Bharat Heavy Electricals Ltd.,
Electronics Division,
Mysore Road, Bangalore – 560 026

Tender Document for " Supply of Accessories for Fiber Optic Cable Laying and termination and Services at site for NTPC- NABINAGAR STN C&I & SG (3x660MW), NORTH KARANPURA (3X660MW), GADARWARA (2X800 MW), FGUTPP-IV UNCHAHAR (1X500MW), SURATHGARH UNIT 7&8, PARBATI-II (4X200MW), KOTHAGUDEM (1X800MW) Projects (Ref. NKR0000164)

TENDER REFERENCE DOC	NKR0000164
TENDER DOCUMENT AVAILABLE FROM	Refer eprocurement system website
LAST DATE AND TIME FOR SUBMISSION OF TENDER	Refer eprocurement system website
DATE AND TIME FOR TENDER OPENING	Refer eprocurement system website
SUBMISSION OF TENDER	Bidder to submit tender in E-procurement site : https://bheleps.buyjunction.in/. Refer instructions give in tender document for offer submission of bid in E-procurement site. Service provider: M-junction

This Tender Document Contains documents as per below index:

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REQUEST FOR QUOTATION

RFQ NO. NKR0000164 DT. 14.01.2017

MATERIAL CODE	ITEM DESCRIPTION	UOM	NHPC PRABATI	NORTH KARANPUR	NTPC NABINAGAR C&I	NTPC NABINAGAR SG	SURATGARH	KOTHAGUDEM	UNCHAHAR	GADARWARA	TOTAL
PR0120004479	PIGTAILS-SINGLE MODE 9µm/125µm,SC FIBRA PIGTAIL	No.	145	32	660	NIL	840	648	160	60	2545
PR0120004460	PIGTAILS -MULTIMODE 62.5µm/125µm,SC FIBRA PIGTAIL	No.	235	912	390	50	460	NIL	480	1080	3607
PR0120006340	Corrugated flexible Steel tube/hose 1"	Meter	50	256	270	15	380	162	130	270	1533
PR0120006359	Glands For Coupling	No.	50	256	270	15	380	162	130	270	1533
PR0120006430	2" GI conduit/pipe	Meter	NIL	5150	2340	108	2520	1128	NIL	14490	25736
PR0900007362	OFC Markers	No.	NIL	385	560	180	790	294	NIL	930	3139
PR0500004625	SC DUPLEX MULTIMODE PATCHCORDS-5m	No.	NIL	30	NIL	NIL	NIL	NIL	NIL	NIL	30
PR0500004697	SC- SC DUPLEX MULTIMODE PATCHCORDS-2m	No.	NIL	NIL	NIL	NIL	NIL	NIL	50	160	210
PR0500004685	SC- SC DUPLEX SINGLE MODE PATCHCORDS-2m	No.	NIL	NIL	NIL	NIL	NIL	NIL	60	30	90
PR0500004673	SC- LC DUPLEX MULTI MODE PATCHCORDS-2m	No.	NIL	NIL	NIL	NIL	NIL	NIL	130	170	300
PR0500004661	SC- LC DUPLEX SINGLE MODE PATCHCORDS-2m	No.	NIL	NIL	NIL	NIL	NIL	NIL	50	10	60
	No.of Terminations	Activity Unit	336	944	1040	48	1184	648	496	1080	5776
	No. of Visits	No.	4	8	8	2	6	4	7	11	50

Pre-Qualification Criteria for the vendors.

1. The bidder shall have experience of performing Fiber optic cable terminations in last Two (2) years, starting from 01/01/2015 and ending on 31/12/2016 in India.

   Completed terminations shall be 200 nos minimum.

2. Copies of purchase orders and documentary proof of termination completion consisting of one of the following should be mandatorily furnished for proof of the above failing which offer will NOT be considered:

   Installation report / Minutes of Meeting / Customer acceptance certificate.

3. Termination technician should be trained and certified for OFC termination. Documentary proof/evidence in this regard shall be submitted.

Note: If the above terms are not complied with, the offer will be liable for rejection

CHECKLIST FOR PQC:

	PQC Clause	**Description**	**Nature of Enclosure required**	**REMARKS**
1	Experience of FOC termination in last two (2) years	Please mention No. of PO's enclosed (Total no. of terminations shall be 200 nos minimum)	Mention No. Of PO's Enclosed: Mention Total no. of terminations	
2	Proof of Terminations completion	Mention type of Document submitted for a total of 200 terminations Installation Report Minutes of meeting Customer acceptance certificate	Please tick whichever has been enclosed Installation Report Minutes of meeting Customer acceptance certificate	
3	Trained Technician	Documentary proof for training / Trainer's certificate	Please tick whichever has been enclosed Documentary proof of training Trainer's certificate	

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PURCHASE SPECIFICATION Of Fibre Optic Cables & Accessories

Revision: 07

Approved by: Prithvi Raj S

Prepared by	Issued by	Date
Anupama Sinha	CE-Engg (HMI)	05/05/14

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REVISION HISTORY SHEET

Rev No.	Date	Nature of Change	Reason	Prepared by	Approved by
00	05-05-2014	First issue	----------	AS	PRS
01	28-05-2014	Minor	----------	AS	PRS
02	06-09-2014	Minor	----------	AS	PRS
03	23-10-2014	Minor	----------	AS	PRS
04	16-10-2015	Minor	----------	AS	PRS
05	18-02-2016	Minor	----------	AS	PRS
06	23-04-2016	Minor	----------	AS	PRS
07	11-01-2017	Minor	----------	AS	KP

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SPECIFICATION OF FIBRE OPTIC CABLES:

A: MULTI-MODE 62.5um/125um FIBRE OPTIC CABLE

1. 4 core, Uni-tube, Armoured, Direct Burial 62.5 µm /125 µm MM FO cable

FOUR-FIBRE, UNITUBE CONSTRUCTION, GEL FILLED, MULTIMODE OPTICAL FIBRE CABLE (OFC) WITH 4 Nos. 62.5/125 MICRONS COLOUR CODED FIBRES AS PER G.651 STANDARDS, ECCST ARMOUR, EMBEDDED STEEL WIRE / FRP STRENGTH MEMBERS, WATER SWELLABLE/WATER BLOCKING TAPE & OUTER UV RESISTANT AND FIRE RETARDANT LSZH SHEATH HAVING ANTI-TERMITE AND ANTI-RODENT PROPERTIES, SUITABLE FOR DIRECT/DUCT BURIAL AND LAYING ON CABLE TRAYS.
QUANTITY TOLERANCE: UPTO +5% OF TOTAL LENGTH EXTRA

1.1 4 core, multi-tube, Armoured, Direct Burial 62.5 µm /125 µm MM FO cable

FOUR-FIBER MULTI-TUBE CONSTRUCTION, GEL FILLED, MULTIMODE OPTICAL FIBRE CABLE (OFC) WITH 4 Nos. 62.5/125 MICRONS COLOUR CODED FIBRES AS PER G.651 STANDARDS, ECCST ARMOUR, CENTRAL FRP STRENGTH MEMBER, INNER SHEATH ,WATER SWELLABLE/WATER BLOCKING TAPE & OUTER UV RESISTANT AND FIRE RETARDANT LSZH SHEATH HAVING ANTI-TERMITE AND ANTI-RODENT PROPERTIES, SUITABLE FOR DIRECT/DUCT BURIAL AND LAYING ON CABLE TRAYS.
QUANTITY TOLERANCE: UPTO +5% OF TOTAL LENGTH EXTRA

2. 6 core, uni-tube, Armoured, Direct Burial 62.5 µm /125 µm MM FO cable

SIX-FIBRE, UNITUBE CONSTRUCTION, GEL FILLED, MULTIMODE OPTICAL FIBRE CABLE (OFC) WITH 6 Nos. 62.5/125 MICRONS COLOUR CODED FIBRES AS PER G.651 STANDARDS, ECCST ARMOUR, EMBEDDED STEEL WIRE / FRP STRENGTH MEMBERS, WITH WATER SWELLABLE/WATER BLOCKING TAPE & OUTER UV RESISTANT AND FIRE RETARDANT LSZH SHEATH HAVING ANTI-TERMITE AND ANTI-RODENT PROPERTIES, SUITABLE FOR DIRECT/DUCT BURIAL AND LAYING ON CABLE TRAYS.
QUANTITY TOLERANCE: UPTO +5% OF TOTAL LENGTH EXTRA

3. 6 core, multi-tube, Armoured, Direct Burial 62.5 µm /125 µm MM FO cable

SIX-FIBER MULTI-TUBE CONSTRUCTION, GEL FILLED, MULTIMODE OPTICAL FIBRE CABLE (OFC) WITH 6 Nos. 62.5/125 MICRONS COLOUR CODED FIBRES AS PER G.651 STANDARDS, ECCST ARMOUR, CENTRAL FRP STRENGTH MEMBER, INNER SHEATH, WATER SWELLABLE/WATER BLOCKING TAPE & OUTER UV RESISTANT AND FIRE RETARDANT LSZH SHEATH HAVING ANTI-TERMITE AND ANTI-RODENT PROPERTIES, SUITABLE FOR DIRECT/DUCT BURIAL AND LAYING ON CABLE TRAYS.
QUANTITY TOLERANCE: UPTO +5% OF TOTAL LENGTH EXTRA

4. 8 core, multi-tube, Armoured, Direct Burial 62.5 µm /125 µm MM FO cable

EIGHT FIBRE MULTI TUBE CONSTRUCTION (4 FIBERS PER TUBE) GEL FILLED MULTIMODE OPTICAL FIBRE CABLE (OFC) WITH 08 Nos. 62.5/125 MICRONS COLOR CODED FIBRES AS PER G.651 STANDARDS, ECCST ARMOUR, CENTRAL FRP STRENGTH MEMBER, INNER SHEATH, WATER SWELLABLE/WATER BLOCKING TAPE & OUTER UV RESISTANT AND FIRE RETARDANT LSZH SHEATH HAVING ANTI-TERMITE AND ANTI-RODENT PROPERTIES, SUITABLE FOR DIRECT/DUCT BURIAL AND LAYING ON CABLE TRAYS.
QUANTITY TOLERANCE +5% OF TOTAL LENGTH EXTRA

5. 12 core, multi-tube, Armoured, Direct Burial 62.5 µm/125 µm MM FO cable

TWELVE FIBRE FIBRE MULTI TUBE CONSTRUCTION (4 FIBERS PER TUBE) GEL FILLED MULTIMODE OPTICAL FIBRE CABLE (OFC) WITH 12 Nos. 62.5/125 MICRONS COLOR CODED FIBRES AS PER G.651 STANDARDS, ECCST ARMOUR, CENTRAL FRP STRENGTH MEMBER, INNER SHEATH, WATER SWELLABLE/WATER BLOCKING TAPE & OUTER UV RESISTANT AND FIRE RETARDANT LSZH SHEATH HAVING ANTI-TERMITE AND ANTI-RODENT PROPERTIES, SUITABLE FOR DIRECT/DUCT BURIAL AND LAYING ON CABLE TRAYS.
QUANTITY TOLERANCE +5% OF TOTAL LENGTH INCLUDED

B: SINGLE-MODE 9um/125um FIBRE OPTIC CABLE

1. 4 core, uni-tube, Armoured, Direct Burial 9 µm /125 µm SM FO cable
FOUR FIBRE UNI-TUBE CONSTRUCTION, GEL FILLED, SINGLE MODE OPTICAL FIBRE CABLE (OFC) WITH 04 Nos. 9/125 MICRONS COLOR CODED FIBRES AS PER G.652 STANDARDS, ECCST ARMOUR, EMBEDDED STEEL WIRE / FRP STRENGTH MEMBERS, WITH WATER SWELLABLE/WATER BLOCKING TAPE & OUTER UV RESISTANT AND FIRE RETARDANT LSZH SHEATH HAVING ANTI-TERMITE AND ANTI-RODENT PROPERTIES, SUITABLE FOR DIRECT/DUCT BURIAL AND LAYING ON CABLE TRAYS.
QUANTITY TOLERANCE: UPTO +5% OF TOTAL LENGTH EXTRA

1.1 4 core, multi-tube, Armoured, Direct Burial 9µm/125µm SM FO cable
FOUR FIBRE MULTI TUBE CONSTRUCTION, GEL FILLED, SINGLE MODE OPTICAL FIBRE CABLE (OFC) WITH 04 Nos. 9/125 MICRONS COLOR CODED FIBRES AS PER G.652 STANDARDS, ECCST ARMOUR, CENTRAL FRP STRENGTH MEMBERS, INNER SHEATH, WATER SWELLABLE/WATER BLOCKING TAPE & OUTER UV RESISTANT AND FIRE RETARDANT LSZH SHEATH HAVING ANTI-TERMITE AND ANTI-RODENT PROPERTIES, SUITABLE FOR DIRECT/DUCT BURIAL AND LAYING ON CABLE TRAYS.
QUANTITY TOLERANCE: UPTO +5% OF TOTAL LENGTH EXTRA

2. 6 core, uni-tube, Armoured, Direct Burial 9µm/125µm SM FO cable
SIX FIBRE UNI-TUBE CONSTRUCTION, GEL FILLED, SINGLE MODE OPTICAL FIBRE CABLE (OFC) WITH 06 Nos. 9/125 MICRONS COLOR CODED FIBRES AS PER G.652 STANDARDS, ECCST ARMOUR, EMBEDDED STEEL WIRE / FRP STRENGTH MEMBERS, WITH WATER SWELLABLE/ WATER BLOCKING TAPE & OUTER UV RESISTANT AND FIRE RETARDANT LSZH SHEATH HAVING ANTI-TERMITE AND ANTI-RODENT PROPERTIES, SUITABLE FOR DIRECT/DUCT BURIAL AND LAYING ON CABLE TRAYS.
QUANTITY TOLERANCE: UPTO +5% OF TOTAL LENGTH EXTRA

3. 6 core, multi-tube, Armoured, Direct Burial 9µm/125µm SM FO cable
SIX FIBRE MULTI TUBE CONSTRUCTION, GEL FILLED, SINGLE MODE OPTICAL FIBRE CABLE (OFC) WITH 06 Nos. 9/125 MICRONS COLOR CODED FIBRES AS PER G.652 STANDARDS, ECCST ARMOUR, CENTRAL FRP STRENGTH MEMBERS, INNER SHEATH, WATER SWELLABLE/WATER BLOCKING TAPE & OUTER UV RESISTANT AND FIRE RETARDANT LSZH SHEATH HAVING ANTI-TERMITE AND ANTI-RODENT PROPERTIES, SUITABLE FOR DIRECT/DUCT BURIAL AND LAYING ON CABLE TRAYS.
QUANTITY TOLERANCE: UPTO +5% OF TOTAL LENGTH EXTRA

4. 8 core, multi-tube, Armoured, Direct Burial 9µm/125µm SM FO cable
EIGHT FIBRE MULTI TUBE CONSTRUCTION (4 FIBERS PER TUBE), GEL FILLED, SINGLE MODE OPTICAL FIBRE CABLE (OFC) WITH 08 Nos. 9/125 MICRONS COLOR CODED FIBRES AS PER G.652 STANDARDS, ECCST ARMOUR, CENTRAL FRP STRENGTH MEMBERS, INNER SHEATH, WATER SWELLABLE/WATER BLOCKING TAPE & OUTER UV

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RESISTANT AND FIRE RETARDANT LSZH SHEATH HAVING ANTI-TERMITE AND ANTI-RODENT PROPERTIES, SUITABLE FOR DIRECT/DUCT BURIAL AND LAYING ON CABLE TRAYS.
QUANTITY TOLERANCE: UPTO +5% OF TOTAL LENGTH EXTRA

5. 12 core, multi-tube, Armoured, Direct Burial 9µm/125µm SM FO cable
TWELVE FIBRE MULTI TUBE CONSTRUCTION (4 FIBERS PER TUBE), GEL FILLED, SINGLE MODE OPTICAL FIBRE CABLE (OFC) WITH 12 Nos. 9/125 MICRONS COLOR CODED FIBRES AS PER G.652 STANDARDS, ECCST ARMOUR, CENTRAL FRP STRENGTH MEMBERS, INNER SHEATH, WATER SWELLABLE/WATER BLOCKING TAPE & OUTER UV RESISTANT AND FIRE RETARDANT LSZH SHEATH HAVING ANTI-TERMITE AND ANTI-RODENT PROPERTIES, SUITABLE FOR DIRECT/DUCT BURIAL AND LAYING ON CABLE TRAYS.
QUANTITY TOLERANCE: UPTO +5% OF TOTAL LENGTH EXTRA

C: FO CABLE ACCESSORIES

1. **PIGTAILS – MULTIMODE 62.5µm /125µm, SIMPLEX SC FIBRE PIGTAIL** MULTIMODE 62.5/125 MICRON SIMPLEX PIGTAIL 1M LENGTH WITH SC-SC PUSHPULL CONNECTOR WITH CERAMIC FERRULE AND INSERTION LOSS < 0.40dB.

2. **PIGTAILS – SINGLE MODE 9µm /125µm, SIMPLEX SC FIBRE PIGTAIL** SINGLE MODE 9/125 MICRON SIMPLEX PIGTAIL 1M LENGTH WITH SC-SC PUSHPULL CONNECTOR WITH CERAMIC FERRULE AND INSERTION LOSS < 0.30dB.

3. **MULTI MODE SC CONNECTORS – MM** SC CONNECTOR, 62.5 MICRON, CERAMIC FERRULE, Compliant with EIA/TIA 568-B.3, WITH TYPICAL INSERTION LOSS < 0.5dB

4. **SINGLE MODE SC CONNECTORS – SM** SC CONNECTOR, 9 MICRON, CERAMIC FERRULE, Compliant with EIA/TIA 568-B.3, WITH TYPICAL INSERTION LOSS < 0.4dB

5. **SC-SC DUPLEX MULTIMODE PATCHCORDS -** SC-SC DUPLEX MM PATCHCORD – 2M LENGTH, PUSH PULL CONNECTOR, CERAMIC FERRULE, INSERTION LOSS TYPICAL 0.35dB

6. **SC-SC DUPLEX SINGLE MODE PATCHCORDS -** SC-SC DUPLEX SM PATCHCORD – 2M LENGTH, PUSH PULL CONNECTOR, CERAMIC FERRULE, INSERTION LOSS TYPICAL 0.15dB

7. **SC-LC DUPLEX MULTIMODE PATCHCORDS - –** SC-LC MM PATCHCORD – 2M LENGTH, CONNECTOR A: LC DUPLEX CONNECTOR, CERAMIC FERRULE, INSERTION typical 0.35dB. CONNECTOR B: SC DUPLEX CONNECTOR, CERAMIC FERRULE, INSERTION typical 0.35dB.

8. **SC-LC SINGLE MODE DUPLEX PATCHCORDS –** SC-LC SM PATCHCORD – 2M LENGTH, CONNECTOR A: LC DUPLEX CONNECTOR, CERAMIC FERRULE, INSERTION typical 0.15dB. CONNECTOR B: SC DUPLEX CONNECTOR, CERAMIC FERRULE, INSERTION typical 0.15dB

9. **SC-SC DUPLEX MULTIMODE PATCHCORDS -** SC-SC DUPLEX MM PATCHCORD – 5M LENGTH, PUSH PULL CONNECTOR, CERAMIC FERRULE, INSERTION LOSS TYPICAL 0.35dB

10. **SC-SC DUPLEX SINGLE MODE PATCHCORDS -** SC-SC DUPLEX SM PATCHCORD – 5M LENGTH, PUSH PULL CONNECTOR, CERAMIC FERRULE, INSERTION LOSS TYPICAL 0.15dB

11. **SC-SC DUPLEX MULTIMODE PATCHCORDS -** SC-SC DUPLEX MM PATCHCORD – 10M LENGTH, PUSH PULL CONNECTOR, CERAMIC FERRULE, INSERTION LOSS TYPICAL 0.35dB

12. **SC-SC DUPLEX SINGLE MODE PATCHCORDS -** SC-SC DUPLEX SM PATCHCORD – 10M LENGTH, PUSH PULL CONNECTOR, CERAMIC FERRULE, INSERTION LOSS TYPICAL 0.15dB

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For all the above items (C1 to C12) make to be one of the following: D-Link, Molex, TE/Tyco, Schneider-Digilink, Panduit, Belden, R&M.

