400sq mm XLPE, AL , ARMOURED cable for Raghanesda 1 and Raghanesda 2 Solar PV projects.

ITEM	Raghanesda-1	Raghanesda-2
1. 3.3kV , 1Cx400sq mm Al XLPE armoured red cable	67000m	120000m
2. 3.3kV , 1Cx400sq mm Al XLPE armoured black cable	67000m	120000m

PRE – QUALIFICATION CRITERIA:

A. Vendor shall be OEM of cables as per IS: 7098 Part-2 in India. As evidence to this, vendor shall enclose their product catalog along with BIS license copy.

B. Vendor should have already obtained type test reports for cables of 3.3 kV or above voltage grade, 400 sq.mm or higher size, single or multi-core, Aluminium conductor, Armoured as per IS: 7098 Part-2 from an NABL accredited lab. As evidence to this, vendor shall enclose reports for all the type tests as per IS 7098 Part-2.

C. Vendor should have supplied minimum cumulative quantity of 70 KMs of 3.3 kV or above voltage grade, 300 sq.mm or higher size, single or multi-core, Aluminium conductor, Armoured cables as per IS: 7098 Part-2 in India within last 3 years prior to the publication of this tender. As evidence to this, vendor shall enclose copies of purchase orders along with supply completion proof in form of dispatch documents (Invoice and LR) or letter from customer.

A. Introduction

This technical specification provides BHEL requirement for supply of 3.3 kV (E) grade, 1CX400 sq.mm power cable for drawing DC power from PV array to solar Inverter in solar power plants.

B. Technical specification

#	Particular	BHEL specification
1.0	Item description	3.3 kV (E) grade cable, 1 Core x 400 sq.mm, stranded, compacted Aluminium conductor, XLPE insulated, Galvanized steel strip or wire Armored, FR-LSH PVC (Type ST2) outer sheathed confirming to IS 7098 (Part-2): 2011 or latest edition
2.0	Application	Suitable for use in outdoor application in solar power plants for drawing DC power from PV array to solar Inverter
3.0	Applicable standards	IS: 7098 (Part-2): 2011 or latest edition amended up to date
4.0	Voltage grade	3.3kV AC - Earthed grade (E)
5.0	**Conductor**	As per IS: 8130-2013 /latest edition
a)	Material	Class-2 stranded compacted plain Aluminium conductor (grade H4)
b)	Cross sectional area	400 sq.mm
c)	Maximum conductor resistance at 20°C	As per relevant IS
d)	No of strands (minimum)	As per relevant IS
e)	Approx. dia of each strand in mm	Dia of each strand shall be such as to meet the DC Resistance of conductor specified in IS:8130-1984
6.0	**Insulation**	As per IS: 7098 (Part-2)
a)	Material	Cross-linked polyethylene (XLPE)
b)	Nominal insulation thickness	As per relevant IS
c)	Tolerance on thickness	As per relevant IS
d)	Volume resistivity at 27°C	1x 10^14 Ohm-cm (Min)
e)	Volume resistivity at 90°C	1x 10^12 Ohm-cm (Min)
f)	Max. conductor temperature	90°C – Normal continuous operation 250 °C – Short circuit condition
7.0	Core identification (insulation colour)	Red / Black
8.0	**Armouring**	As per IS: 3975- 1979/latest edition
a)	Armour material and shape	Galvanized steel strip or wire armour
b)	Armour wire diameter / strip dimension (Nominal)	As per relevant IS
c)	Max. resistivity of armour at 20°C	As per relevant IS
d)	The gap between armour wires shall not exceed one armour wire space and there shall be no cross over/ over-riding of armour wire. 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. Zinc rich paint shall be applied on armour joint surface of GS strip.	