D: OTHERS ITEMS:-

1. **BREAKOUT KITS – FOR FIBRE CABLE**
2. **FLEXIBLE STEEL TUBE -** Corrugated flexible Steel tube/hose of 1" diameter
3. **CABLE GLANDS** - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates
4. **SPLICING ENCLOSURE** - The splicing enclosures of the optical fiber cable shall be dust tight (no dust ingress) and protected against immersion in WATER (suitable for continuous immersion in WATER). The enclosures shall be complete with all accessories including splice cassettes, splice protection and OFC preparation kit along with instruction sheet.
5. **2" GI conduit/pipe (As per ISI Standards – medium duty)**
6. **2" rodent proof HDPE Conduit (As per ISI Standards)**
7. **Coupler/joints for 2" HDPE Conduit**
8. **OFC Markers:** This shall be provided for every 50 m of cable, as per site requirement. These markers shall be of Cast metal with "OFC" engraving.

E.
Technical Specifications

Cables with fibres in jelly filled construction with ECCST Armour, with WATER SWELLABLE/ WATER BLOCKING TAPE, provided with embedded Steel wire / FRP strength members for Unitube cables and Central FRP strength member and inner sheath for multi-tube cables. Outer UV resistant and fire retardant LSZH jacket having anti-termite and Anti-rodent properties provided with sequential length marking suitable for direct/duct burial or laying on cable trays.

1. **Multi-Mode Armoured Cable:**

Multi-mode fiber utilized in the optical fiber cable shall meet ITU G.652D, IEC Specification 60793-2-50 Type B1.3,with following specifications:

i) **Fiber and buffering:**

a.	Fiber type:	Graded index multimode Fiber
b.	Core diameter:	62.5 microns $\pm$ 2.5 microns
c.	Cladding diameter	125 microns $\pm$ 2.0 microns
d.	Cladding non-circularity	$\leq$ 1%
e.	Core non-circularity	$\leq$ 5%
f.	Primary coating diameter	245μm $\pm$ 10μm
g.	Nμmerical aperture	0.275 $\pm$ 0.015 microns

ii) **Attenuation & Bandwidth:**

a. At 850 nm, attenuation < = 3.5 dB / Km & band width 160MHz-km
b. At 1310 nm, attenuation < = 1.5 dB / Km & band width 500MHz-km
c. Coupling loss <0.75db/connection

Note: For all other parameter refer to the General specifications

2. **Single-Mode Armoured Cable):**

The single-mode fiber utilized in the optical fiber cable shall meet ITU G.652D, IEC Specification 60793-2-50 Type B1.3,

i.) **Fiber and buffering:**

a.	Fiber type:	Stepped single mode Fiber
b.	Cladding diameter	125 microns $\pm$ 0.7 microns
c.	Cladding non-circularity	$\leq$ 0.7 %
d.	Core non-circularity	$\leq$ 0.5μm
e.	Primary coating diameter	242μm $\pm$ 5μm

ii.) **Attenuation & Bandwidth:**

a. At 1550 nm, attenuation < = 0.25dB / Km
b. At 1310 nm, attenuation < = 0.36 dB / Km
c. Coupling loss <0.75db/connection

Note: For all other parameter refer to the General specifications

3. General Specification :

Mechanical, Geometrical, Transmission and Environmental characteristics should be as per relevant IEC 60794-1-2-X spec

Stripping ability: All layers easily removed with commercially available tools.

Fibre Identification: All the fibers in the PBT lose tube are to be colour for identification purpose with UV curable inks i.e., Blue, Orange, Green and natural. The tube colour will be natural.

Marking: The cable should have identification marking at regular intervals of 1 meter which will be of permanent nature. The accuracy of the sequential marking should be within ± 0.5%.

Immunity: The cables shall be immune to corrosive element found naturally in the ground. Optical fibers shall be coated with protective materials / coatings and should not have any reaction with cladding or core materials

Life of cable: The minimum expected life of the cable shall be 25 years.

Cable Ends: Running end shall be provided with pulling eye & the other end shall be sealed with thermal shrink cap

Length of the cable drum: The length can be standard factory length +/-10%. Care to be taken to minimize wastage while cutting to length by optimizing drum lengths in line with site requirement.

Compliance: Cable should, in general, be ISO/IEC and EIA/TIA compliant and conform to Mechanical conditions as per IEC 60-794-1-2-X Standards for Tensile force, Crush Resistance, Impact Resistance, Torsion, Kink etc.

Following parameter to be met:

Overall Nominal Diameter:

Uni-Tube: 9 mm (minimum) multi-tube: 10mm (minimum)

Minimum Tensile strength:

2000 N during installation

1000 N after installation

Crush Resistance:

For Multi-tube cables – 4000 N

For Uni-tube Cables – 2000 N

F : DOCUMENTS TO BE GIVEN ALONG WITH QUOTATION

i. **Detailed Technical data sheet and cable dimension details**. (with cable cross-sectional diagram)
ii. Cable should, in general, confirm to Mechanical Strength and dimensions of relevant IEC 60794-1-2-X spec.
iii. Deviations, if any, to our specification to be mentioned in Offer.
iv. Vendor to furnish **manufacturer's compliance certificate** for LSZH, Anti-Rodent and Anti-Termite properties for the outer sheath of the OFC, along with the Test Report for the raw material / compound provided by the outer sheath raw material manufacturer.

G. NOTE:

a. Material has to be directly sent to site and service shall be provided at site.
b. Rates to be mentioned separately per meter of OFC cable and per Unit for all other accessories. The offered prices should be Valid for + 20% quantity of the overall scope of the purchase.
c. Manufacturer's Datasheet and QAP in format provided by BHEL will have to be submitted before manufacturing to get Final Customer's Approval.
d. Tests as per IEC 60794-1-2-X and other relevant specs have to be carried out.
e. Packaging & Forwarding -Vendor shall ensure adequate packaging to protect the drums /other boxes against damage during transit.

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ANNEXURE-I (CHECKLIST)

Vendor to duly fill in the Checklist and submit the same with their offer:-

Sl. No.	Specification and other requirement details	Vendor Confirmation
1.	Cables with fibres in jelly filled construction with ECCST Armour, with WATER SWELLABLE/WATER BLOCKING TAPE, provided with embedded Steel wire / FRP strength members for **Unitube c**ables and Central FRP strength member and inner sheath for **multi-tube** cables. Outer UV resistant and fire retardant LSZH jacket having anti-termite and Anti-rodent properties provided with sequential length marking suitable for direct/duct burial or laying on cable trays..	YES/NO
2.	**Multi-mode Armoured cable—** Multi-mode fiber utilized in the optical fiber cable shall meet ITU G.652D, IEC Specification 60793-2-50 Type B1.3,with following specifications: **i.) Fiber and buffering:** d. Fiber type: Graded index multimode Fiber e. Core diameter: 62.5 microns $\pm$ 2.5 microns f. Cladding diameter 125 microns $\pm$ 2.0 microns g. Cladding non-circularity $\leq$ 1% h. Core non-circularity $\leq$ 5% i. Primary coating diameter 245μm $\pm$ 10μm j. Numerical aperture 0.275 $\pm$ 0.015 microns **ii.) Attenuation & Bandwidth:** k. At 850 nm, attenuation < = 3.5 dB / Km & band width 160MHz-km l. At 1310 nm, attenuation < = 1.5 dB / Km & band width 500MHz-km m. Coupling loss <0.75db/connection	YES/NO
3.	**Single-mode Armoured cable--** The single-mode fiber utilized in the optical fiber cable shall meet ITU G.652D, IEC Specification 60793-2-50 Type B1.3, **i.) Fiber and buffering:** d. Fiber type: Stepped single mode Fiber e. Cladding diameter 125 microns $\pm$ 0.7 microns f. Cladding non-circularity $\leq$ 0.7 % g. Core non-circularity $\leq$ 0.5μm h. Primary coating diameter 242μm $\pm$ 5μm **ii.) Attenuation & Bandwidth:** i. At 1550 nm, attenuation < = 0.25dB / Km j. At 1310 nm, attenuation < = 0.36 dB / Km k. Coupling loss <0.75db/connection	YES/NO
4.	Mechanical, Geometrical, Transmission and Environmental characteristics should be as per relevant IEC 60794-1-2-X spec	YES/NO
5.	**Stripping ability:** All layers easily removed with commercially available tools.	YES/NO
6.	**Fibre Identification:** All the fibers in the PBT lose tube are to be colour for identification purpose with UV curable inks i.e., Blue, Orange, Green and natural. The tube colour will be natural.	YES/NO
7.	**Marking:** The cable should have identification marking at regular intervals of 1 meter which will be of permanent nature. The accuracy of the sequential	YES/NO

	marking should be within ± 0.5%.	
Sl. No.	**Specification and other requirement details**	**Vendor Confirmation**
8.	**Immunity**: The cables shall be immune to corrosive element found naturally in the ground. Optical fibers shall be coated with protective materials / coatings and should not have any reaction with cladding or core materials	YES/NO
9.	**Life of cable:** The minimum expected life of the cable shall be 25 years.	YES/NO
10.	**Cable Ends:** Running end shall be provided with pulling eye & the other end shall be sealed with thermal shrink cap	YES/NO
11.	**Length of the cable drum:** The length can be standard factory length +/- 10%. Care to be taken to minimize wastage while cutting to length by optimizing drum lengths in line with site requirement.	YES/NO
12.	**Compliance:** Cable should, in general, be ISO/IEC and EIA/TIA compliant and conform to Mechanical conditions as per IEC 794-1-2-X Standards for Tensile force, Crush Resistance, Impact Resistance, Torsion, Kink etc.	YES/NO
13.	**Overall Nominal Diameter:** Uni-Tube: 9 mm (minimum) multi-tube: 10mm (minimum)	YES/NO
14.	**Minimum Tensile strength:** 2000 N during installation 1000 N after installation	YES/NO
15.	**Crush Resistance:** For Multi-tube cables – 4000 N For Uni-tube Cables – 2000 N	YES/NO
16.	Vendor to furnish manufacturer's compliance certificate for LSZH, Anti-Rodent and Anti-Termite properties for the outer sheath of the OFC, along with the Test Report for the raw material / compound provided by the outer sheath raw material manufacturer.	YES/NO
17.	**SPLICING ENCLOSURE** (if applicable) - The splicing enclosures of the optical fiber cable shall be dust tight (no dust ingress) and protected against immersion in WATER (suitable for continuous immersion in WATER). The enclosures shall be complete with all accessories including splice cassettes, splice protection and OFC preparation kit along with instruction sheet.	YES/NO

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PROJECT : Suratgarh Units 7&8 (2 x 660 MW)

CUSTOMER : RRVUNL

EQUIPMENT : OPTICAL FIBER CABLE ACCESSORIES & SERVICES

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REVISION HISTORY SHEET

REV No.	DATE	NATURE OF CHANGE	REASON	PREPARED BY	REVIEWED BY
00	19.09.2015	FIRST ISSUE	---	MS	RKA
01	12.11.2015	SECOND ISSUE	No of terminations clarified	MS	RKA
02	07.03.2016	THIRD ISSUE	Fiber cable spec included as per TCE contract	MS	RKA
03	07.03.2016	FOURTH ISSUE	OFC markers qty. corrected	MS	RKA
04	09.06.2016	FIFTH ISSUE	OFC accessories & services inlcuded	MS	RKA

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Supply of Optical Fiber Cable accessories & services for RRVUNL at Suratgarh Units 7&8 (2 x 660 MW) project.

1.1 Project Location: Suratgarh, Rajasthan.

1.2 Scope of Supply: Supply of Fiber Optic Cable accessories as per "Technical specification" (Purchase Spec.# PS/404/2525) and quantities as mentioned in the table below:

1.2a. Bill of Material (Please quote for quantity mentioned in last column i.e. Total Project requirement considering both Main and Reserve Line segments): Specification Reference for line items: PS4042525.

Sl. No.	Description	Material Code	PLC (Main Line)	SLAN (Main Line)	DCS (Main Line)	CMMS SPARE (Main Line)	Total (Main & Reserve Line)
1	PIGTAILS – SINGLEMODE 9µm /125µm, SC FIBRE PIGTAIL	PR0120004479	170 Nos	100 Nos	80 Nos	70 Nos	**840 Nos**
2	PIGTAILS – MULTIMODE 62.5µm /125µm, SC FIBRE PIGTAIL	PR0120004460			230 Nos		**460 Nos**
3	2" GI CONDUIT PIPE	PR0120006430	288 meters	198 meters	630 meters	144 meters	**2520 meters**
4	Corrugated flexible Steel tube/hose 1"	PR0120006340	40 mtrs	30 mtrs	70 mtrs	20 mtrs	**380 mtrs**
5	Glands For Coupling	PR0120006359	40 Nos	30 Nos	70 Nos	20 Nos	**380 Nos**
6	OFC Markers (at every 50 meters of OFC buried i.e. HDPE conduit length)	PR0900007362	97 Nos	39 Nos	211 Nos	48 Nos	**790 Nos**

1.2b Supply of tubing, epoxy, Splicing KITS/BOXES (as applicable) & all other consumables in required quantities for termination of FO cable to LIU.

1.2c Specification for Fibre optic (FO) cable accessories: Detailed specifications of pigtails, and all other accessories required for successful terminations are given in purchase specification document no. PS/404/2525 latest revision (attached). Confirmation for meeting all the specification requirements are to be given for each of the applicable items.

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1.3 Services: Fiber terminations and testing of OFC network.

Sl. No.	Description	Quantity	Unit Price	Total Price
1	**a)Termination** Termination of Fiber optic cable cores using Pigtails by fusion splicing methods. b) **Testing, System Integration and Documentation:** i. Fiber optic cable healthiness must be tested before & after installation for all individual fibers. Site Test should include continuity & attenuation test. ii. System Integration including OFC connection to BHEL supplied LIU, using BHEL supplied patch cords to connect from LIU to BHEL supplied Ethernet switch's fiber ports/ SFPs or BHEL supplied converters. iii. Documentation: Standard Test certificates/reports for all states as per the relevant IEC, EIA and other international standards and data sheets where applicable should be submitted. iv. Demonstration at site MOM with BHEL site stating successful completion of supply, installation & demonstration of OFC at site.	1184 Nos.		
2	Travel, lodging & boarding charges and transportation of men and material to site for carrying out the above activities (**estimated 6 visits comprising of 5 working days stay at site)**	**LUMP-SUM**		
	Services (to be quoted as optional) 3, 4, 5			
3	Travel, lodging & boarding charges and transportation of men and material to site (**estimated 1 visit comprising of 5 working days stay at site)**	**LUMP-SUM**		
4	Travel charges per trip for per person for extended Site Stay, in addition to the above stay at site, if warranted. These charges will be payable only after visit, as given in clause 1.3 sl. no. 2, is completed.	**LUMP-SUM**		
5	Charges (inclusive of all expenses) per day for one person for extended Site Stay in addition to the above stay at site for supervision activity. These charges will be payable only after above mentioned days are consumed.	**LUMP-SUM**		

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Notes on Scope of Supply and Scope of Services:

i. Supplier has to provide additional pigtails (as replacement) free of cost in case of failed connection for any reason.

ii. Termination and testing of full network comprising all listed cables/Segments (+ 10%). (Travel & other expenses for termination per person to be included & will not be payable by BHEL). Vendor should mention the termination and testing charges on per fiber basis. The offered prices for termination should be Valid for + 25% quantity of the overall scope of the purchase.

iii. No offer of any of the services listed above will result in technical disqualification of offer.

iv. Vendor should also submit optional quote for additional visit and additional stay as per sl no 3, 4 & 5 from clause 1.3.

v. Supply of Optical Fiber cables, HDPE pipe, HDPE couplers and Laying of Optical Fiber cables and HDPE conduit will be in BHEL site scope.

2**. General:**

a. Material has to be directly sent to site and service shall be provided at site.

b. The installations are at Suratgarh Units 6 & 7 (2 X 600 MW) in Rajasthan. Full Details of Address of the site will be intimated at time of placing PO.

c. Any deviations with respect to the above specification should be brought out in the offer, Otherwise offer may be rejected.

d. The man days as per clause 1.3 sl. no.2 would be sufficient for the total scope of activity. In case the work is not completed within the planned visit, an additional visit of 5 days as per clause 1.3 sl. no.3 may be used or a visit of different number of days other than 5 days may be employed by combining clause 1.3 sl. no. 4 (for travel) & 5 (for per day stay at site).

e. In case there is a need to stay back for completion of work, man-day charges as per clause 1.3 sl. no.5 will be paid for extra man days only if delay is due to BHEL.

f. The terms clause 1.3 sl. no3, 4 & 5 will not be payable with purchase order. However these rates will be binding on the supplier for the offered services, to complete the activities mentioned in this tender, in case the scope of work is not completed due to any unforeseen situation.

g. Travel charges as per clause 1.3 sl. no4 & man day charges as per clause 1.3 sl. no5 will be payable incase supplier deputes his engineer for trouble shooting purposes upon a written request from BHEL for already completed scope of activity.

h. The charges as mentioned under clause 1.3 sl. no1 & 2 will be paid to the supplier on pro-rata basis subject to submission of completion certificate by BHEL-Site/BHEL-Engg.

Advance intimation of one week will be given for deputing personnel to site.

3.1 Documents to Be Given Along With Quotation

Compliance sheet, Detailed BOM, Technical data sheet and conduit/pipe dimension drawings ALONG WITH MAKES AND DATASHEET OF ALL EQUIPMENT.

3.2 Acceptance Criteria:

- Completeness of supply as per 1.2a & b (Material) & 1.3 (Scope of Services).
- Demonstration of proper working of the network.

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- Datasheet/drawing of pigtails, HDPE pipe, test certificate & documentation as per sl. no. 3.1 above
- Completion of work certificate obtained from BHEL site Engineers / Customer Engineers.
- Spliced / Repaired cables are not acceptable.

4. Pre Dispatch Inspection

Test certificates from OEM for having tested the cable in line with offer to be submitted for material being supplied.

5. Packaging for Dispatches

1. The packaging to be in drums (if applicable) of lengths such that total requirement (as provided in 1.2a) is met with zero/minimal wastage.
2. Acceptable tolerance is +5% of length specified.
3. Sufficient packaging should be provided for protection during transit.

6. OFC Cable & HDPE (BHEL Supply): The services mentioned in section 1.3 are required for termination testing of the following BHEL supplied Fiber Optic cables and conduits:

Sl. No.	Description	Material Code	PLC (Main Line)	SLAN (Main Line)	DCS (Main Line)	CMMS SPARE (Main Line)	Total (Main & Reserve Line)
1	FO CABLE, 4 core SM multi-tube (Make: Birla Ericsson/ Aksh Fibre/ D-Link/ Finolex)	PR0460002012	17530 mtrs	7680 mtrs	21450 mtrs	9600 mtrs	**112520 mtrs**
2	FO CABLE, 8 core SM multi-tube (Make: Birla Ericsson/ Aksh Fibre/ D-Link/ Finolex)	PR0460002000	1850 mtrs				**3700 mtrs**
3	FO CABLE, 4 core MM multi-tube (Make: Birla Ericsson/ Aksh Fibre/ D-Link/ Finolex)	PR0460002072			20650 mtrs		**41300 mtrs**
4	32/26mm PLB HDPE along with couplers for every 75 m length	PR0900002600	4850 meters	1920 meters	10525 meters	2400 meters	**39390 meters**

The above items are not to be supplied by vendor and are provided by BHEL. The quantity has been reproduced here for more clarity for servicing the FO cable supplied. The cable segments for the project are mentioned as follows:

ANNEXURE OFC CABLE SEGMENT LIST

PLC OFC Cable Segment List Suratgarh 7&8

Main Line Segments

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)	Remarks
1	CNP52 Panel (Z1-CORESWM Module 3 Port 1F) in CCR/CER	CNE47/PLC/SCADA enclosure (PLC1-A Port FX1) at Switchyard/SCADA PLC	16	8 core Single Mode	200	4 cores are used for PLC and 4 for Station LAN networks, 8 cores are spare
2	CNP52 Panel (Z1-CORESWM Module 3 Port 2F) in CCR/CER	CNE25/PLC/Eff enclosure (PLC2-A Port FX1) at Effluent Treatment Plant	8	4 core Single Mode	700	
3	CNP52 Panel (Z1-CORESWM Module 3 Port 15F) in CCR/CER	CNE26/PLC/Elec enclosure (PLC3-A Port FX1) at Electro Chlorination Plant	16	8 core Single Mode	650	4 cores are used for PLC and 4 for Station LAN networks, 8 cores are spare
4	CNP52 Panel (Z1-CORESWM Module 3 Port 16F) in CCR/CER	CNE48/PLC/AC enclosure (PLC4-A Port FX1) at Air Conditioning and Ventilation System	16	8 core Single Mode	150	4 cores are used for PLC and 4 for Station LAN networks, 8 cores are spare
5	CNP52 Panel (Z1-CORESWM Module 3 Port 17F) in CCR/CER	CNE49/PLC/CPU enclosure (PLC5-A Port FX1) at Condensate Polishing Unit	8	4 core Single Mode	500	
6	CNP52 Panel (Z1-CORESWM Module 3 Port 18F) in CCR/CER	CNE27/PLC/PTP enclosure (PLC6-A Port FX1) at Pre-Treatment Plant	8	4 core Single Mode	900	
7	CNP52 Panel (Z1-CORESWM Module 3 Port 19F) in CCR/CER	CNE71/PLC/HYD enclosure (PLC7-A Port FX1) at HYDROGEN PLANT	16	8 core Single Mode	850	4 cores are used for PLC and 4 for Station LAN networks, 8 cores are spare
8	CNP52 Panel (Z1-CORESWM Module 3 Port 20F) in CCR/CER	CNE28/PLC/DM enclosure (PLC8-A Port FX1) at DM PLANT	8	4 core Single Mode	500	
9	CNP52 Panel (Z1-CORESWM Module 3 Port 21F) in CCR/CER	CNE72/PLC/WTIP1 enclosure (PLC9-A Port FX1) at Wagon Tippler 1&2	8	4 core Single Mode	2500	
10	CNP52 Panel (Z1-CORESWM Module 3 Port 22F) in CCR/CER	CNE73/PLC/WTIP2 enclosure (PLC10-A Port FX1) at CHP Control Room	8	4 core Single Mode	2500	
11	CNP52 Panel (Z1-CORESWM Module 3 Port 23F) in CCR/CER	CNE74/PLC/WTIP3 enclosure (PLC11-A Port FX1) at Wagon Tippler 3	8	4 core Single Mode	2300	
12	CNP52 Panel (Z1-CORESWM Module 3 Port 23F) in CCR/CER	CNE75/PLC/WTIP4 enclosure (PLC12-A Port FX1) at Wagon Tippler 4	8	4 core Single Mode	2300	
13	CNP52 Panel (Z1-CORESWM Module 3 Port 23F) in CCR/CER	CNE76/PLC/CSU1 enclosure (PLC13-A Port FX1) at Coal Sampling Unit PLC at JNT-11	8	4 core Single Mode	2200	
14	CNP52 Panel (Z1-CORESWM Module 3 Port 23F) in CCR/CER	CNE77/PLC/CSU2 enclosure (PLC14-A Port FX1) at Coal Sampling Unit PLC at JNT-29	8	4 core Single Mode	2000	
15	CNP52 Panel (Z1-CORESWM Module 3 Port 23F) in CCR/CER	CNE78/PLC/CSU3 enclosure (PLC15-A Port FX1) at Coal Sampling Unit PLC at JNT-2	8	4 core Single Mode	750	

16	CNP52 Panel (Z1-CORESWM Module 3 Port 23F) in CCR/CER	CNE79/PLC/CSU4 enclosure (PLC16-A Port FX1) at Coal Sampling Unit PLC at JNT-21	8	4 core Single Mode	380	
		Total Length Main Line 4C Single Mode:			**17530**	
		Total Length Main Line 8C Single Mode:			**1850**	

Another set of OFC segments same as above are applicable for reserve line segments

Station LAN OFC Cable Segment List Suratgarh 7&8

Main Line Segments

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)
1	CNP52 Panel (Z1-CORESWM Module 1 Port 1F) in CCR/CER	CNE01/SLAN/Stn enclosure (SLAN1-A Port FX1) at Station Building- Central Control Room	8	4 core Single Mode	100
2	CNP52 Panel (Z1-CORESWM Module 1 Port 2F) in CCR/CER	CNE41/SLAN/Srvc enclosure (SLAN2-A Port FX1) at Service Building	8	4 core Single Mode	180
3	CNP52 Panel (Z1-CORESWM Module 1 Port 15F) in CCR/CER	CNE42/SLAN/SWAS enclosure (SLAN3-A Port FX1) at SWAS Room	8	4 core Single Mode	100
4	CNP52 Panel (Z1-CORESWM Module 1 Port 16F) in CCR/CER	CNE55/SLAN/CHP enclosure (SLAN4-A Port FX1) at Coal Handling Plant Local Control Room	8	4 core Single Mode	1500
5	CNP52 Panel (Z1-CORESWM Module 1 Port 17F) in CCR/CER	CNE51/SLAN/AHP enclosure (SLAN5-A Port FX1) at Ash Handling Plant Local Control Room	8	4 core Single Mode	1200
6	CNP52 Panel (Z1-CORESWM Module 1 Port 18F) in CCR/CER	CNE43/SLAN/ESP enclosure (SLAN6-A Port FX1) at ESP Local Control Room	8	4 core Single Mode	400
7	CNP52 Panel (Z1-CORESWM Module 1 Port 19F) in CCR/CER	CNE23/SLAN/WTP enclosure (SLAN7-A Port FX1) at Water Treatment Plant Local Control Room	8	4 core Single Mode	1200
8	CNP52 Panel (Z1-CORESWM Module 1 Port 20F) in CCR/CER	CNE24/SLAN/CW enclosure (SLAN8-A Port FX1) at CW & ACW Pump House Local Control Room	8	4 core Single Mode	200
9	CNP52 Panel (Z1-CORESWM Module 1 Port 21F) in CCR/CER	CNE44/SLAN/FOPH enclosure (SLAN9-A Port FX1) at Fuel oil handling system Local Control Room	8	4 core Single Mode	800
10	CNP52 Panel (Z1-CORESWM Module 1 Port 22F) in CCR/CER	CNE45/SLAN/WSHP enclosure (SLAN10-A Port FX1) at Workshop	8	4 core Single Mode	1200
11	CNP52 Panel (Z1-CORESWM Module 1 Port 23F) in CCR/CER	CNE46/SLAN/STR enclosure (SLAN11-A Port FX1) at Stores	8	4 core Single Mode	800
		Total Length Main Line 4C Single Mode:			**7680**

Another set of OFC segments same as above are applicable for reserve line segments

DCS OFC Cable Segment List connecting ACN controller in CCR/CER to ACN controller in remote locations

Main Line Segments

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)	Remarks
1	CNP32 Panel (Z1-SW211 Port 1X) connected to 19/20 Slot Media Converter Chassis-A Port1 at **Central Control Room**	CNE11 enclosure (Z1-SW215 Port 1X) connected to 2 Slot Media Converter Chassis Slot1 Port1 at **Fuel Oil Pump House LDO Unloading System**	8	4 core Single Mode	700	
2	CNP32 Panel (Z1-SW211 Port 2X) connected to 19/20 Slot Media Converter Chassis-A Port2 at **Central Control Room**	CNE21 enclosure (Z1-SW219 Port 1X) connected to 2 Slot Media Converter Chassis Slot1 Port1 at **River Water Pump House**	8	4 core Single Mode	7000	
3	CNP32 Panel (Z1-SW211 Port 3X) connected to 19/20 Slot Media Converter Chassis-A Port3 at **Central Control Room**	CNE22 enclosure (Z1-SW221 Port 1X) connected to 2 Slot Media Converter Chassis Slot1 Port1 at **Raw Water Pump House**	8	4 core Single Mode	1000	
4	CNP32 Panel (Z1-SW211 Port 4X) connected to 19/20 Slot Media Converter Chassis-A Port4 at **Central Control Room**	CNE13 enclosure (Z1-SW223 Port 1X) connected to 2 Slot Media Converter Chassis Slot1 Port1 at **Auxiliary Boiler**	8	4 core Single Mode	550	
5	CNE11 enclosure (Z1-SW215 Port 2X) connected to 2 Slot Media Converter Chassis Slot1 Port2 at **Fuel Oil Pump House LDO Unloading System**	CNE12 enclosure (Z1-SW225 Port 1X) connected to 2 Slot Media Converter Chassis Slot1 Port1 at **HFO Unloading Pump House**	8	4 core Single Mode	1700	
6	CNP32 Panel (Z1-SW211 Port 5X) connected to 19/20 Slot Media Converter Chassis-A Port5 at **Central Control Room**	CNR01 panel (Z1-SW225 Port 1X) connected to 2 Slot Media Converter Chassis1 Slot1 Port1 at **Ash Handling Plant Control Room**	8	4 core Single Mode	1200	
7	CNP32 Panel (Z1-SW211 Port 6X) connected to 19/20 Slot Media Converter Chassis-A Port6 at **Central Control Room**	CNR11 panel (Z1-SW217 Port 1X) connected to 8 Slot Media Converter Chassis1 Slot1 Port1 at **Coal Handling Plant Control Room**	8	4 core Single Mode	1500	

OFC Cable Segments connecting ACN controller in CCR/CER to Remote I/O module in remote locations

Main Line Segments FOPH

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)	Remarks
8	CAF41/42 panel (unmanaged switch with Fiber converter) connected to LIU at **Fuel Oil Pump House LDO Unloading System**	CAF95 panel (unmanaged switch with Fiber converter) connected to LIU at **HFO Unloading Pump House**	8	4 core Multi Mode	1700	

Main Line Segments CWPH

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)	Remarks
9	CW Pump A Unit7 CCR/CER CRE29/30/31 Panel (unmanaged switch with Fiber converter) connected to LIU	CW Pump A Unit7 R-I/O CRE85 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	600	
10	CW Pump B Unit7 CCR/CER CRE32/33/34 Panel (unmanaged switch with Fiber converter) connected to LIU	CW Pump B Unit7 R-I/O CRE86 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	600	
11	CW Pump C Unit7 CCR/CER CRE35/36/37 Panel (unmanaged switch with Fiber converter) connected to LIU	CW Pump C Unit7 R-I/O CRE87 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	600	
12	CW Pump A Unit8 CCR/CER CRE29/30/31 Panel (unmanaged switch with Fiber converter) connected to LIU	CW Pump A Unit8 R-I/O CRE85 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	600	
13	CW Pump B Unit8 CCR/CER CRE32/33/34 Panel (unmanaged switch with Fiber converter) connected to LIU	CW Pump B Unit8 R-I/O CRE86 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	600	
14	CW Pump C Unit8 CCR/CER CRE35/36/37 Panel (unmanaged switch with Fiber converter) connected to LIU	CW Pump C Unit8 R-I/O CRE87 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	600	
15	CW Pump Common CCR/CER CRE53/54 Panel (unmanaged switch with Fiber converter) connected to LIU	CW Pump Common R-I/O CRE88 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	600	

Main Line Segments MRS/Compressor House

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)	Remarks
16	MRS ACN1 Unit7 CCR/CER CRE13/14 Panel (unmanaged switch with Fiber converter) connected to LIU	MRS R-I/O-1 Unit7 CRE81/82 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	400	
17	MRS ACN2 Unit7 CCR/CER CRE15/16 Panel (unmanaged switch with Fiber converter) connected to LIU	MRS R-I/O-2 Unit7 CRE83/84 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	400	
18	MRS ACN1 Unit8 CCR/CER CRE13/14 Panel (unmanaged switch with Fiber converter) connected to LIU	MRS R-I/O-1 Unit8 CRE81/82 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	400	
19	MRS ACN2 Unit8 CCR/CER CRE15/16 Panel (unmanaged switch with Fiber converter) connected to LIU	MRS R-I/O-2 Unit8 CRE83/84 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	400	

Main Line Segment Raw Water Pump House

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)	Remarks
20	Raw Water Pump House ACN Common CCR/CER CRE53/54 Panel (unmanaged switch with Fiber converter) connected to LIU	Raw Water Pump House R-I/O Common CRE89 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	1000	

Main Line Segment River Water Pump House

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)	Remarks
21	River Water Pump House ACN Common CCR/CER CRE55/56 Panel (unmanaged switch with Fiber converter) connected to LIU	River Water Pump House R-I/O Common CRE90/91 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Single Mode	7000	

Main Line Segment Filter Water Pump House

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)	Remarks
22	Filter Water Pump House ACN Common CCR/CER CRE57 Panel (unmanaged switch with Fiber converter) connected to LIU	Filter Water Pump House R-I/O Common CRE92/93/94 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	450	

Main Line Segments Ash Handling Plant

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)	Remarks
23	AHP MCC2 Area-1 ACN AHPCR CRC10 Panel (unmanaged switch with Fiber converter) connected to LIU	AHP MCC2 Area-1 R-I/O CRC51/52/53 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	800	
24	AHP MCC2 Area-2 ACN AHPCR CRC11/12 Panel (unmanaged switch with Fiber converter) connected to LIU	AHP MCC2 Area-2 R-I/O CRC54/55 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	800	
25	AHP MCC3 Area ACN AHPCR CRC13/14/15 Panel (unmanaged switch with Fiber converter) connected to LIU	AHP MCC3 Area R-I/O CRC56 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	1500	

Coal Handling Plant

Main Line Segments CHP Crusher Unit

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)	Remarks
26	Crusher Unit ACN1&2 CHPCR CRD10 Panel (unmanaged switch with Fiber converter) connected to LIU	CHP Crusher Unit R-I/O CRD51/52/53 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	900	
27	Crusher Unit ACN3&4 CHPCR CRD10 Panel (unmanaged switch with Fiber converter) connected to LIU	CHP Crusher Unit R-I/O CRD54/55/56 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	900	
28	Crusher Unit ACN1&2 CHPCR CRD11 Panel (unmanaged switch with Fiber converter) connected to LIU	CHP Crusher Unit R-I/O CRD57/58/59 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	900	

29	Crusher Unit ACN3&4 CHPCR CRD11 Panel (unmanaged switch with Fiber converter) connected to LIU	CHP Crusher Unit R-I/O CRD60/61/62 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	900	

Main Line Segments Wagon Tippler

30	Wagon Tippler1&2 ACN1&2 CHPCR CRD12 Panel (unmanaged switch with Fiber converter) connected to LIU	Wagon Tippler1&2 R-I/O CRD63/64 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	1200	
31	Wagon Tippler3&4 ACN1&2 CHPCR CRD12 Panel (unmanaged switch with Fiber converter) connected to LIU	Wagon Tippler3&4 R-I/O CRD65/66 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	1200	

Main Line Segments Stockpile Area

32	Stockpile Area ACN1&2 CHPCR CRD13 Panel (unmanaged switch with Fiber converter) connected to LIU	Stockpile Area R-I/O CRD67/68/69 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	900	
33	Stockpile Area ACN3&4 CHPCR CRD13 Panel (unmanaged switch with Fiber converter) connected to LIU	Stockpile Area R-I/O CRD70/71/72 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	900	

Main Line Segments Bunker Level

34	Bunker Level ACN1&2 CHPCR CRD14 Panel (unmanaged switch with Fiber converter) connected to LIU	Bunker Level R-I/O CRD73/74/75 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	800	
35	Bunker Level ACN3&4 CHPCR CRD14 Panel (unmanaged switch with Fiber converter) connected to LIU	Bunker Level R-I/O CRD76/77/78 Panel (unmanaged switch with Fiber converter) connected to LIU	8	4 core Multi Mode	800	

Another set of OFC segments same as above are applicable for reserve line segments

Total Length Main Line 4C Multi Mode: 21450

Total Length Main Line 4C Single Mode: 20650

CMMS SPARE LOCATIONS Cable Segment List Suratgarh 7&8

Main Line Segments

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)
1	CNP52 Panel (Z1-CORESWM Module 2 Port 1F) in CCR/CER	CNE61/SLAN/SPR1 enclosure (SLAN16-A Port FX1) location to be decided by RRVUNL	8	4 core Single Mode	1200
2	CNP52 Panel (Z1-CORESWM Module 2 Port 2F) in CCR/CER	CNE62/SLAN/SPR2 enclosure (SLAN17-A Port FX1) location to be decided by RRVUNL	8	4 core Single Mode	1200
3	CNP52 Panel (Z1-CORESWM Module 2 Port 3F) in CCR/CER	CNE63/SLAN/SPR3 enclosure (SLAN18-A Port FX1) location to be decided by RRVUNL	8	4 core Single Mode	1200
4	CNP52 Panel (Z1-CORESWM Module 2 Port 4F) in CCR/CER	CNE64/SLAN/SPR4 enclosure (SLAN19-A Port FX1) location to be decided by RRVUNL	8	4 core Single Mode	1200
5	CNP52 Panel (Z1-CORESWM Module 2 Port 5F) in CCR/CER	CNE65/SLAN/SPR5 enclosure (SLAN20-A Port FX1) location to be decided by RRVUNL	8	4 core Single Mode	1200
6	CNP52 Panel (Z1-CORESWM Module 2 Port 6F) in CCR/CER	CNE66/SLAN/SPR6 enclosure (SLAN21-A Port FX1) location to be decided by RRVUNL	8	4 core Single Mode	1200
7	CNP52 Panel (Z1-CORESWM Module 2 Port 7F) in CCR/CER	CNE67/SLAN/SPR7 enclosure (SLAN22-A Port FX1) location to be decided by RRVUNL	8	4 core Single Mode	1200
8	CNP52 Panel (Z1-CORESWM Module 2 Port 8F) in CCR/CER	CNE68/SLAN/SPR8 enclosure (SLAN23-A Port FX1) location to be decided by RRVUNL	8	4 core Single Mode	1200
		Total Length Main Line 4C Single Mode:			**9600**

Another set of OFC segments same as above are applicable for reserve line segments

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PROJECT : NABINAGAR STAGE II (3 x 660 MW) SG PACKAGE

CUSTOMER : NTPC

EQUIPMENT : OPTICAL FIBER CABLE ACCESSORIES & SERVICES

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REVISION HISTORY SHEET

REV No.	DATE	NATURE OF CHANGE	REASON	PREPARED BY	REVIEWED BY
00	8.12.2015	FIRST ISSUE	---	MS	RKA
01	28.12.2015	SECOND ISSUE	Material codes updated with correct unit of measure	MS	RKA
02	09.06.2016	SECOND ISSUE	Only OFC accessories & services included	MS	RKA

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Supply of Optical Fiber Cable accessories & services for NTPC at NABINAGAR STAGE II (3 x 660 MW) project SG package.

1.1 Project Location: Nabinagar, Bihar.

1.2 Scope of Supply: Supply of Fiber Optic Cable accessories as per "Technical specification" (Purchase Spec.# PS/404/2525) and quantities as mentioned in the table below:

1.2a. Bill of Material: Specification Reference for line items: PS4042525.

Sl. No.	Description	Material Code	Qty
1	PIGTAILS – MULTIMODE 62.5µm /125µm, SC FIBRE PIGTAIL	PR0120004460	50 Nos
2	2" GI CONDUIT PIPE for road crossing	PR0120006430	108 meters
3	Corrugated flexible Steel tube/hose 1"(protection for fiber cable at each end of segment)	PR0120006340	15 mtrs
4	Glands For Coupling (for Corrugated flexible Steel tube/hose)	PR0120006359	15 Nos
5	OFC Markers (at every 50 meters of OFC)	PR0900007362	180 Nos

1.2b Supply of tubing, epoxy, Splicing KITS/BOXES (as applicable) & all other consumables in required quantities for termination of FO cable to LIU.