REVISION : 00	PREPARED	APPROVED	DATE
	L. Nanda Kishore	Prachi Rao V	30-01-2021

9.0	**Outer sheath**	As per IS: 5831-1984 and ASTM stds	
a)	Material	Extruded PVC Type ST2 with FR-LSH properties	
b)	Thickness of outer sheath	As per IS: 7098 (Part-2)	
c)	Colour of outer sheath	Black for black insulation / Black with red line for red insulation	
d)	Overall diameter of cable	Vendor shall indicate dimension. Allowable tolerance shall be +/-2 mm over declared value.	
e)	Properties	The sheath shall be resistant to water, ultraviolet radiation, fungus, termite and rodent attacks.	
10.0	Ovality at any cross section shall be kept minimum as per requirements of IS 7098 Part-2 so as to have circular cross section of cable.		
11.0	Minimum bending radius	As per IS: 1255	
12.0	**FR-LSH properties**		
a)	Oxygen index	Min. 29% as per IS 10810 Part 58	
b)	Temperature index	Min. 250°C as per As per IS 10810 Part 64	
c)	Flammability	As per IEC-60332 Part-3	
d)	Halogen acid gas evolution	Max. 20 % as per IEC-60754 Part-1	
e)	Smoke density	Max. 60% as per ASTM-D-2843	
13.0	Continuous current carrying capacity of cable for **DC**		
a)	In Ground at 30°C (Amps)	533 A (Minimum)	
b)	In Duct at 30°C (Amps)	433 A (Minimum)	
c)	In Air at 40°C (Amps)	664 A (Minimum)	
14.0	Short-circuit withstand capacity and duration – To be mentioned by vendor		
a)	Conductor (kAmps) for 1 sec		
b)	Armour (kAmps) for 1 sec		
15.0	**Routine tests** (As per IS: 7098 (Part-2) 1988).	To be conducted by the vendor on each drum of finished cables. Test report shall be submitted to BHEL along with inspection call for acceptance tests	
a)	Conductor resistance test		
b)	HV test		
16.0	**Acceptance Tests**		
	All acceptance tests shall be carried out on manufactured cable as per IS-7098 (Part-2). Vendor shall issue inspection call to BHEL/ BHEL Customer for witness of tests prior to dispatch of cables.		
17.0	**Type Tests**		
	During detailed engineering, vendor shall submit the reports of all valid type tests as per IS 7098 (Part-2) latest edition conducted within last 5 years. These reports should be for the test conducted on the cables similar to those proposed to be supplied under this contract and the test(s) should have been conducted at an NABL accredited laboratory. However, if the vendor is not able to submit valid type test reports, the vendor shall conduct all such tests under this contract at no additional cost to BHEL either at third party lab or in presence of BHEL /customer representative and submit the reports for approval.		

18.0	**Cable identification / marking**	
a)	The printing/ embossing shall be progressive, automatic, in line and marking shall be legible and indelible.	
b)	Identification scheme / printing on the cable	Embossing on outer sheath at an interval of 1 meter: (a) BHEL, Customer Name (b) Type of cable and Voltage grade (c) Cable size (d) Word 'FRLSH' (e) Year of manufacture (f) Manufacturer name, brand name or trade mark, (g) ISI mark and IS standard (h) Sequential marking of length of the cable in meters.
19.0	**Packing and marking**	
a)	The cable shall be supplied in non-returnable wooden or steel drum of heavy construction. The surface of the drum and the outermost cable layer shall be covered with water proof cover. Both the ends of the cable shall be properly sealed by means of non-hygroscopic sealing materials and secured by 'U' nails so as to eliminate ingress of water during transportation, storage and erection. Wood preservative anti-termite treatment shall be applied to the entire drum. Wooden drums shall comply IS: 10418.	
b)	Drum length	1000 meter +/- 5%
c)	Marking on the drum	Each drum shall be marked with following information: BHEL PO number and date, BHEL specification number, Cable description, Manufacturer name, Address and contact number, Part number, Size & Length of the cable, Type of cable, Number of Cores, Nominal cross-section Area of Conductor, Cable code, Voltage grade, Approx. gross mass, Year of manufacture, ISI mark and IS standard etc. stencilled on both sides of the drum. A tag containing same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction in which it should be rolled.
20.0	**Documents to be submitted along with offer**	
	1. Filled in values/details wherever the same is asked for in BHEL technical specifications 2. Vendor has to enclose the deviation sheet clause wise separately in case any deviations are sought by the vendor. Absence of any deviation sheet shall be taken as compliance of BHEL specification in total without any deviation.	
21.0	**Documents to be submitted within 1 week after receipt of Purchase order**	
	1. Technical datasheet of the cable with cross section sketch 2. Manufacturing Quality Plan (MQP) 3. Type Test Certificate and reports of cable with similar construction	

CIN No. U99999MH1970GAPO14629

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Ref. No. 91/DIV/CAB/05

9th October 2019

All Members of Cable Division & All SEBs, Utilities & Listed Purchasing organisations

Sub: i) Revision in Price Variation Formulae for Medium Voltage Power Cables
ii) New Price Variation Formula for 6 Quad Railway signalling Cables as per RDSO specs

IEEMA was working on inclusion of Metallic screen factors of copper tape applicable for the MV Power Cables and on specific request from Railways, IEEMA was also working on evolution of factors and formula for 6 Quad Railway Signalling Cables as per RDSO specifications.

IEEMA has been discussing internally on evolution of standards weight factors of metals and polymers applicable for EHV Cables for various standard rating and for specific short circuit test requirements.

After compilation of all inputs of factors from major manufacturers, the revised Price Variation Formulae for EHV Cables, MV Power Cables including metallic screen factor (Cu tape) have been prepared. Similarly a new PV formula for 6 Quad Railway signalling cables as per RDSO specification has also been prepared. The same in the draft form were circulated vide cir. No. 73/DIV/CAB/05 dated 23rd August 2019 for your reviews.

Since there are no adverse comments received; we are making these formulae operational from 1st September 2019. We request and recommend all the users & stakeholders including Utilities, PSUs etc. to incorporate these PV formulae in all the new tenders/contracts.

For pending contracts of EHV Cables and MV Power Cables, the date of delivery on or after 1st September 2019, to arrive at the final price variation, we recommend using the following two stage method, which is a standard institutionalized methodology adopted by IEEMA for change over in all IEEMA PV clauses.

1. Calculate price variation 'P' from applicable prices/indices from your base date / date of tendering up to September 2019 i.e. considering all prices/indices published in PV circular of September 2019 at numerator place; using IEEMA PV clause effective from 1st November 2017.