1.2c Specification for Fibre optic (FO) cable accessories: Detailed specifications of GI pipes, pigtails, and all other accessories required for successful terminations are given in purchase specification document no. PS/404/2525 latest revision (attached). Confirmation for meeting all the specification requirements are to be given for each of the applicable items.

1.3 Services: Fiber terminations and testing of OFC network.

Sl. No.	Description	Quantity	Unit Price	Total Price
1	**a)Termination** Termination of Fiber optic cable cores using Pigtails by fusion splicing methods. b) **Testing, System Integration and Documentation:** i. Fiber optic cable healthiness must be tested before & after installation for all individual fibers. Site Test should include continuity & attenuation test. ii. System Integration including OFC connection to BHEL supplied LIU, using BHEL supplied patch cords to connect from LIU to BHEL supplied Ethernet switch's fiber ports/ SFPs or BHEL supplied converters. iii. Documentation: Standard Test certificates/reports for all states as per the relevant IEC, EIA and other international standards and data sheets where applicable should be submitted. iv. Demonstration at site MOM with BHEL site stating successful completion of supply, installation & demonstration of OFC at site.	48 Nos.		
2	Travel, lodging & boarding charges and transportation of men and material to site for carrying out the above activities (**estimated 2 visits comprising of 5 working days stay at site)**	**LUMP-SUM**		
	Services (to be quoted as optional) 3, 4, 5			
3	Travel, lodging & boarding charges and transportation of men and material to site (**estimated 1 visit comprising of 5 working days stay at site)**	**LUMP-SUM**		
4	Travel charges per trip for per person for extended Site Stay, in addition to the above stay at site, if warranted. These charges will be payable only after visit, as given in clause 1.3 sl. no. 2, is completed.	**LUMP-SUM**		
5	Charges (inclusive of all expenses) per day for one person for extended Site Stay in addition to the above stay at site for supervision activity. These charges will be payable only after above mentioned days are consumed.	**LUMP-SUM**		

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Notes on Scope of Supply and Scope of Services:

i. Supplier has to provide additional pigtails (as replacement) free of cost in case of failed connection for any reason.

ii. Termination and testing of full network comprising all listed cables/Segments (+ 10%). (Travel & other expenses for termination per person to be included & will not be payable by BHEL). Vendor should mention the termination and testing charges on per fiber basis. The offered prices for termination should be Valid for + 25% quantity of the overall scope of the purchase.

iii. No offer of any of the services listed above will result in technical disqualification of offer.

iv. Vendor should also submit optional quote for additional visit and additional stay as per sl no 3, 4 & 5 from clause 1.3.

v. **Supply of Optical Fiber cables, HDPE pipe, HDPE couplers and Laying of Optical Fiber cables and HDPE conduit will be in BHEL site scope.**

2**. General:**

a. Material has to be directly sent to site and service shall be provided at site.

b. The installations are at Nabinagar Stage II (3 X 660 MW) in Bihar. Full Details of Address of the site will be intimated at time of placing PO.

c. Any deviations with respect to the above specification should be brought out in the offer, Otherwise offer may be rejected.

d. The man days as per clause 1.3 sl. no.2 would be sufficient for the total scope of activity. In case the work is not completed within the planned visit, an additional visit of 5 days as per clause 1.3 sl. no.3 may be used or a visit of different number of days other than 5 days may be employed by combining clause 1.3 sl. no. 4 (for travel) & 5 (for per day stay at site).

e. In case there is a need to stay back for completion of work, man-day charges as per clause 1.3 sl. no.5 will be paid for extra man days only if delay is due to BHEL.

f. The terms clause 1.3 sl. no3, 4 & 5 will not be payable with purchase order. However these rates will be binding on the supplier for the offered services, to complete the activities mentioned in this tender, in case the scope of work is not completed due to any unforeseen situation.

g. Travel charges as per clause 1.3 sl. no4 & man day charges as per clause 1.3 sl. no5 will be payable incase supplier deputes his engineer for trouble shooting purposes upon a written request from BHEL for already completed scope of activity.

h. The charges as mentioned under clause 1.3 sl. no1 & 2 will be paid to the supplier on pro-rata basis subject to submission of completion certificate by BHEL-Site/BHEL-Engg.

Advance intimation of one week will be given for deputing personnel to site.

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3.1 Documents to Be Given Along With Quotation
Compliance sheet, Detailed BOM, Technical data sheet and conduit dimension drawings ALONG WITH MAKES AND DATASHEET OF ALL EQUIPMENT.

3.2 Acceptance Criteria:
- Completeness of supply as per 1.2a & b (Material) & 1.3 (Scope of Services).
- Demonstration of proper working of the network.
- Datasheet/drawing of pigtails, GI pipe, flexible steel tube, test certificate & documentation as per sl. no. 3.1 above
- Completion of work certificate obtained from BHEL site Engineers / Customer Engineers.
- Spliced / Repaired cables are not acceptable.

4. Pre Dispatch Inspection
Test certificates from OEM for having tested the cable in line with offer to be submitted for material being supplied.

5. Packaging For Dispatches
1. The packaging to be in drums (if applicable) of lengths such that total requirement (as provided in 1.2a) is met with zero/minimal wastage.
2. Acceptable tolerance is +5% of length specified.
3. Sufficient packaging should be provided for protection during transit.

6. OFC Cable & HDPE (BHEL Supply): The services mentioned in section 1.3 are required for termination testing of the following BHEL supplied Fiber Optic cables and conduits as well:

Sl. No.	Description	Material Code	Qty
1	FO CABLE, 4 core MM multi-tube	PR0460002072	9000 mtrs
2	Rodent proof HDPE Conduit along with couplers for every 75 m length	PR0900002627	900 meters

The above items are not to be supplied by vendor and are provided by BHEL. The quantity has been reproduced here for more clarity for servicing the FO cable supplied. The cable segments for the project are mentioned as follows:

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OFC Cable Segment List Nabinagar II SG

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)
1	NWPS01 Panel Station LAN (L3CORESW-A Module 1 Port 1X connected via 20 Slot ChassisA MC loaded with dual port MM Media Converter) in CCR/CER	CAF42 panel -Line A (9FOPH-A Port 1X connected via 2 Slot Chassis MC laoded with dual port MM Media Converter) in FOPH Control Room	8	4 core Multi Mode	1500
2	NWPS01 Panel Station LAN (L3CORESW-B Module 1 Port 1X connected via 20 Slot ChassisB MC loaded with dual port MM Media Converter) in CCR/CER	CAF42 panel -Line B (9FOPH-B Port 1X connected via 2 Slot Chassis MC laoded with dual port MM Media Converter) in FOPH Control Room	8	4 core Multi Mode	1500
3	NWPS01 Panel Station LAN (L3CORESW-A Module 1 Port 2X connected via 20 Slot ChassisA MC loaded with dual port MM Media Converter) in CCR/CER	CJF96 panel -Line A (9AUXB-A Port 1X connected via 2 Slot Chassis MC laoded with dual port MM Media Converter) in Auxiliary Boiler Control Room	8	4 core Multi Mode	1500
4	NWPS01 Panel Station LAN (L3CORESW-B Module 1 Port 2X connected via 20 Slot ChassisB MC loaded with dual port MM Media Converter) in CCR/CER	CJF96 panel -Line B (9AUXB-B Port 1X connected via 2 Slot Chassis MC laoded with dual port MM Media Converter) in Auxiliary Boiler Control Room	8	4 core Multi Mode	1500
5	NWPS01 Panel Station LAN (L3CORESW-A Module 1 Port 3X connected via 20 Slot ChassisA MC loaded with dual port MM Media Converter) in CCR/CER	SG Air Compressor panel - Line A (9AIRC-A Port 1X connected via 2 Slot Chassis MC loaded with dual port MM Media Converter) in Air Compressor Control Room	8	4 core Multi Mode	1500

6	NWPS01 Panel Station LAN (L3CORESW-B Module 1 Port 3X connected via 20 Slot ChassisB MC loaded with dual port MM Media Converter) in CCR/CER	SG Air Compressor panel - Line B (9AIRC-B Port 1X connected via 2 Slot Chassis MC loaded with dual port MM Media Converter) in Air Compressor Control Room	8	4 core Multi Mode	1500
Total			48		9000

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PROJECT : FGUTPP-IV UNCHAHAR (1 X 500 MW)

CUSTOMER : NTPC LTD

EQUIPMENT : FIBER OPTIC CABLE, ACCESSORIES AND SERVICES

REVISION HISTORY SHEET

REV No.	DATE	NATURE OF CHANGE	REASON	PREPARED BY	CHECKED BY	REVIEWED BY
00	27.04.2016	FIRST ISSUE	---	SBG	BNS	DP

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1. General

The fiber optic cable is required for FGUTPP-IV, UNCHAHAR (1 X 500 MW) project. The scope of work broadly involves the supply of OFC, termination and testing of the entire Fiber Optic Network.

2. Scope of Supply

2.1 Scope of supply includes supply of list of items and their quantities as per *Table 2.1, 2.2, 2.3, 2.4, 2.5, 2.6 and 2.7: "Bill of Materials"*. Fiber optic cable should be supplied as per *"Technical specifications"*, mentioned in ***PSPEC PS4042668,*** *HDPE conduit and coupling as per* ***PSPEC PS404XXXX*** *and other accessory components as per* ***PSPEC PS4042525.*** The locations & distances are mentioned in *Table 2.8 to Table 2.14 (Cable Segment Details)*. These measurements and lengths mentioned in the tables are indicative.

Table – 2.1: Bill of Materials for common system (SAC) connectivity

Sl No	Description	PSPEC reference	Make	Quantity
1	4–Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable. **(quantity computation: Refer table 2.8)**	PS4042668 section A-2	Aksh Fiber/ Birla Ericson / Finolex / Smart link/R&M*/ HFCL*/Corning*	14000 Meters
2	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **(quantity computation: Refer table 2.8)**	PS4042525 section C-1	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	200 Nos.
3	ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor. To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while crossing roads / canals / river.	PS4042673	Reputed make	6000 meters
4	HDPE coupling suitable for the HDPE conduits being supplied. Joints / couplers required for complete laying, terminations, connections and testing.	PS4042673	Reputed make	As required
5	Corrugated flexible steel tube/hose of 1" diameter	PS4042525 section D-2	Reputed make	50 m
6	End glands for coupling of 1" flexible steel tube/hose to gland plates	PS4042525 section D-3	Reputed make	50 no's
7	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.		Reputed make	As required
8	SC – LC Duplex MM Patch cords 2 meter	PS4042525 section C-7	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	25 nos.

Table – 2.2: Bill of Materials for Water system connectivity

Sl No	Description	PSPEC reference	Make	Quantity
1	4–Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable.(for unit 1 and common system connectivity) **(quantity computation: Refer table 2.9)**	PS4042668 section A-2	Aksh Fiber/ Birla Ericson / Finolex / Smartlink/R&M*/ HFCL*/Corning*	16000 Meters
2	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied.(for unit-1 and common system connectivity) **(quantity computation: Refer table 2.9)**	PS4042525 section C-1	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	150 Nos.
3	ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor. To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while crossing roads / canals / river.	PS4042673	Reputed make	6000 meters
4	HDPE coupling suitable for the HDPE conduits being supplied. Joints / couplers required for complete laying, terminations, connections and testing.	PS4042673	Reputed make	As required
5	Corrugated flexible steel tube/hose of 1" diameter	PS4042525 section D-2	Reputed make	40 m
6	End glands for coupling of 1" flexible steel tube/hose to gland plates	PS4042525 section D-3	Reputed make	40 no's

7	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.		Reputed make	As required
8	SC – LC Duplex MM Patch cords 2 mtrs	PS4042525 section C-7	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	30 nos.

Table – 2.3: Bill of Materials for Makeup water system connectivity

Sl No	Description	PSPEC reference	Make	Quantity
1.	4–Fiber single-mode, multi-tube construction, 9 / 125 µm outdoor armored fiber optic cable. **(quantity computation: Refer table 2.10)**	PS4042668 section B-2	Aksh Fiber/ Birla Ericson / Finolex / Smartlink/R&M*/ HFCL*/Corning*	5000 Meters
2.	Simplex SM SC pigtails - For terminating Fibers compatible with SM-FO cable supplied. **(quantity computation: Refer table 2.10)**	PS4042525 section C-2	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	30 Nos.
3.	ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor. To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while crossing roads / canals / river.	PS4042673	Reputed make	2000 meters
4.	HDPE coupling suitable for the HDPE conduits being supplied. Joints / couplers required for complete laying, terminations, connections and testing.	PS4042673	Reputed make	As required
5.	Corrugated flexible steel tube/hose of 1" diameter	PS4042525 section D-2	Reputed make	4 m
6.	End glands for coupling of 1" flexible steel tube/hose to gland plates	PS4042525 section D-3	Reputed make	4 no's
7.	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.		Reputed make	As required
8.	SC – SC Duplex SM Patch cords 2 meter	PS4042525 section C-6	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	5 nos.

Table – 2.4: Bill of Materials for AHP system connectivity

Sl No	Description	PSPEC reference	Make	Quantity
1	4–Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable.(for unit 1 and common system connectivity)**(quantity computation: Refer table 2.11)**	PS4042668 section A-2	Aksh Fiber/ Birla Ericson / Finolex / Smartlink/R&M*/ HFCL*/Corning*	8000 Meters
2	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied.(for unit-1 and common system connectivity)**(quantity computation: Refer table 2.11)**	PS4042525 section C-1	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	100 Nos.
3	ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor. To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while crossing roads / canals / river.	PS4042673	Reputed make	3000 meters
4	HDPE coupling suitable for the HDPE conduits being supplied. Joints / couplers required for complete laying, terminations, connections and testing.	PS4042673	Reputed make	As required
5	Corrugated flexible steel tube/hose of 1" diameter	PS4042525 section D-2	Reputed make	14 m
6	End glands for coupling of 1" flexible steel tube/hose to gland plates	PS4042525 section D-3	Reputed make	14 no's
7	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.		Reputed make	As required

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8	SC – LC Duplex MM Patch cords 2 mtrs	PS4042525 section C-7	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	20 nos.

Table – 2.5: Bill of Materials for CHP system connectivity

Sl No	Description	PSPEC reference	Make	Quantity
1	4–Fiber single-mode, multi-tube construction, 9 / 125 µm outdoor armored fiber optic cable. **(quantity computation: Refer table 2.12)**	PS4042668 section B-2	Aksh Fiber/ Birla Ericson / Finolex / Smartlink/R&M*/ HFCL*/Corning*	5000 Meters
2	Simplex SM SC pigtails - For terminating Fibers compatible with SM-FO cable supplied. **(quantity computation: Refer table 2.12)**	PS4042525 section C-2	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	30 Nos.
3	ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor. To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while crossing roads / canals / river.	PS4042673	Reputed make	2000 Meters
4	HDPE coupling suitable for the HDPE conduits being supplied. Joints / couplers required for complete laying, terminations, connections and testing.	PS4042673	Reputed make	As required
5	Corrugated flexible steel tube/hose of 1" diameter	PS4042525 section D-2	Reputed make	4 m
6	End glands for coupling of 1" flexible steel tube/hose to gland plates	PS4042525 section D-3	Reputed make	4 no's
7	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.		Reputed make	As required
8	SC – SC Duplex SM Patch cords 2 meter	PS4042525 section C-6	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	5 nos.

Table – 2.6: Bill of Materials for FOPH system connectivity

Sl No	Description	PSPEC reference	Make	Quantity
1	4–Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable.(for unit 1 and common system connectivity) **(quantity computation: Refer table 2.13)**	PS4042668 section A-2	Aksh Fiber/ Birla Ericson / Finolex / Smartlink/R&M*/ HFCL*/Corning*	2000 Meters
2	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied.(for unit-1 and common system connectivity) **(quantity computation: Refer table 2.13)**	PS4042525 section C-1	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	30 Nos.
3	ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor. To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while crossing roads / canals / river.	PS4042673	Reputed make	1000 meters
4	HDPE coupling suitable for the HDPE conduits being supplied. Joints / couplers required for complete laying, terminations, connections and testing.	PS4042673	Reputed make	As required
5	Corrugated flexible steel tube/hose of 1" diameter	PS4042525 section D-2	Reputed make	4 m
6	End glands for coupling of 1" flexible steel tube/hose to gland plates	PS4042525 section D-3	Reputed make	4 no's
7	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.		Reputed make	As required
8	SC – LC Duplex MM Patch cords 2 meter	PS4042525 section C-7	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	5 nos.

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Table – 2.7: Bill of Materials for common system (service building, PI server, old stage connectivity)

Sl No	Description	PSPEC reference	Make	Quantity
1	12–Fiber single-mode, multi-tube construction, 9 / 125 μm outdoor armored fiber optic cable. **(quantity computation: Refer table 2.14)**	PS4042668 section B-6	Aksh Fiber/ Birla Ericson / Finolex / Smartlink/R&M*/ HFCL*/Corning*	15000 Meters
2	Simplex SM SC pigtails - For terminating Fibers compatible with SM-FO cable supplied. **(quantity computation: Refer table 2.14)**	PS4042525 section C-2	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	100 Nos.
3	ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor. To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while crossing roads / canals / river.	PS4042673	Reputed make	5000 meters
4	HDPE coupling suitable for the HDPE conduits being supplied. Joints / couplers required for complete laying, terminations, connections and testing.	PS4042673	Reputed make	As required
5	Corrugated flexible steel tube/hose of 1" diameter	PS4042525 section D-2	Reputed make	14 m
6	End glands for coupling of 1" flexible steel tube/hose to gland plates	PS4042525 section D-3	Reputed make	14 no's
7	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.		Reputed make	As required
8	SC – SC Duplex MM Patch cords 2 meter	PS4042525 section C-5	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	50 nos.
9	SC – SC Duplex SM Patch cords 2 meter	PS4042525 section C-6	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	50 nos.
10	SC – LC Duplex SM Patch cords 2 meter	PS4042525 section C-8	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	50 nos.
11	SC – LC Duplex MM Patch cords 2 meter	PS4042525 section C-7	Digi Link / Molex/ TE-Tyco / Schneider-Digi link/Panduit/Belden	50 nos.

TERMINATION REQUIREMENTS

Table – 2.8: 4-core multi-mode cable segment details (for maxNET & RIO connectivity - SAC system)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
maxDNA NETWORK CONNECTIVITY DETAILS				
1	LOCATION : CWPH CR : PANEL : CRA04 : SWITCH - 8CWPHSW-1A	LOCATION : UNIT#6 CR : PANEL : NWPD03 : SWITCH - 8SACSW-1A	450	8
2	LOCATION : CWPH CR : PANEL : CRA04 : SWITCH - 8CWPHSW-1B	LOCATION : UNIT#6 CR : PANEL : NWPD03 : SWITCH - 8SACSW-1B	450	8
3	LOCATION : AC PLANT CR : PANEL : CRA16 : SWITCH - 8ACPSW-1A	LOCATION : UNIT#6 CR : PANEL : NWPD03 : SWITCH - 8SACSW-1A	150	8
4	LOCATION : AC PLANT CR : PANEL : CRA16 : SWITCH - 8ACPSW-1B	LOCATION : UNIT#6 CR : PANEL : NWPD03 : SWITCH - 8SACSW-1B	150	8
5	LOCATION : CPU REGENERATION ROOM : PANEL : CRA09 : SWITCH - 8CPUREGENSW-1A	LOCATION : UNIT#6 CR : PANEL : NWPD03 : SWITCH - 8SACSW-1A	400	8
6	LOCATION : CPU REGENERATION ROOM : PANEL : CRA09 : SWITCH - 8CPUREGENSW-1B	LOCATION : UNIT#6 CR : PANEL : NWPD03 : SWITCH - 8SACSW-1B	400	8
7	LOCATION : CPU SERVICE VESSEL ROOM : PANEL : CRA12 : SWITCH - 8CPUSVSW-1A	LOCATION : UNIT#6 CR : PANEL : NWPD03 : SWITCH - 8SACSW-1A	1000	8
8	LOCATION : CPU SERVICE VESSEL ROOM : PANEL : CRA12 : SWITCH - 8CPUSVSW-1B	LOCATION : UNIT#6 CR : PANEL : NWPD03 : SWITCH - 8SACSW-1B	1000	8
9	LOCATION : ESP CR : PANEL : CRA17 : SWITCH - 8ESPSW-1A	LOCATION : UNIT#6 CR : PANEL : NWPD03 : SWITCH - 8SACSW-1A	1000	8
10	LOCATION : ESP CR : PANEL : CRA17 : SWITCH - 8ESPSW-1B	LOCATION : UNIT#6 CR : PANEL : NWPD03 : SWITCH - 8SACSW-1B	1000	8
RIO CONNECTIVITY DETAILS				

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1	LOCATION : CWPH CR : PANEL : CRA03(RIO) - BEM-1 LINK-1	LOCATION : UNIT#6 CR : PANEL : 8S01CRA01(DPU) - BEM-1 LINK-1	450	8
2	LOCATION : CWPH CR : PANEL : CRA03(RIO) - BEM-1 LINK-2	LOCATION : UNIT#6 CR : PANEL : 8S01CRA01(DPU) - BEM-1 LINK-2	450	8
3	LOCATION : CWPH CR : PANEL : CRA03(RIO) - BEM-2 LINK-1	LOCATION : UNIT#6 CR : PANEL : 8S01CRA01(DPU) - BEM-2 LINK-1	450	8
4	LOCATION : CWPH CR : PANEL : CRA03(RIO) - BEM-2 LINK-2	LOCATION : UNIT#6 CR : PANEL : 8S01CRA01(DPU) - BEM-2 LINK-2	450	8
5	LOCATION : CWPH CR : PANEL : CRA04(RIO) - BEM-1 LINK-1	LOCATION : UNIT#6 CR : PANEL : 8S02CRA02(DPU) - BEM-1 LINK-1	450	8
6	LOCATION : CWPH CR : PANEL : CRA04(RIO) - BEM-1 LINK-2	LOCATION : UNIT#6 CR : PANEL : 8S02CRA02(DPU) - BEM-1 LINK-2	450	8
7	LOCATION : CWPH CR : PANEL : CRA04(RIO) - BEM-2 LINK-1	LOCATION : UNIT#6 CR : PANEL : 8S02CRA02(DPU) - BEM-2 LINK-1	450	8
8	LOCATION : CWPH CR : PANEL : CRA04(RIO) - BEM-2 LINK-2	LOCATION : UNIT#6 CR : PANEL : 8S02CRA02(DPU) - BEM-2 LINK-2	450	8
9	LOCATION : CT FAN AREA : PANEL : CRA05(RIO) - BEM-1 LINK-1	LOCATION : UNIT#6 CR : PANEL : 8S02CRA02(DPU) - BEM-1 LINK-1	600	8
10	LOCATION : CT FAN AREA : PANEL : CRA05(RIO) - BEM-1 LINK-2	LOCATION : UNIT#6 CR : PANEL : 8S02CRA02(DPU) - BEM-1 LINK-2	600	8
11	LOCATION : CT FAN AREA : PANEL : CRA05(RIO) - BEM-2 LINK-1	LOCATION : UNIT#6 CR : PANEL : 8S02CRA02(DPU) - BEM-2 LINK-1	600	8
12	LOCATION : CT FAN AREA : PANEL : CRA05(RIO) - BEM-2 LINK-2	LOCATION : UNIT#6 CR : PANEL : 8S02CRA02(DPU) - BEM-2 LINK-2	600	8
SERIAL DEVICE CONNECTIVITY DETAILS				
1	LOCATION : CT FAN AREA : SERIAL DEVICE SERVER	LOCATION : UNIT#6 CR : PANEL : NWPD03 : SWITCH - 8SACSW-1A/1B	1000	8
	SPARE	SPARE	1000	16
Total quantity			**14000**	**200**

Four core multi-mode, multi-tube cables : 23 segments, both ends need terminations
Number of Terminations : 184
Cables should be terminated using SC pigtails and tested.

Table – 2.9: 4-core multi-mode cable segment details (for maxNET & RIO connectivity - WATER system)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
maxDNA NETWORK CONNECTIVITY DETAILS				
1	LOCATION : CW/PT CHLORINATION ROOM : PANEL : CRB13 : SWITCH - 11CWCHSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - 11WSSW-1A	1000	8
2	LOCATION : CW/PT CHLORINATION ROOM : PANEL : CRB13 : SWITCH - 11CWCHSW-1B	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - 11WSSW-1B	1000	8
3	LOCATION : CW TREATMENT ROOM : PANEL : XXXX : SWITCH - 11CWTRTSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - 11WSSW-1A	1000	8
4	LOCATION : CW TREATMENT ROOM : PANEL : XXXX : SWITCH - 11CWTRTSW-1B	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - 11WSSW-1B	1000	8
5	LOCATION : WASTE SERVICE WATER SYSTEM/PT ROOM : PANEL : CRB11 : SWITCH - 11WSWSSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - 11WSSW-1A	1000	8
6	LOCATION : WASTE SERVICE WATER SYSTEM/PT ROOM : PANEL : CRB11 : SWITCH - 11WSWSSW-1B	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - 11WSSW-1B	1000	8
7	LOCATION : COAL DECANTED WATER PUMP : PANEL : XXXX : SWITCH - 11CDWPSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - 11WSSW-1A	1000	8
8	LOCATION : COAL DECANTED WATER PUMP : PANEL : XXXX : SWITCH - 11CDWPSW-1B	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - 11WSSW-1B	1000	8
9	LOCATION : AWR CR : PANEL : XXXX : SWITCH - 11AWRSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - 11WSSW-1A	1000	8
10	LOCATION : AWR CR : PANEL : XXXX : SWITCH - 11AWRSW-1B	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - 11WSSW-1B	1000	8
11	WATER SYSTEM : PANEL : NWPD03 : SWITCH - 11WSSW-1A	STATIONLAN SYSTEM : PANEL : NWPS01 : L3CORESW-A	500	8
12	WATER SYSTEM : PANEL : NWPD03 : SWITCH - 11WSSW-1B	STATIONLAN SYSTEM : PANEL : NWPS02 : L3CORESW-B	500	8
RIO CONNECTIVITY DETAILS				
1	LOCATION : EER ROOM : PANEL : CRB15(RIO) - BEM-1 LINK-1	LOCATION : WASTE SERVICE WATER SYSTEM/PT ROOM : PANEL : BW06CRB10(DPU) - BEM-1 LINK-1	1000	8
2	LOCATION : EER ROOM : PANEL : CRB15(RIO) - BEM-1 LINK-2	LOCATION : WASTE SERVICE WATER SYSTEM/PT ROOM : PANEL : BW06CRB10(DPU) - BEM-1 LINK-2	1000	8
3	LOCATION : EER ROOM : PANEL : CRB15(RIO) - BEM-2 LINK-1	LOCATION : WASTE SERVICE WATER SYSTEM/PT ROOM : PANEL : BW06CRB10(DPU) - BEM-2 LINK-1	1000	8
4	LOCATION : EER ROOM : PANEL : CRB15(RIO) - BEM-2 LINK-2	LOCATION : WASTE SERVICE WATER SYSTEM/PT ROOM : PANEL : BW06CRB10(DPU) - BEM-2 LINK-2	1000	8
	SPARE	SPARE	1000	22

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Total quantity	**16000**	**150**

Four core multi-mode, multi-tube cables : 16 segments, both ends need terminations
Number of Terminations : 128
Cables should be terminated using SC pigtails and tested.

Table – 2.10:4-core single-mode cable segment details (for maxNET connectivity - MKWS system)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
maxDNA NETWORK CONNECTIVITY DETAILS				
1	MAKEUP WATER SYSTEM : PANEL : CRB22 : SWITCH - 10MKWSSW-1A	STATIONLAN SYSTEM : PANEL : NWPS01 : L3CORESW-A	2000	8
2	MAKEUP WATER SYSTEM : PANEL : CRB22 : SWITCH - 10MKWSSW-1B	STATIONLAN SYSTEM : PANEL : NWPS02 : L3CORESW-B	2000	8
	SPARE	SPARE	1000	12
Total quantity			**5000**	**30**

Four core single-mode, multi-tube cables : 2 segments, both ends need terminations
Number of Terminations : 16
Cables should be terminated using SC pigtails and tested.

Table – 2.11: 4-core multi-mode cable segment details (for maxNET & RIO connectivity - AHP system)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
maxDNA NETWORK CONNECTIVITY DETAILS				
1	LOCATION : SILO CR : PANEL : CRC12 : SWITCH - 7AHPSILOSW-A	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - 7AHPSW-1A	1000	8
2	LOCATION : SILO CR : PANEL : CRC12 : SWITCH - 7AHPSILOSW-B	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - 7AHPSW-1B	1000	8
3	LOCATION : ESP CR : PANEL : CRC06 : SWITCH - 7AHPESPSW-A	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - 7AHPSW-1A	1000	8
4	LOCATION : ESP CR : PANEL : CRC06 : SWITCH - 7AHPESPSW-B	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - 7AHPSW-1B	1000	8
5	AHP SYSTEM : PANEL : NWP-AHP : SWITCH - 7AHPSW-1A	STATIONLAN SYSTEM : PANEL : NWPS01 : L3CORESW-A	500	8
6	AHP SYSTEM : PANEL : NWP-AHP : SWITCH - 7AHPSW-1B	STATIONLAN SYSTEM : PANEL : NWPS02 : L3CORESW-B	500	8
RIO CONNECTIVITY DETAILS				
1	LOCATION : UNIT#6 CR : PANEL : CRC02(RIO) - BEM-1 LINK-1	LOCATION : AHP CR : PANEL : 7A01CRC01(DPU) - BEM-1 LINK-1	500	8
2	LOCATION : UNIT#6 CR : PANEL : CRC02(RIO) - BEM-1 LINK-2	LOCATION : AHP CR : PANEL : 7A01CRC01(DPU) - BEM-1 LINK-2	500	8
3	LOCATION : UNIT#6 CR : PANEL : CRC02(RIO) - BEM-2 LINK-1	LOCATION : AHP CR : PANEL : 7A01CRC01(DPU) - BEM-2 LINK-1	500	8
4	LOCATION : UNIT#6 CR : PANEL : CRC02(RIO) - BEM-2 LINK-2	LOCATION : AHP CR : PANEL : 7A01CRC01(DPU) - BEM-2 LINK-2	500	8
	SPARE	SPARE	1000	20
Total quantity			**8000**	**100**

Four core multi-mode, multi-tube cables : 10 segments, both ends need terminations
Number of Terminations : 80
Cables should be terminated using SC pigtails and tested.

Table – 2.12:4-core single-mode cable segment details (for maxNET connectivity - CHP system)

Sl.	From Device	To Device	Actual	Terminations

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No.			Distance (in meters)	(numbers)
maxDNA NETWORK CONNECTIVITY DETAILS				
1	CHP SYSTEM : PANEL : NWP-CHP : SWITCH - 12CHPSW-1A	STATIONLAN SYSTEM : PANEL : NWPS01 : L3CORESW-A	2200	8
2	CHP SYSTEM : PANEL : NWP-CHP : SWITCH - 12CHPSW-1B	STATIONLAN SYSTEM : PANEL : NWPS02 : L3CORESW-B	2200	8
	SPARE	SPARE	600	12
Total quantity			**5000**	**30**

Four core single-mode, multi-tube cables : 2 segments, both ends need terminations
Number of Terminations : 16
Cables should be terminated using SC pigtails and tested.

Table – 2.13: 4-core multi-mode cable segment details (for FOPH system connectivity (network connectivity to Station LAN)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
1	FOPH SYSTEM-NET A SWITCH (DCS panel)	STATION LAN– L3CORESW-A SWITCH (panel NWPS01)	1200m	8
2	FOPH SYSTEM-NET B SWITCH(DCS panel)	STATION LAN– L3CORESW-B SWITCH (panel NWPS02)	1200m	8
3	SPARE	SPARE	600m	12
Total quantity			**2000m**	**30**

Four core multi-mode, multi-tube cables : 2 segments, both ends need terminations
Number of Terminations : 16
Cables should be terminated using SC pigtails and tested.

Table – 2.14: 12-core single-mode cable segment details (for service building, other stage connectivity)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
1	SERVICE BUILDING (ENCLOSURE NWEN01-NET A)	STATION LAN– L3COMSW-A (panel NWPS01)	1000m	8
2	SERVICE BUILDING (ENCLOSURE NWEN01-NET B)	STATION LAN– L3COMSW-B (panel NWPS02)	1000m	8
3	UNCHAHAR OLD STAGE – NET A	STATION LAN– L3COMSW-A (panel NWPS01)	1000m	8
4	UNCHAHAR OLD STAGE – NET B	STATION LA.N– L3COMSW-B (panel NWPS02)	1000m	8
5	PI SERVER	STATION LAN– L3COMSW-A (panel NWPS01)	2000m	8
6	DATA CONCENTRATOR	STATION LAN– L3COMSW-A (panel NWPS01)	2000m	8
7	SWITCH YARD	STATION LAN– L3COMSW-A (panel NWPS01)	2000m	8
8	SPARE	SPARE	5000m	44
Total quantity			**15000m**	**100**

Twelve core single-mode, multi-tube cables : 7 segments, both ends need terminations
Number of Terminations : 56
Cables should be terminated using SC pigtails and tested.

3. Scope of Services:

Termination and Testing of the Fiber Optic Cable

The scope of services for Termination and Testing of the fiber optic cable shall be as per **Table 3.1: Scope of Services** below:

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Table – 3.1: Scope of Services

Sl. No.	Description	Quantity	Unit Price	Total Price
1	**Termination:** Termination of Fiber optic cable cores using Pigtails by fusion splicing methods. **Testing, System Integration and Documentation:** i. Fiber optic cable healthiness must be tested before & after installation for all individual fibers. ii. System Integration including connecting patch cords from LIU to fiber ports of Ethernet switch and / or converters. iii. Documentation: All Standard Test certificates/reports and data sheets where applicable should be submitted. iv. Demonstration at site MOM with BHEL site stating successful completion of supply, installation & demonstration of OFC at site.	496		
2	Travel, lodging & boarding charges and transportation of men and material to site for carrying out the above activities (**minimum 7 visits, and each visit should comprise of 6 working days each excluding journey days)**			
OPTIONAL SERVICES:				
3	Travel charges per trip per person for extended Site trip, in addition to the above, if warranted. These charges will be payable only after above mentioned visits are completed.			
4	Charges (inclusive of all expenses) per day for one person for extended Site Stay in addition to the above stay.			
5	Splicing / joining of OFC cables on per fiber basis including Splicing Boxes/Enclosures and testing to be quoted for outdoor (remote) splicing. These charges will be paid based on the actual splicing work undertaken at site, arising out of requirements of joining cables during the execution of the totals scope of activity. The exact requirement can be spelt out only during execution.			

Notes on Scope of Supply and Scope of Services:

Sl. No.	Description	Vendor Confirmation
1	All unused pigtails (including spares) shall be terminated with the connector to a bulkhead connector sleeve, protected by reusable cap on the opposite sleep port, to prevent the intrusion of foreign materials or dust.	Yes / No
2	Supplier has to provide **additional pigtails (as replacement) free of cost** in case of failed connection for any reason.	Yes / No
3	Vendor should mention the price of fiber optic cable per meter. The offered prices shall be valid for ±25% quantity of the overall scope of the purchase enquiry.	Yes / No
4	Vendor should mention the termination and testing charges on per fiber basis.	Yes / No
5	Vendor should plan for more than one visit for carrying out services. It shall be noted that different subsystems will be available at different times. A Work Completion Certificate issued by BHEL Site Engineers / Customer Engineers should be submitted after each visit.	Yes / No
6	No offer of any of the services listed above will result in technical disqualification of offer.	Yes / No

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4. Completion schedule:

Vendor to furnish detailed schedule for:

4.1 Supply of cable and the concerned accessories.

4.2 Completion of fiber optic cable termination and network testing.

5. Acceptance Criteria:

5.1 Completeness of supply, as per the Table 2.1 to 2.14, and services, as per table 3.1.

5.2 Demonstration of proper working of the network.

5.3 Completeness of documentation as per specifications.

5.4 Spliced / Repaired cables are not acceptable.

6. Documents to be given along with quotation:

6.1 Detailed **technical data sheet** & cable dimensional drawings of the make quoted.

6.2 **Deviations**, if any, with respect to the above specifications with technical justifications on suitability of the vendor's alternate offer with the requirement.

6.3 **Clause wise compliance** to Purchase specifications with vendor seal and signature in each page should be enclosed along with the offer.

7.Notes to suppliers:

i. The cable laying and termination work will be commencing approximately 2 months to 1 year from the date of supply and planned to be completed within 1 month from the day of starting.

ii. The above man days would be sufficient for the total scope of activity. In case the work is not completed within the planned visits, and incase the number of man days are not consumed due to the non-availability of work front, then BHEL will pay only travel charges as per table 3.1 point 3 above for additional visits to site.

iii. In case there is a need to stay back for completion of work, man-day charges as per table 3.1 point 4 will be paid for extra man days only if delay is due to BHEL.

iv. The terms as per table 3.1 points 3 and 4) will not be payable with purchase order, however these rates will be binding on the supplier for the offered services, to complete the activities mentioned in this tender, in case the scope of work is not completed due to any unforeseen situation.

v. Travel charges as per table 3.1 points 3 and 4) will be payable incase supplier deputes his engineer for trouble shooting purposes upon a written request from BHEL for already completed scope of activity.

vi. The charges as mentioned under table 3.1 points 3, 4 and 5 will be paid to the supplier on pro-rata basis subject to submission of completion certificate by BHEL-Site/BHEL-Engg.

Advance intimation of **one week** will be given for deputing personnel to site.

8. Pre Dispatch Inspection:

Physical inspection of cable along with submission of Factory tested test certificates for completion of the required test in line with offer.

9. Packaging for dispatches:

9.1 Acceptable tolerance is + 5 % of the standard packing length.

9.2 Sufficient packaging should be provided for protection during transportation.

10. Dispatch:

10.1 Materials should be directly dispatched to site. Services should be provided at site at the time of commissioning.

10.2 Project details and complete postal address of the site will be intimated at the time of enquiry / placement of purchase order.

11. Warranty:

Vendor shall warrant that the fiber optic cable/components will be free from defect in design, material and workmanship for a period of 12 months commencing upon the completion of commissioning (termination and testing) of the cable (segment wise) or 18 months from the date of dispatch whichever

is earlier. The liability will be limited to replacement of defective parts arising solely from faulty design materials and / or workmanship.

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PROJECT : NABINAGAR STAGE II (3 x 660 MW) STATION C&I

CUSTOMER : NTPC

EQUIPMENT : OPTICAL FIBER CABLE ACCESSORIES & SERVICES

TITLE		DRN.	NAME	SIGN	DATE
Purchase Specification Optical Fiber Cable for NABINAGAR STAGE II Stn C&I (3 x 660 MW)	Dept Code 404				
		PREPARED	MARSHAL SANDHU		09.06.2016
		APPROVED	REETESH KUMAR		09.06.2016

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REVISION HISTORY SHEET

REV No.	DATE	NATURE OF CHANGE	REASON	PREPARED BY	REVIEWED BY
00	29.04.2016	FIRST ISSUE	---	MS	RKA
01	09.06.2016	SECOND ISSUE	Only OFC accessories & services included	MS	RKA

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Supply of Optical Fiber Cable accessories & services for NTPC at NABINAGAR STAGE II (3 x 660 MW)project Stn C&I package.