2. Treat the above calculated 'P' as 'P_0' and calculate final price variation considering all prices / indices published in September 2019 as base prices/indices (at the denominator place) up to the applicable prices/indices as per your date of delivery; using revised PV clause of MV Power Cable effective from 1st September 2019.

Director

Encl: Revised PV Formulae for EHV Cables, Medium Voltage Power Cables
New PV Formula for 6 Quad Railway signaling Cables as per RDSO specs

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IEEMA (PVC)/MV SCREEN CABLE/2019 **Effective from: 1st September 2019**

Price Variation Clause for 3.3-33 KV XLPE Insulated Armoured Single & Three core Screen Cables

The Price quoted/confirmed is based on the input cost of raw materials/components as on the date of quotation, and the same is deemed to be related to the prices of raw materials as specified in the price variation clause given below. In case of any variation in these prices, the price payable shall be subject to adjustment up or down in accordance with the formulae provided in this document.

Terms used in price variation formulae:

P Price payable as adjusted in accordance with above appropriate formula **(in Rs/Km)**
Po Ex-Works Price quoted/confirmed **(in Rs/Km)**

ALUMINIUM

AlF Variation factor for Aluminium

Al Price of Aluminium. This price is as applicable one month prior to the date of delivery.
Alo Price of Aluminium. This price is as applicable one month prior to the date of tendering.

COPPER

CuF Variation factor for copper

Cu Price of CC copper rods. This price is as applicable one month prior to the date of delivery.
Cuo Price of CC copper rods. This price is as applicable one month prior to the date of tendering.

PVC COMPOUND

PVCc price of PVC compound. This price is as applicable on first working day of the month, one month prior to the date of delivery.
PVCco Price of PVC compound. This price is as applicable on first working day of the month, one month prior to the date of tendering.

CCFAl Variation factor for PVC compound/Polymer for aluminum conductor cable.
CCFCu Variation factor for PVC compound/Polymer for copper conductor cable.

XLPE COMPOUND

Cc price of XLPE compound. This price is as applicable on first working day of the month, one month prior to the date of delivery.
Cco Price of XLPE compound. This price is as applicable on first working day of the month, one month prior to the date of tendering.

XLFAL Variation factor for XLPE compound for aluminum conductor cable.
XLFCU Variation factor for XLPE compound for Copper conductor cable.

IEEMA (PVC)/MV SCREEN CABLE/2019 **Effective from: 1st September 2019**

STEEL

FeF	Variation factor for steel
FeW	Variation factor for round wire steel armouring
Fe	Price of Steel Strips/steel wire. This price is as applicable on the first working day of the month, one month prior to the date of delivery.
Feo	Price of steel strips/steel wire. This price is as applicable on first working day of the month, one month prior to the date of tendering.

COPPER TAPE

SMIFS	Variation Factor for Copper Tape
SMIF1	Price of CC copper rods. This price is as applicable one month prior to the date of delivery.
SMIF0	Price of CC copper rods. This price is as applicable one month prior to the date of tendering.

The above prices and indices are as published by IEEMA vide Circular reference IEEMA (PVC)/CABLE(R-1)/--/-- prevailing as on 1st working day of the month i.e. one month prior to the date of tendering.

The date of delivery is the date on which the cable is notified as being ready for inspection/dispatch (in the absence of such notification, date of manufacturer's dispatch note is to be considered as the date of delivery) or contracted delivery date (including any agreed extension thereto) whichever is earlier.

Notes: All prices of raw materials are exclusive of GST amount. The details of prices are as under:

1. Price of Aluminium is LME average Cash SELLER Settlement price of Primary Aluminium in US$ per MT as published by London Metal Bulletin (LME) including Premium for Aluminium Ingot in US$ per MT is converted in Indian Rs./MT.
2. Price of PVC Compound (in Rs/MT) is the ex-works price, as quoted by the manufacturer.
3. Price of XLPE Compound (in Rs/MT) is the ex-works price, as quoted by the manufacturer
4. Price of CC copper rods (in Rs/MT) is ex-works price as quoted by the primary producer.
5. Price of galvanized steel strip / steel wire (in Rs/MT) is ex-works price as quoted by the manufacturer for Round steel Wire and Flat steel strip (the relevant price of steel strip or steel wire is to be selected depending upon the type of armouring of the cable).

Price variation formulae

G. For Aluminium conductor XLPE insulated 3.3 to 33 kV Single Core Armoured power cables

$$P = Po + AlF\ (Al - Alo) + XLFAL(CC-Cco) + SMIFS\ (SMIF1-SMIF0) + CCFAl\ (PVCc - PVCco)$$

For Single Core unarmoured cables Aluminium factor (AlF) shall be referred from Table ALP

Table References:

ALP	Aluminium conductor Factor in single core (for unarmoured cable) ; AlF
H1	Aluminium Armour Factor for Armour with Al Cond.
H2(a)	XLPE Compound Factor ; XLFAl
H3(a)	Copper Tape Factor ; SMIFS
H5(a)	Polymer factor for Single core cable ; CCFAl