1.1 Project Location: Nabinagar, Bihar.

1.2 Scope of Supply: Supply of Fiber Optic Cable accessories as per "Technical specification" (Purchase Spec.# PS/404/2525) and quantities as mentioned in the table below:

1.2a. Bill of Material: Specification Reference for line items: PS4042525 latest revision

Sl. No.	Description	Material Code	Qty
1	PIGTAILS – MULTIMODE 62.5µm /125µm, SC FIBRE PIGTAIL	PR0120004460	390 Nos
2	PIGTAILS – SINGLEMODE 9µm /125µm, SC FIBRE PIGTAIL	PR0120004479	660 Nos
3	2" GI CONDUIT PIPE for road crossing	PR0120006430	2340 meters
4	Corrugated flexible Steel tube/hose 1"(protection for fiber cable at each end of segment)	PR0120006340	270 mtrs
5	Glands For Coupling (for Corrugated flexible Steel tube/hose)	PR0120006359	270 Nos
6	OFC Markers (at every 50 meters of HDPE length (OFC buried))	PR0900007362	560 Nos

1.1.2b Supply of tubing, epoxy, Splicing KITS/BOXES (as applicable) & all other consumables in required quantities for termination of FO cable to LIU.

1.2c Specification for Fibre optic (FO) cable accessories: Detailed specifications of pigtails and all other accessories required for successful terminations are given in purchase specification document no. PS/404/2525 latest revision (attached). Confirmation for meeting all the specification requirements are to be given for each of the applicable items.

1.3 Services: Fiber terminations and testing of OFC network.

Sl. No.	Description	Quantity	Unit Price	Total Price
1	**a)Termination** Termination of Fiber optic cable cores using Pigtails by fusion splicing methods. b) **Testing, System Integration and Documentation:** i. Fiber optic cable healthiness must be tested before & after installation for all individual fibers. Site Test should include continuity & attenuation test. ii. System Integration including OFC connection to BHEL supplied LIU, using BHEL supplied patch cords to connect from LIU to BHEL supplied Ethernet switch's fiber ports/ SFPs or BHEL supplied converters. iii. Documentation: Standard Test certificates/reports for all states as per the relevant IEC, EIA and other international standards and data sheets where applicable should be submitted. iv. Demonstration at site MOM with BHEL site stating successful completion of supply, installation & demonstration of OFC at site.	1040 Nos.		
2	Travel, lodging & boarding charges and transportation of men and material to site for carrying out the above activities (**estimated 8 visits comprising of 5 working days stay at site)**	**LUMP-SUM**		
	Services (to be quoted as optional) 3, 4, 5			
3	Travel, lodging & boarding charges and transportation of men and material to site (**estimated 1 visit comprising of 5 working days stay at site)**	**LUMP-SUM**		
4	Travel charges per trip for per person for extended Site Stay, in addition to the above stay at site, if warranted. These charges will be payable only after visit, as given in clause 1.3 sl. no. 2, is completed.	**LUMP-SUM**		
5	Charges (inclusive of all expenses) per day for one person for extended Site Stay in addition to the above stay at site for supervision activity. These charges will be payable only after above mentioned days are consumed.	**LUMP-SUM**		

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Notes on Scope of Supply and Scope of Services:

i. Supplier has to provide additional pigtails (as replacement) free of cost in case of failed connection for any reason.

ii. Termination and testing of full network comprising all listed cables/Segments (+ 10%). (Travel & other expenses for termination per person to be included & will not be payable by BHEL). Vendor should mention the termination and testing charges on per fiber basis. The offered prices for termination should be Valid for + 25% quantity of the overall scope of the purchase.

iii. No offer of any of the services listed above will result in technical disqualification of offer.

iv. Vendor should also submit optional quote for additional visit and additional stay as per sl no 3, 4 & 5 from clause 1.3.

v. **Supply of Optical Fiber cables, HDPE pipe, HDPE couplers and Laying of Optical Fiber cables and HDPE conduit will be in BHEL site scope.**

2**. General:**

a. Material has to be directly sent to site and service shall be provided at site.

b. The installations are at Nabinagar Stage II (3 X 660 MW) in Bihar. Full Details of Address of the site will be intimated at time of placing PO.

c. Any deviations with respect to the above specification should be brought out in the offer, Otherwise offer may be rejected.

d. The man days as per clause 1.3 sl. no.2 would be sufficient for the total scope of activity. In case the work is not completed within the planned visit, an additional visit of 5 days as per clause 1.3 sl. no.3 may be used or a visit of different number of days other than 5 days may be employed by combining clause 1.3 sl. no. 4 (for travel) & 5 (for per day stay at site).

e. In case there is a need to stay back for completion of work, man-day charges as per clause 1.3 sl. no.5 will be paid for extra man days only if delay is due to BHEL.

f. The terms clause 1.3 sl. no3, 4 & 5 will not be payable with purchase order. However these rates will be binding on the supplier for the offered services, to complete the activities mentioned in this tender, in case the scope of work is not completed due to any unforeseen situation.

g. Travel charges as per clause 1.3 sl. no4 & man day charges as per clause 1.3 sl. no5 will be payable incase supplier deputes his engineer for trouble shooting purposes upon a written request from BHEL for already completed scope of activity.

h. The charges as mentioned under clause 1.3 sl. no1 & 2 will be paid to the supplier on pro-rata basis subject to submission of completion certificate by BHEL-Site/BHEL-Engg.

Advance intimation of one week will be given for deputing personnel to site.

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3.1 Documents to Be Given Along With Quotation
Compliance sheet, Detailed BOM, Technical data sheet and cable dimension drawings ALONG WITH MAKES AND DATASHEET OF ALL EQUIPMENT.

3.2 Acceptance Criteria:
- Completeness of supply as per 1.2a & b (Material) & 1.3 (Scope of Services).
- Demonstration of proper working of the network.
- Datasheet/drawing of pigtails, GI pipe, flexible steel tube, test certificate & documentation as per sl. no. 3.1 above
- Completion of work certificate obtained from BHEL site Engineers / Customer Engineers.
- Spliced / Repaired cables are not acceptable.

4. Pre Dispatch Inspection
Test certificates from OEM for having tested the cable in line with offer to be submitted for material being supplied.

5. Packaging For Dispatches
1. The packaging to be in drums (if applicable) of lengths such that total requirement (as provided in 1.2a) is met with zero/minimal wastage.
2. Acceptable tolerance is +5% of length specified.
3. Sufficient packaging should be provided for protection during transit.

6. OFC Cable & HDPE (BHEL Supply): The services mentioned in section 1.3 are required for termination testing of the following BHEL supplied Fiber Optic cables and conduits as well:

Sl. No.	Description	Material Code	Qty
1	FO CABLE, 4 core MM multi-tube	PR0460002072	35000 mtrs
2	FO CABLE, 4 core SM multi-tube	PR0460002012	75300 mtrs
3	Rodent proof HDPE Conduit along with couplers for every 75 m length	PR0900002627	27575 meters

The above items are not to be supplied by vendor and are provided by BHEL. The quantity has been reproduced here for more clarity for servicing the FO cable supplied. The cable segments for the project are mentioned as follows:

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OPTICAL FIBER CABLE LIST NABINAGAR
II STATION C&I

Net A Cable Segments (similar cable segments are applicable to NETB):

Sl No	From	To	OFC Cable	Distance
Station LAN to Offsite maxDNA Subsystems:				
1	Station LAN Panel NWPS01 (L3CORSW-A switch port 4X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	NWPA03 panel (2HMI2-A port G1) in CCR/CER U#2 via 2 Slot Media Converter (SM mount)	4 Core SMF	300
2	Station LAN Panel NWPS01 (L3CORSW-A switch port 6X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	NWPA03 panel (3HMI3-A port G1) in CCR/CER U#3 via 2 Slot Media Converter (SM mount)	4 Core SMF	500
3	Station LAN Panel NWPS01 (L3CORSW-A switch port 16X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	NWPC02 panel (BNS1-A port 1X) in Water System Control Room via 20 Slot Media Converter (SM mount)	4 Core SMF	900
4	Station LAN Panel NWPS01 (L3CORSW-A switch port 21X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	NWPC03 panel (CNS1-A port 1X) in Ash Handling System Control Room via 20 Slot Media Converter (SM mount)	4 Core SMF	800
5	Station LAN Panel NWPS01 (L3CORSW-A switch port 20X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	NWPL01 panel (DNS1-A port 2X) in Coal Handling System Control Room via 8 Slot Media Converter (SM mount)	4 Core SMF	2000
Total (4 Core SMF Station LAN to Offsite):				4500
Stand Alone DDCMIS Subsystem:				
6	NWPC01 Panel (ANS1-A port 2X) in in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	CFR12 Panel (ANS7-A port 15X) in CW CER via 2 Slot Media Converter (SM mount)	4 Core SMF	1000
7	NWPC01 Panel (ANS1-A port 3X) in in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	CRF19 Panel (ANS4-A port 14X) in Control room - CT Switchgear #1 via 2 Slot Media Converter (SM mount)	4 Core SMF	1300

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8	NWPC01 Panel (ANS1-A port 4X) in in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	CRF7 Panel (ANS5-A port 15X) in CCR/CER U#2 via 2 Slot Media Converter (SM mount)	4 Core SMF	300
9	NWPC01 Panel (ANS1-A port 5X) in in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	CRF10 Panel (ANS6-A port 15X) in CCR/CER U#3 via 2 Slot Media Converter (SM mount)	4 Core SMF	500
10	NWPC01 Panel (ANS1-A port 6X) in in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	CRF18 Panel (ANS8-A port 15X) in Misc Switchgear Room via 2 Slot Media Converter (SM mount)	4 Core SMF	2000
Total (4 Core SMF Stand Alone):				5100
11	**CCR/CER U#1 (FG102 panel)**	**ESP Control Room U#1 FG102/RIO#1 (RIO-BEM)**	**4 Core MMF**	**300**
12	**CCR/CER U#2 (FG103 panel)**	**ESP Control Room U#2 FG103/RIO#1 (RIO-BEM)**	**4 Core MMF**	**300**
13	**CCR/CER U#3 (FG104 panel)**	**ESP Control Room U#3 FG104/RIO#1 (RIO-BEM)**	**4 Core MMF**	**300**
14	**CT Switchgear #1 (FG109A panel) CT1A/1B**	**CT2A/2B Switchgear FG109A/RIO#2A (RIO-BEM)**	**4 Core MMF**	**500**
15	**CT Switchgear #1 (FG109A panel) CT1A/1B**	**CT2A/2B Switchgear FG109A/RIO#2B (RIO-BEM)**	**4 Core MMF**	**500**
16	**CT Switchgear #1 (FG109B panel) CT1A/1B**	**CT3A/3B Switchgear FG109B/RIO#3A (RIO-BEM)**	**4 Core MMF**	**800**
17	**CT Switchgear #1 (FG109B panel) CT1A/1B**	**CT3A/3B Switchgear FG109B/RIO#3B (RIO-BEM)**	**4 Core MMF**	**800**
Total (4 Core MMF Stand Alone):				3500
Water System DDCMIS Subsystem:				
18	NWPC02 Panel (BNS1-A port 2X) in Water System CR via 20 Slot Media Converter (SM mount)	CFB16 Panel (BNS3-A port 14X) in Service Water Pump House via 2 Slot Media Converter (SM mount)	4 Core SMF	500
19	NWPC02 Panel (BNS1-A port 3X) in in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	CRB10 Panel (BNS4-A port 14X) in Remote I/O Room CSSP via 2 Slot Media Converter (SM mount)	4 Core SMF	1000
20	NWPC02 Panel (BNS1-A port 4X) in in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	CRB13 Panel (BNS5-A port 14X) in Remote I/O Room Waste Water System via 2 Slot Media Converter (SM	4 Core SMF	1000

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		mount)		
Total (4 Core SMF Water System):				2500
21	**Water System CR (FG202C panel)**	**Raw Water Pump House FG202C/RIO#3 (RIO-BEM)**	**4 Core MMF**	**2000**
Total (4 Core MMF Water System):				2000
Ash Handling System DDCMIS Subsystem:				
22	NWPC03 Panel (CNS1-A port 2X) in AHP System CR via 20 Slot Media Converter (SM mount)	CRF12 Panel (CNS3-A port 14X) in Ash Silo Control Room via 2 Slot Media Converter (SM mount)	4 Core SMF	1200
23	NWPC03 Panel (CNS1-A port 3X) in AHP System CR via 20 Slot Media Converter (SM mount)	CRF19 Panel (CNS4-A port 14X) in Ash Water Recirculation Control Room via 2 Slot Media Converter (SM mount)	4 Core SMF	3000*
24	NWPC03 Panel (CNS1-A port 4X) in AHP System CR via 20 Slot Media Converter (SM mount)	CRF07 Panel (CNS5-A port 16X) in ESP CR U#1 via 2 Slot Media Converter (SM mount)	4 Core SMF	500
25	NWPC03 Panel (CNS1-A port 5X) in AHP System CR via 20 Slot Media Converter (SM mount)	CRF10 Panel (CNS6-A port 16X) in ESP CR U#2 via 2 Slot Media Converter (SM mount)	4 Core SMF	600
26	NWPC03 Panel (CNS1-A port 6X) in AHP System CR via 20 Slot Media Converter (SM mount)	CRF18 Panel (CNS7-A port 16X) in ESP CR U#3 via 2 Slot Media Converter (SM mount)	4 Core SMF	700
Total (4 Core SMF AHP):				6000
27	**ESP CR U#1 (FG401A panel)**	**CER U#1 FG401A/RIO (RIO-BEM)**	**4 Core MMF**	**300**
28	**ESP CR U#2 (FG402A panel)**	**CER U#2 FG402A/RIO (RIO-BEM)**	**4 Core MMF**	**300**
29	**ESP CR U#3 (FG403A panel)**	**CER U#3 FG403A/RIO (RIO-BEM)**	**4 Core MMF**	**300**
Total (4 Core MMF AHP):				**900**

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Coal Handling System DDCMIS Subsystem:				
30	NWPL01 Panel (DNS1-A port 3X) in CHP Control Room via 8 Slot Media Converter (SM mount)	CRD09 Panel (DNS3-A port 16X) in MCC-1D via 2 Slot Media Converter (SM mount)	4 Core SMF	2000
Total (4 Core SMF CHP):				2000
31	**CHP Control Room (FG-501C-2 panel)**	**MCC-1A Room FG501C-2/RIO#1A (RIO-BEM)**	**4 Core MMF**	**650**
32	**CHP Control Room (FG-502C-2 panel)**	**MCC-1A Room FG502C-2/RIO#2A (RIO-BEM)**	**4 Core MMF**	**650**
33	**CHP Control Room (FG-501BE panel)**	**MCC-1B Room FG501BE/RIO#1B (RIO-BEM)**	**4 Core MMF**	**700**
34	**CHP Control Room (FG-501BE panel)**	**MCC-1E Room FG501BE/RIO#1E (RIO-BEM)**	**4 Core MMF**	**1600**
35	**CHP Control Room (FG-502BE panel)**	**MCC-1B Room FGF02BE/RIO#1B (RIO-BEM)**	**4 Core MMF**	**700**
36	**CHP Control Room (FG-502BE panel)**	**MCC-1E Room FGF02BE/RIO#1E (RIO-BEM)**	**4 Core MMF**	**1600**
37	**MCC-1D Room (FG-501D panel)**	**MCC-1D Room FG501D/RIO (RIO-BEM)**	**4 Core MMF**	**100**
38	**MCC-1D Room (FG-502D panel)**	**MCC-1D Room FG502D/RIO (RIO-BEM)**	**4 Core MMF**	**100**
Total (4 Core MMF CHP):				6100

Station LAN Connections to L3GIGSW2 Switch				
39	NWPS01 Panel (L3GIGSW2-A Port 25X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	NWEN04/SLAN/SWAS enclosure (SLAN1-A Port FX1) in SWAS Room	4 Core SMF	500
40	NWPS01 Panel (L3GIGSW2-A Port 26X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	NWEN05/SLAN/SRVC enclosure (SLAN2-A Port FX1) in Service Building	4 Core SMF	850
41	NWPS01 Panel (L3GIGSW2-A Port 27X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	NWEN06/SLAN/LOC1 enclosure (SLAN3-A Port FX1) in Undecided Location1	4 Core SMF	2000

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42	NWPS01 Panel (L3GIGSW2-A Port 28X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	NWEN07/SLAN/LOC2 enclosure (SLAN4-A Port FX1) in Undecided Location2	4 Core SMF	2000
Total (4 Core SMF SLAN):				5350
PLC Connections to L3GIGSW2 Switch				
43	NWPS01 Panel (L3GIGSW2-A Port 1X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	ESP U#1 Control Room (Switch, LIU, media converter in PLC vendor's scope)	4 Core SMF	300
44	NWPS01 Panel (L3GIGSW2-A Port 2X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	ESP U#2 Control Room (Switch, LIU, media converter in PLC vendor's scope)	4 Core SMF	300
45	NWPS01 Panel (L3GIGSW2-A Port 3X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	ESP U#3 Control Room (Switch, LIU, media converter in PLC vendor's scope)	4 Core SMF	300
46	NWPS01 Panel (L3GIGSW2-A Port 7X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	SWGR U#2 CCR/CER (Switch, LIU, media converter in PLC vendor's scope)	4 Core SMF	600
47	NWPS01 Panel (L3GIGSW2-A Port 8X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	SWGR U#3 CCR/CER (Switch, LIU, media converter in PLC vendor's scope)	4 Core SMF	700
48	NWPS01 Panel (L3GIGSW2-A Port 9X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	Hydrogen Generation Plant (Switch, LIU, media converter in PLC vendor's scope)	4 Core SMF	1700
49	NWPS01 Panel (L3GIGSW2-A Port 11X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	Wagon Tippler (Switch, LIU, media converter in PLC vendor's scope)	4 Core SMF	2600
50	NWPS01 Panel (L3GIGSW2-A Port 12X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	AHP HCSD System at HCSD Pump House (Switch, LIU, media converter in PLC vendor's scope)	4 Core SMF	700

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51	NWPS01 Panel (L3GIGSW2-A Port 14X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	PADO U#2 at CCR/CER U#2 (Switch, LIU, media converter in PADO scope)	4 Core SMF	300
52	NWPS01 Panel (L3GIGSW2-A Port 15X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	PADO U#3 at CCR/CER U#3 (Switch, LIU, media converter in PADO scope)	4 Core SMF	500
53	NWPS01 Panel (L3GIGSW2-A Port 16X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	PI/ERP at Service Building (Switch, LIU, media converter in NTPC scope)	4 Core SMF	850
54	NWPS01 Panel (L3GIGSW2-A Port 18X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	GRP U#2 at CCR/CER U#2 (Switch, LIU, media converter in GRP vendor's scope)	4 Core SMF	500
55	NWPS01 Panel (L3GIGSW2-A Port 19X) in CCR/CER U#1 via 20 Slot Media Converter (SM mount)	GRP U#3 at CCR/CER U#3 (Switch, LIU, media converter in GRP vendor's scope)	4 Core SMF	800
Total (4 Core SMF PLC):				7200

SPARE OFC IN CASE OF CHANGES IN SITE			
56	Spare OFC1 Four Core SMF for maxDNA DCS(Source & Destination will be finalised at a later date)	4 Core SMF	1000
57	Spare OFC2 Four Core SMF for maxDNA DCS(Source & Destination will be finalised at a later date)	4 Core SMF	1000
58	Spare OFC3 Four Core SMF for maxDNA DCS(Source & Destination will be finalised at a later date)	4 Core SMF	1000
59	Spare OFC4 Four Core SMF for maxDNA DCS(Source & Destination will be finalised at a later date)	4 Core SMF	1000
60	Spare OFC5 Four Core SMF (Source & Destination will be finalised at a later date)	4 Core SMF	1000
Total (4 Core SMF Spare):			5000
61	**Spare OFC6 Four Core MMF for BEM (Source & Destination will be finalised at a later date)**	**4 Core MMF**	**1000**
62	**Spare OFC7 Four Core MMF for BEM (Source & Destination will be finalised at a later date)**	**4 Core MMF**	**1000**
63	**Spare OFC8 Four Core MMF for BEM (Source & Destination will be finalised at a later date)**	**4 Core MMF**	**1000**

64	**Spare OFC9 Four Core MMF for BEM (Source & Destination will be finalised at a later date)**	**4 Core MMF**	**1000**
65	**Spare OFC10 Four Core MMF for BEM (Source & Destination will be finalised at a later date)**	**4 Core MMF**	**1000**
Total (4 Core MMF Spare):			5000

Total (NetA MMF 4 Core)	17500	meters
Total (NetA SMF 4 Core)	37650	meters
Terminations(NetA MMF 4 Core)	192	nos
Terminations (NetA SMF 4 Core)	328	nos

Total for OFC Nabinagar (DCS, Station LAN & PLC)		
Total 4 Core Multi mode FO Cable (NetA and B)	**35000**	**meters**
Total 4 Core Single mode FO Cable (NetA and B)	**75300**	**meters**
Total No of Fiber Segments	**130**	**Nos**
Total No of Terminations	**1040**	**Nos**

* The Ash Water Recirculation System will be located near Ash Pond which is outside plant boundary; hence there is a possibility that wireless may be used instead of OFC for this segment. This will be confirmed at site.

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PROJECT : GADARWARA STPP-I – (2 X 800 MW)

CUSTOMER : NTPC LTD

EQUIPMENT: FIBER OPTIC CABLE, ACCESSORIES AND SERVICES

REVISION HISTORY SHEET

REV No.	DATE	NATURE OF CHANGE	REASON	PREPARED BY	CHECKED BY	REVIEWED BY
00	09.01.2017	FIRST ISSUE	---	HN	BNS	DP

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1. **General**

The fiber optic cable is required for Gadarwara Stg-I (2 x 800 MW) project, Gadarwara, District: Narsinghpur, Madhya Pradesh, India. The scope of work broadly involves the supply of OFC, termination and testing of the entire Fiber Optic Network.

2. **Scope of Supply**

2.1 Scope of supply includes supply of list of items and their quantities as per *Table 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10 and 2.11: "Bill of Materials"*. ~~Fiber optic cable should be supplied as per *"Technical specifications"*, mentioned in *purchase specification* **PS4042668**~~ *and other accessory components as per* ***PS4042525***.The locations & distances are mentioned in *Table 2.11 to Table 2.22 (Termination requirements / Cable Segment Details)*. The measurements and lengths mentioned in the tables are **indicative**.

Table – 2.1: Bill of Materials for SG Unit 1 and Common system (FOPH) connectivity

Sl No	Description	PSPEC Reference	Material Code	Quantity	Compliance
~~1.~~	~~4 Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable. **(quantity computation: Refer table 2.12) Make:** HFCL, R&M, Birla Ericson, Finolex, Aksh Fiber, Digilink and Corning Cable System~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~3500 Meters~~	~~Yes/No~~
2.	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525. (quantity computation: Refer table 2.12)**	PS4042525 section C-1	PR0120004460	16 + 1 = 17 Nos.	Yes/No
~~3.~~	~~a) ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor. To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while crossing roads / canals / river.~~ ~~b) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900002627~~	~~1400 meters~~	~~Yes/No~~
4.	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	4 Meters.	Yes/No
5.	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	4 Nos.	Yes/No
6.	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	350 Meters	Yes/No
7.	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	20 Nos.	Yes/No
8.	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required	Yes/No
9.	SC – SC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-5	PR0500004697	10 nos.	Yes/No
10.	SC – LC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-7	PR0500004673	10 nos.	Yes/No

Table – 2.2: Bill of Materials for SG Unit 2 and Common system (Aux.Boiler) connectivity

Sl No	Description	PSPEC Reference	Material Code	Quantity	Compliance
1.	~~4 Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable. **(quantity computation: Refer table 2.13) Make:** HFCL, R&M, Birla Ericson, Finolex,~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~3500 Meters~~	~~Yes/No~~

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	~~Aksh Fiber, Digilink and Corning Cable System~~				
2.	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525**. **(quantity computation: Refer table 2.13)**	PS4042525 section C-1	PR0120004460	16 + 1 = 17 Nos.	Yes/No
3.	~~a) ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor.~~ ~~To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while crossing roads / canals / river.~~ ~~b) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900002627~~	~~1400 meters~~	~~Yes/No~~
4.	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	4 Meters	Yes/No
5.	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	4 Nos.	Yes/No
6.	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	350 Meters	Yes/No
7.	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	20 Nos.	Yes/No
8.	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required	Yes/No
9.	SC – SC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-5	PR0500004697	10 nos.	Yes/No
10.	SC – LC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-7	PR0500004673	10 nos.	Yes/No

Table – 2.3: Bill of Materials for TG Unit 1 and Common system (CPU) connectivity

Sl No	Description	PSPEC Reference	Material Code	Quantity	Compliance
~~1.~~	~~4 Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable. **(quantity computation: Refer table 2.14) Make:** HFCL, R&M, Birla Ericson, Finolex, Aksh Fiber, Digilink and Corning Cable System~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~5500 Meters~~	~~Yes/No~~
2.	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525**. **(quantity computation: Refer table 2.14)**	PS4042525 section C-1	PR0120004460	48 + 4 = 52 Nos.	Yes/No
~~3.~~	~~a) ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor.~~ ~~To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while crossing roads / canals / river.~~ ~~b) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900002627~~	~~2200 meters~~	~~Yes/No~~
4.	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	12 Meters	Yes/No
5.	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	12 Nos.	Yes/No
6.	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	550 Meters	Yes/No

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7.	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	35 Nos.	Yes/No
8.	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required	Yes/No
9.	SC – SC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-5	PR0500004697	10 nos.	Yes/No
10.	SC – LC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-7	PR0500004673	10 nos.	Yes/No

Table – 2.4: Bill of Materials for TG Unit 2 and Common system (CPU) connectivity

Sl No	Description	PSPEC Reference	Material Code	Quantity	Compliance
~~1.~~	~~4 Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable.~~ ~~**(quantity computation: Refer table 2.15) Make:** HFCL, R&M, Birla Ericson, Finolex, Aksh Fiber, Digilink and Corning Cable System~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~3500 Meters~~	~~Yes/No~~
2.	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525**. **(quantity computation: Refer table 2.15)**	PS4042525 section C-1	PR0120004460	32 + 2 = 34 Nos.	Yes/No
~~3.~~	~~a) ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor.~~ ~~To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while crossing roads / canals / river.~~ ~~b) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900002627~~	~~1400 meters~~	~~Yes/No~~
4.	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	8 Meters.	Yes/No
5.	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	8 Nos.	Yes/No
6.	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	350 Meters	Yes/No
7.	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	20 Nos.	Yes/No
8.	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required	Yes/No

Table – 2.5: Bill of Materials for Station C&I and SAC connectivity

Sl No	Description	PSPEC Reference	Material Code	Quantity	Compliance
~~1.~~	~~4 Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable.~~ ~~**(quantity computation: Refer table 2.16) Make:** HFCL, R&M, Birla Ericson, Finolex, Aksh Fiber, Digilink and Corning Cable System~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~15100 Meters~~	~~Yes/No~~
2.	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525**. **(quantity computation: Refer table 2.16)**	PS4042525 section C-1	PR0120004460	200 + 10 = 210 Nos.	Yes/No
~~3.~~	~~a) ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor.~~ ~~To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while crossing roads / canals / river.~~ ~~b) Items under common supply of PS4042673 section~~	~~PS4042673 section 4a~~ ~~PS4042673~~	~~PR0900002627~~	~~6040 meters~~	~~Yes/No~~

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	~~5 also to be included~~	~~Section 5~~			
4.	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	50 Meters.	Yes/No
5.	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	50 Nos.	Yes/No
6.	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	1510 Meters	Yes/No
7.	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	100 Nos.	Yes/No
8.	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required	Yes/No
9.	SC – SC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-5	PR0500004697	20 nos.	Yes/No
10.	SC – LC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-7	PR0500004673	30 nos.	Yes/No

Table – 2.6: Bill of Materials for Station C&I and Water system connectivity

Sl No	Description	PSPEC Reference	Material Code	Quantity	Compliance
~~1.~~	~~4 Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable.~~ ~~**(quantity computation: Refer table 2.17) Make:** HFCL, R&M, Birla Ericson, Finolex, Aksh Fiber, Digilink and Corning Cable System~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~33000 Meters~~	~~Yes/No~~
2.	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525**. **(quantity computation: Refer table 2.17)**	PS4042525 section C-1	PR0120004460	200 + 10 = 210 Nos.	Yes/No
~~3.~~	~~a) ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor.~~ ~~To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while crossing roads / canals / river.~~ ~~b) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900000262 7~~	~~13200 meters~~	~~Yes/No~~
4.	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	50 Meters.	Yes/No
5.	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	50 Nos.	Yes/No
6.	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	3300 Meters	Yes/No
7.	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	220 Nos.	Yes/No
8.	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required	Yes/No
9.	SC – SC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-5	PR0500004697	20 nos.	Yes/No
10.	SC – LC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-7	PR0500004673	20 nos.	Yes/No

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Table – 2.7: Bill of Materials for Station C&I and AHP connectivity

Sl No	Description	PSPEC Reference	Material Code	Quantity	Compliance
~~1.~~	~~4 Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable. **(quantity computation: Refer table 2.18) Make:** HFCL, R&M, Birla Ericson, Finolex, Aksh Fiber, Digilink and Corning Cable System~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~18000 Meters~~	~~Yes/No~~
2.	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525**. **(quantity computation: Refer table 2.18)**	PS4042525 section C-1	PR0120004460	96 + 6 = 102 Nos.	Yes/No
~~3.~~	~~a) ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor.~~ ~~To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while crossing roads / canals / river.~~ ~~b) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900002627~~	~~7200 meters~~	~~Yes/No~~
4.	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	24 Meters	Yes/No
5.	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	24 Nos.	Yes/No
6.	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	1800 Meters	Yes/No
7.	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	120 Nos.	Yes/No
8.	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	Reputed make	-	As required	Yes/No
9.	SC – SC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-5	PR0500004697	30 nos.	Yes/No
10.	SC – LC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-7	PR0500004673	30 nos.	Yes/No

Table – 2.8: Bill of Materials for AHP and AWRS – SM FOC connectivity

Sl No	Description	PSPEC Reference	Material Code	Quantity	Compliance
~~1.~~	~~4 Fiber single-mode, multi-tube construction, 9 / 125 µm outdoor armored fiber optic cable. **(quantity computation: Refer table 2.19) Make:** HFCL, R&M, Birla Ericson, Finolex, Aksh Fiber, Digilink and Corning Cable System~~	~~PS4042668 section B-2~~	~~PR0460002012~~	~~5000 Meters~~	~~Yes/No~~
2.	Simplex SM SC pigtails - For terminating Fibers compatible with SM-FO cable supplied. **Make: As per PS4042525**. **(quantity computation: Refer table 2.19)**	PS4042525 section C-2	PR0120004479	16 + 2 = 18 Nos.	Yes/No
~~3.~~	~~a) 2" Dia rodent proof HDPE permanently lubricated pipes.~~ ~~(To be used to lay fiber optic cables, described in sl. no. 1 at areas where cable trays are not available and while crossing roads / canals / river. Reputed make).~~ ~~b) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900002627~~	~~2000 meters~~	~~Yes/No~~
4.	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	4 Meters	Yes/No
5.	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	4 Nos.	Yes/No
6.	2" GI Conduit pipe (As per ISI Standards – medium duty)	PS4042525	PR0120006430	500 Meters	

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	Reputed make	Section D-5	0		Yes/No
7.	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	30 Nos.	Yes/No
8.	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required	Yes/No
9.	SC – LC Duplex SM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 Section C-8	PR0500004661	10 nos.	Yes/No

Table – 2.9: Bill of Materials for Station C&I and CHP connectivity

Sl No	Description	PSPEC Reference	Material Code	Quantity	Compliance
~~1.~~	~~4 Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable. **(quantity computation: Refer table 2.20) Make:** HFCL, R&M, Birla Ericson, Finolex, Aksh Fiber, Digilink and Corning Cable System~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~46600 Meters~~	~~Yes/No~~
2.	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525**. **(quantity computation: Refer table 2.20)**	PS4042525 section C-1	PR0120004460	392 + 20 = 412 Nos.	Yes/No
~~3.~~	~~a) ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor.~~ ~~To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while crossing roads / canals / river.~~ ~~b) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900000262 7~~	~~18640 meters~~	~~Yes/No~~
4.	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	98 Meters	Yes/No
5.	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	98 Nos.	Yes/No
6.	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	4660 Meters	Yes/No
7.	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	300 Nos.	Yes/No
8.	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required	Yes/No
9.	SC – SC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-5	PR0500004697	20 nos.	Yes/No
10.	SC – LC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-7	PR0500004673	20 nos.	Yes/No

Table – 2.10: Bill of Materials for Station C&I and MUWP connectivity

Sl No	Description	PSPEC Reference	Material Code	Quantity	Compliance
~~1.~~	~~4 Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable. **(quantity computation: Refer table 2.21) Make:** HFCL, R&M, Birla Ericson, Finolex, Aksh Fiber, Digilink and Corning Cable System~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~1250 Meters~~	~~Yes/No~~
2.	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525**. **(quantity computation: Refer table 2.21)**	PS4042525 section C-1	PR0120004460	24 + 2 = 26 Nos.	Yes/No
~~3.~~	~~a) ISI Certified 2" Dia rodent proof HDPE permanently lubricated pipes at 53% fill factor.~~ ~~To be used to lay fiber optic cables, described in sl. no. 1 & sl. no. 2, at areas where cable trays are not available and while~~	~~PS4042673 section 4a~~	~~PR0900000262 7~~	~~500 meters~~	~~Yes/No~~

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	~~crossing roads / canals / river.~~ ~~b) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 Section 5~~			
4.	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	6 Meters	Yes/No
5.	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	6 Nos.	Yes/No
6.	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	120 Meters	Yes/No
7.	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	5 Nos.	Yes/No
8.	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required	Yes/No
9.	SC – SC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-5	PR0500004697	10 nos.	Yes/No
10.	SC – LC Duplex MM Patch cords 2 mtrs **Make: As per PS4042525**	PS4042525 section C-7	PR0500004673	10 nos.	Yes/No

Table – 2.11: Bill of Materials for common system (service building, PI server, old stage connectivity)

Sl No	Description	PSPEC Reference	Material Code	Quantity	
~~1.~~	~~12 Fiber single-mode, multi-tube construction, 9 / 125 µm outdoor armored fiber optic cable. (quantity computation: Refer table 2.22) Make: HFCL, R&M, Birla Ericson, Finolex, Aksh Fiber, Digilink and Corning Cable System~~	~~PS4042668 section B-6~~	~~PR0460002056~~	~~10000 Meters~~	~~Yes/No~~
2.	Simplex SM SC pigtails - For terminating Fibers compatible with SM-FO cable supplied. **Make: As per PS4042525** (quantity computation: Refer table 2.22)	PS4042525 section C-2	PR0120004479	40 + 2 = 42 Nos.	Yes/No
~~3.~~	~~a) 2" Dia rodent proof HDPE permanently lubricated pipes.~~ ~~(To be used to lay fiber optic cables, described in sl. no. 1 at areas where cable trays are not available and while crossing roads / canals / river. Reputed make).~~ ~~b) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900002627~~	~~4000 meters~~	~~Yes/No~~
4.	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	10 Meters	Yes/No
5.	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	10 Nos.	Yes/No
6.	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	1000 Meters	Yes/No
7.	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	60 Nos.	Yes/No
8.	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required	Yes/No
9.	SC – SC Duplex MM Patch cords 2 meter **Make: As per PS4042525**	PS4042525 section C-5	PR0500004697	30 nos.	Yes/No
10.	SC – SC Duplex SM Patch cords 2 meter **Make: As per PS4042525**	PS4042525 section C-6	PR0500004685	30 nos.	Yes/No
11.	SC – LC Duplex MM Patch cords 2 meter **Make: As per PS4042525**	PS4042525 section C-7	PR0500004673	30 nos.	Yes/No

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TERMINATION REQUIREMENTS

Table – 2.12: 4-core multi-mode cable segment details (for SG Unit 3 and common system (FOPH) connectivity) – Indicative

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
1	CAF42(FOPH ROOM))/FOPH-Media_Converter-MM-A	NWPS01/L3CORESW_A-PORT 7-8 (LOCATION U1 CCR)	1500	8
2	CAF42(FOPH ROOM))/FOPH-Media_Converter-MM-B	NWPS02/L3CORESW_B-PORT 7-8 (LOCATION U1 CCR)	1500	8
	SPARE QUANTITY		500	
Total quantity			**3500 m**	**16**

Four core multi-mode, multi-tube cables : 2 segments, both ends need terminations
Number of Terminations : 16
Cables should be terminated using SC pigtails and tested.

Table – 2.13: 4-core multi-mode cable segment details (for SG Unit 4 and common system (Aux. Boiler) connectivity) – Indicative

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
1	CJF96(AUX.BLR ROOM))/Aux.Blr-Media_Converter-MM-A	NWPS01/L3CORESW_A-PORT 11-12 (LOCATION U1 CCR)	1500	8
2	CJF96(AUX.BLR ROOM))/Aux.Blr-Media_Converter-MM-B	NWPS02/L3CORESW_B-PORT 11-12 (LOCATION U1 CCR)	1500	8
	SPARE QUANTITY		500	
Total quantity			**3500 m**	**16**

Four core multi-mode, multi-tube cables : 2 segments, both ends need terminations
Number of Terminations : 16
Cables should be terminated using SC pigtails and tested.

Table – 2.14: 4-core multi-mode cable segment details (for TG Unit 3 and common system (CPU) connectivity) – Indicative

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
1	CCA40(CPU ROOM(Common))/CPU-Media_Converter-MM-A	NWPS01/L3CORESW_A-PORT 5-6 (LOCATION U1 CCR)	1000	8
2	CCA40(CPU ROOM(Common))/CPU-Media_Converter-MM-B	NWPS02/L3CORESW_B-PORT 5-6 (LOCATION U1 CCR)	1000	8
3	CCA40(CPU ROOM(Common)) – 70S10_Primary – Net A : BEM1PA-LINK1	BEM1PA-LINK1: <CCA43-93>(RIO location-U#1)<70S10_Primary> - Net A	750	8
4	CCA40(CPU ROOM(Common)) –	BEM1PB-LINK2: <CCA43-93>(RIO	750	8

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	70S10_Primary – Net B : BEM1PB-LINK2	location-U#1)<70S10_Primary> - Net B		
5	CCA40(CPU ROOM(Common)) – 70S10_Secondary – Net A : BEM1SA-LINK3	BEM1SA-LINK3: <CCA43-93>(RIO location-U#1)<70S10_Secondary> - Net A	750	8
6	CCA40(CPU ROOM(Common)) – 70S10_Secondary – Net B : BEM1SB-LINK4	BEM1SB-LINK4: <CCA43-93>(RIO location-U#1)<70S10_Secondary> - Net B	750	8
	SPARE QUANTITY		500	
Total quantity			**5500 m**	**48**

Four core multi-mode, multi-tube cables : 6 segments, both ends need terminations
Number of Terminations : 48
Cables should be terminated using SC pigtails and tested.

Table – 2.15: 4-core multi-mode cable segment (for TG Unit 4 and common system (CPU) connectivity) – Indicative

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
1	CCA40(CPU ROOM(Common)) – 70S10_Primary – Net A : BEM2PA-LINK1	BEM2PA-LINK1: <CCA44-94>(RIO location-U#2)<70S10_Primary> - Net A	750	8
2	CCA40(CPU ROOM(Common)) – 70S10_Secondary – Net B : BEM2PB-LINK2	BEM2PB-LINK2: <CCA44-94>(RIO location-U#2)<70S10_Primary> - Net B	750	8
3	CCA40(CPU ROOM(Common)) – 70S10_Primary – Net B : BEM2SA-LINK3	BEM2SA-LINK3: <CA44-94>(RIO location-U#2)<70S10_Secondary> - Net A	750	8
4	CCA40(CPU ROOM(Common)) – 70S10_Secondary – Net B : BEM2SB-LINK4	BEM2SB-LINK4: <CCA44-94>(RIO location-U#2)<70S10_Secondary> - Net B	750	8
	SPARE QUANTITY		500	
Total quantity			**3500 m**	**32**

Four core multi-mode, multi-tube cables : 4 segments, both ends need terminations
Number of Terminations : 32
Cables should be terminated using SC pigtails and tested.

Table – 2.16: 4-core multi-mode cable segment (for Station C&I and SAC connectivity) – Indicative

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
Station C&I/Station LAN and SAC Connectivity-maxDNA Connectivity				
1	SAC-Media_Converter1-A(U#1 CER-NWPD03)	DC-SW-1A(CT-1A/1B Room) - Net A	1000	8
2	SAC-Media_Converter1-B(U#1 CER-	DC-SW-1B(CT-1A/1B Room) - Net B	1000	8

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	NWPD03)			
3	SAC-Media_Converter2-A(U#1 CER-NWPD03)	DC-SW-2A(CT-2A/2B Room) - Net A	2000	8
4	SAC-Media_Converter2-B(U#1 CER-NWPD03)	DC-SW-2B(CT-2A/2B Room) - Net B	2000	8
5	SAC-Media_Converter3-A(U#1 CER-NWPD03)	DC-SW-3A(SWPH Room) - Net A	750	8
6	SAC-Media_Converter3-B(U#1 CER-NWPD03)	DC-SW-3B(SWPH Room) - Net B	750	8
SAC-RIO Connectivity (U#1 CER) to ESP CR U#1				
7	SAC-<9F02CRF03_Pri:Net A>(CER U#1):BEM1PA LINK1	BEM1PA:<9F02CRF03 RIO>(ESP-CR U#1) -<9F02CRF03_Pri >-Net A	750	8
8	SAC-<9F02CRF03_Pri:Net B>(CER U#1):BEM1PB LINK2	BEM1PB:<9F02CRF03 RIO>(ESP-CR U#1) -<9F02CRF03_Pri >-Net B	750	8
9	SAC-<9F02CRF03_Sec:Net A>(CER U#1):BEM1SA LINK3	BEM1SA:<9F02CRF03 RIO>(ESP-CR U#1) -<9F02CRF03_Sec >-Net A	750	8
10	SAC-<9F02CRF03_Sec:Net B>(CER U#1):BEM1SB LINK4	BEM1SB:<9F02CRF03 RIO>(ESP-CR U#1) -<9F02CRF03_Sec >-Net B	750	8
SAC-RIO Connectivity (U#2 CER) to ESP CR U#2				
11	SAC-<9F03CRF06_Pri:Net A>(CER U#2):BEM1PA LINK1	BEM1PA:<9F03CRF06 RIO>(ESP-CR U#2) -<9F03CRF06_Pri >-Net A	750	8
12	SAC-<9F03CRF06_Pri:Net B>(CER U#2):BEM1PB LINK2	BEM1PB:<9F03CRF06 RIO>(ESP-CR U#2) -<9F03CRF06_Pri >-Net B	750	8
13	SAC-<9F03CRF06_Sec:Net A>(CER U#2):BEM1SA LINK3	BEM1SA:<9F03CRF06 RIO>(ESP-CR U#2) -<9F03CRF06_Sec >-Net A	750	8
14	SAC-<9F03CRF06_Sec:Net B>(CER U#2):BEM1SB LINK4	BEM1SB:<9F03CRF06 RIO>(ESP-CR U#2) -<9F03CRF06_Sec >-Net B	750	8
SAC-RIO Connectivity CT1A/1B CR]				
15	SAC-<9F10CRF18_Pri:Net A>(CT 1A/1B):BEM1PA LINK1	BEM1PA:<9F10CRF18 RIO>(CT 1A/1B) -<9F10CRF18_Pri >-Net A	5	8
16	SAC-<9F10CRF18_Pri:Net B>(CT 1A/1B):BEM1PB LINK2	BEM1PB:<9F10CRF18 RIO>(CT 1A/1B) -<9F10CRF18_Pri >-Net B	5	8
17	SAC-<9F10CRF18_Sec:Net A>(CT 1A/1B):BEM1SA LINK3	BEM1SA:<9F10CRF18 RIO>(CT 1A/1B) -<9F10CRF18_Sec >-Net A	5	8
18	SAC-<9F10CRF18_Sec:Net B>(CT 1A/1B):BEM1SB LINK4	BEM1SB:<9F10CRF18 RIO>(CT 1A/1B) -<9F10CRF18_Sec >-Net B	5	8
SAC-RIO Connectivity CT2A/2B CR				
19	SAC-<9F11CRF20_Pri:Net A>(CT 2A/2B):BEM1PA LINK1	BEM1PA:<9F11CRF20 RIO>(CT 2A/2B) -<9F11CRF20_Pri >-Net A	5	8
20	SAC-<9F11CRF20_Pri:Net B>(CT 2A/2B):BEM1PB LINK2	BEM1PB:<9F11CRF20 RIO>(CT 2A/2B) -<9F11CRF20_Pri >-Net B	5	8
21	SAC-<9F11CRF20_Sec:Net A>(CT 2A/2B):BEM1SA LINK3	BEM1SA:<9F11CRF20 RIO>(CT 2A/2B) -<9F11CRF20_Sec >-Net A	5	8
22	SAC-<9F11CRF20_Sec:Net B>(CT 2A/2B):BEM1SB LINK4	BEM1SB:<9F11CRF20 RIO>(CT 2A/2B) -<9F11CRF20_Sec >-Net B	5	8
CER to TG Building Roof for SWPH Wireless Connectivity				
23	SAC-UPL-A/MM-Media Converter-1A(U#1 CER-NWPD03)-PORT 13	MM Media Converter-2A(TG Bldg. roof) - Net A	250	8
24	SAC-UPL-B/MM-Media Converter-1B(U#1 CER-NWPD03) PORT 13	MM Media Converter-2B(TG Bldg. roof) - Net B	250	8
	SPARE QUANTITY		1060	8
Total quantity			**15100 m**	**200**

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Four core multi-mode, multi-tube cables : 24 segments, both ends need terminations
Number of Terminations : 200
Cables should be terminated using SC pigtails and tested.

Table – 2.17: 4-core multi-mode cable segment (for Station C&I and Water system connectivity) – Indicative

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
Station C&I/Station LAN and Water system connectivity-maxDNA Connectivity				
1	Water Sys-Media_Converter1-A(WS CR-NWPD03)	NWPS01/L3CORESW_A-PORT 15/16 (LOCATION U1 CCR)	2000	8
2	Water Sys -Media_Converter1-B(WS CR-NWPD03)	NWPS02/L3CORESW_B-PORT 15/16 (LOCATION U1 CCR)	2000	8
3	Water Sys-Media_Converter2-A(WS CR-NWPD03)	DC-SW-1A (SWPH Room) - Net A	1500	8
4	Water Sys -Media_Converter2-B(WS CR-NWPD03)	DC-SW-1B (SWPH Room) - Net B	1500	8
5	Water Sys-Media_Converter3-A(WS CR-NWPD03)	DC-SW-2A (CSSP RIO Room) - Net A	2000	8
6	Water Sys -Media_Converter3-B(WS CR-NWPD03)	DC-SW-2B (CSSP RIO Room) - Net B	2000	8
7	Water Sys-Media_Converter4-A(WS CR-NWPD03)	DC-SW-3A (LETS/WSW RIO Room) - Net A	1000	8
8	Water Sys -Media_Converter4-B(WS CR-NWPD03)	DC-SW-3B (LETS/WSW RIO Room) - Net B	1000	8
9	Water Sys -Media_Converter5 (WS CR-NWPD03)	Media Converter for SDS at RWPH Room	750	8
WS-RIO Connectivity: Water System CR to CSSP RIO				
10	Water Sys-<AW05CRB08_Pri:Net A>(WS CR):BEM1PA LINK1	BEM1PA:<AW05CRB08 RIO>(CSSP RIO) -<AW05CRB08_Pri>-Net A	2000	8
11	Water Sys-<AW05CRB08_Pri:Net B>(WS CR):BEM1PB LINK2	BEM1PB:< AW05CRB08 RIO >(CSSP RIO) - <AW05CRB08_Pri>-Net B	2000	8
12	Water Sys-<AW05CRB08_Sec:Net A>(WS CR):BEM1SA LINK3	BEM1SA:< AW05CRB08 RIO >(CSSP RIO) - <AW05CRB08_Sec>-Net A	2000	8
13	Water Sys-<AW05CRB08_Sec:Net B>(WS CR):BEM1SB LINK4	BEM1SB:< AW05CRB08 RIO >(CSSP RIO) - <AW05CRB08_Sec>-Net B	2000	8
WS-RIO Connectivity: Water System CR to LETS/WSW RIO				
14	Water Sys-<AW06CRB10_Pri:Net A>(WS CR):BEM1PA LINK1	BEM1PA:<AW06CRB10 RIO>(LETS/WSW RIO) - <AW06CRB10_Pri>-Net A	1000	8
15	Water Sys-<AW06CRB10_Pri:Net B>(WS CR):BEM1PB LINK2	BEM1PB:< AW06CRB10 RIO>(LETS/WSW RIO) - <AW06CRB10_Pri>-Net B	1000	8
16	Water Sys-<AW06CRB10_Sec:Net A>(WS CR):BEM1SA LINK3	BEM1SA:< AW06CRB10 RIO>(LETS/WSW RIO) - <AW06CRB10_Sec>-Net A	1000	8
17	Water Sys-<AW06CRB10_Sec:Net B>(WS CR):BEM1SB LINK4	BEM1SB:< AW06CRB10 RIO>(LETS/WSW RIO) - <AW06CRB10_Sec>-Net B	1000	8
WS-RIO Connectivity: Water System CR to RWPH CR				

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18	Water Sys-<AW07CRB12_Pri:Net A>(WS CR):BEM1PA LINK1	BEM1PA:<AW07CRB12 RIO>(RWPH Room) -<AW07CRB12_Pri>-Net A	750	8
19	Water Sys-<AW07CRB12_Pri:Net B>(WS CR):BEM1PB LINK2	BEM1PB:< AW07CRB12 RIO>(RWPH Room) -<AW07CRB12_Pri>-Net B	750	8
20	Water Sys-<AW07CRB12_Sec:Net A>(WS CR):BEM1SA LINK3	BEM1SA:< AW07CRB12 RIO>(RWPH Room) -<AW07CRB12_Sec>-Net A	750	8
21	Water Sys-<AW07CRB12_Sec:Net B>(WS CR):BEM1SB LINK4	BEM1SB:< AW07CRB12 RIO>(RWPH Room) - <AW07CRB12_Sec>-Net B	750	8
22	Water Sys-<AW07CRB12_Pri:Net A>(WS CR):BEM2PA LINK1	BEM2PA:<AW07CRB12 RIO>(RWPH ROOM) -<AW07CRB12_Pri>-Net A	750	8
23	Water Sys-<AW07CRB12_Pri:Net B>(WS CR):BEM2PB LINK2	BEM2PB:< AW07CRB12 RIO>(RWPH ROOM) -<AW07CRB12_Pri>-Net B	750	8
24	Water Sys-<AW07CRB12_Sec:Net A>(WS CR):BEM2SA LINK3	BEM2SA:< AW07CRB12 RIO>(RWPH ROOM) -<AW07CRB12_Sec>-Net A	750	8
25	Water Sys-<AW07CRB12_Sec:Net B>(WS CR):BEM2SB LINK4	BEM2SB:< AW07CRB12 RIO>(RWPH ROOM) - <AW07CRB12_Sec>-Net B	750	8
	SPARE QUANTITY		1250	
Total quantity			**33000 m**	**200**

Four core multi-mode, multi-tube cables : 25 segments, both ends need terminations
Number of Terminations : 200
Cables should be terminated using SC pigtails and tested.

Table – 2.18: 4-core multi-mode cable segment (for Station C&I and AHP connectivity) – Indicative

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
Station C&I/Station LAN and AHP connectivity-maxDNA Connectivity				
1	AHP-Media_Converter-MM1-A(AHP CR-NWP-AHP)	NWPS01/L3CORESW_A-PORT 21 (LOCATION U1 CCR)	2000	8
2	AHP-Media_Converter-MM1-B(AHP CR-NWP-AHP)	NWPS02/L3CORESW_B-PORT 21 (LOCATION U1 CCR)	2000	8
3	AHP-Media_Converter-MM2-A(AHP CR- NWP-AHP)	DC-SW-1A (Main Silo Building) - Net A	2000	8
4	AHP -Media_Converter-MM2-B(AHP CR- NWP-AHP)	DC-SW-1B (Main Silo Building) - Net B	2000	8
5	AHP-Media_Converter-MM3-A(AHP CR- NWP-AHP)	DC-SW-2A (ESP CR U#1) - Net A	750	8
6	AHP -Media_Converter-MM3-B(AHP CR- NWP-AHP)	DC-SW-2B (ESP CR U#1) - Net B	750	8
7	AHP-Media_Converter-MM4-A(AHP CR- NWP-AHP)	DC-SW-3A (ESP CR U#2) - Net A	750	8
8	AHP -Media_Converter-MM4-B(AHP CR- NWP-AHP)	DC-SW-3B (ESP CR U#2) - Net B	750	8
9	AHP-Media_Converter-MM5-A(AHP CR- NWP-AHP)	DC-SW-4A (CER U#1) - Net A	1500	8
10	AHP -Media_Converter-MM5-B(AHP CR- NWP-AHP)	DC-SW-4B (CER U#1) - Net B	1500	8
11	AHP-Media_Converter-MM6-A(AHP CR- NWP-AHP)	DC-SW-5A (CER U#2) - Net A	1500	8

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12	AHP -Media_Converter-MM6-B(AHP CR- NWP-AHP)	DC-SW-5B (CER U#2) - Net B	1500	8
	SPARE QUANTITY		1000	
Total quantity			**18000 m**	**96**

Four core multi-mode, multi-tube cables : 12 segments, both ends need terminations
Number of Terminations : 96
Cables should be terminated using SC pigtails and tested.

Table – 2.19: 4-core single-mode cable segment (for AHP and AWRS system connectivity) – Indicative

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
AHP and AWRS Connectivity-maxDNA Connectivity				
1	AHP-Media_Converter-SM1-A(AHP CR-NWP-AHP)	AWRS-Media_Converter-SM1-A(AWRS Room) - Net A	4000	8
2	AHP-Media_Converter-SM1-B(AHP CR-NWP-AHP)	AWRS-Media_Converter-SM1-B(AWRS Room) - Net B	4000	8
	SPARE QUANTITY		1000	
Total quantity			**5000 m**	**16**

Four core single-mode, multi-tube cables : 2 segments, both ends need terminations
Number of Terminations : 16
Cables should be terminated using SC pigtails and tested.

Table – 2.20: 4-core multi-mode cable segment (for Station C&I and CHP connectivity) – Indicative

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
Station C&I/Station LAN and CHP connectivity-maxDNA Connectivity				
1	CHP-Media_Converter-MM1-A(CHP CR-NWP-CHP)	NWPS01/L3CORESW_A-PORT 19/20 (LOCATION U1 CCR)	1500	8
2	CHP-Media_Converter-MM1-B(CHP CR-NWP-CHP)	NWPS02/L3CORESW_B-PORT 19/20 (LOCATION U1 CCR)	1500	8
3	CHP-Media_Converter-MM2-A(CHP CR-NWP-CHP)	DC-SW-1A (MCC-1D RIO) - Net A	2000	8
4	CHP-Media_Converter-MM2-B(CHP CR-NWP-CHP)	DC-SW-1B (MCC-1D RIO) - Net B	2000	8
5	CHP -Media_Converter-MM3 (CHP CR-NWP-CHP)	Media Converter for SDS at MCC-1C RIO	1500	8
6	CHP -Media_Converter-MM4 (CHP CR-NWP-CHP)	Media Converter for SDS at MCC-1A RIO	750	8
CHP-RIO Connectivity: CHP CR and MCC-1A CR – C01CRD01 & RIO				
7	CHP-<C01CRD01_Pri:Net A>(CHP CR):BEM1PA LINK1	BEM1PA:<C01CRD01 RIO>(MCC-1A CR) -<C01CRD01_Pri>-Net A	750	8

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8	CHP-<C01CRD01_Pri:Net B>(CHP CR):BEM1PB LINK2	BEM1PB:< C01CRD01 RIO>(MCC-1A CR) -<C01CRD01_Pri>-Net B	750	8
9	CHP-<C01CRD01_Sec:Net A>(CHP CR):BEM1SA LINK3	BEM1SA:< C01CRD01 RIO>(MCC-1A CR) -<C01CRD01_Sec>-Net A	750	8
10	CHP-<C01CRD01_Sec:Net B>(CHP CR):BEM1SB LINK4	BEM1SB:< C01CRD01 RIO>(MCC-1A CR) - <C01CRD01_Sec>-Net B	750	8
11	CHP-<C01CRD01_Pri:Net A>(CHP CR):BEM2PA LINK1	BEM2PA:<C01CRD01 RIO>(MCC-1A CR) -<C01CRD01_Pri>-Net A	750	8
12	CHP-<C01CRD01_Pri:Net B>(CHP CR):BEM2PB LINK2	BEM2PB:< C01CRD01 RIO>(MCC-1A CR) -<C01CRD01_Pri>-Net B	750	8
13	CHP-<C01CRD01_Sec:Net A>(CHP CR):BEM2SA LINK3	BEM2SA:< C01CRD01 RIO>(MCC-1A CR) -<C01CRD01_Sec>-Net A	750	8
14	CHP-<C01CRD01_Sec:Net B>(CHP CR):BEM2SB LINK4	BEM2SB:< C01CRD01 RIO>(MCC-1A CR) - <C01CRD01_Sec>-Net B	750	8
	CHP CR and MCC-1A CR – C07CRD14 & RIO			
15	CHP-<C07CRD14_Pri:Net A>(CHP CR):BEM1PA LINK1	BEM1PA:<C07CRD14 RIO>(MCC-1A CR) -<C07CRD14_Pri>-Net A	750	8
16	CHP-<C07CRD14_Pri:Net B>(CHP CR):BEM1PB LINK2	BEM1PB:< C07CRD14 RIO>(MCC-1A CR) -<C07CRD14_Pri>-Net B	750	8
17	CHP-<C07CRD14_Sec:Net A>(CHP CR):BEM1SA LINK3	BEM1SA:< C07CRD14 RIO>(MCC-1A CR) -<C07CRD14_Sec>-Net A	750	8
18	CHP-<C07CRD14_Sec:Net B>(CHP CR):BEM1SB LINK4	BEM1SB:< C07CRD14 RIO>(MCC-1A CR) - <C07CRD14_Sec>-Net B	750	8
19	CHP-<C07CRD14_Pri:Net A>(CHP CR):BEM2PA LINK1	BEM2PA:<C07CRD14 RIO>(MCC-1A CR) -<C07CRD14_Pri>-Net A	750	8
20	CHP-<C07CRD14_Pri:Net B>(CHP CR):BEM2PB LINK2	BEM2PB:< C07CRD14 RIO>(MCC-1A CR) -<C07CRD14_Pri>-Net B	750	8
21	CHP-<C07CRD14_Sec:Net A>(CHP CR):BEM2SA LINK3	BEM2SA:< C07CRD14 RIO>(MCC-1A CR) -<C07CRD14_Sec>-Net A	750	8
22	CHP-<C07CRD14_Sec:Net B>(CHP CR):BEM2SB LINK4	BEM2SB:< C07CRD14 RIO>(MCC-1A CR) - <C07CRD14_Sec>-Net B	750	8
CHP-RIO Connectivity: CHP CR and MCC-1C CR – C03CRD06 & RIO				
23	CHP-<C03CRD06_Pri:Net A>(CHP CR):BEM1PA LINK1	BEM1PA:<C03CRD06 RIO>(MCC-1C CR) -<C03CRD06_Pri>-Net A	1500	8
24	CHP-<C03CRD06_Pri:Net B>(CHP CR):BEM1PB LINK2	BEM1PB:< C03CRD06 RIO>(MCC-1C CR) -<C03CRD06_Pri>-Net B	1500	8
25	CHP-<C03CRD06_Sec:Net A>(CHP CR):BEM1SA LINK3	BEM1SA:< C03CRD06 RIO>(MCC-1C CR) -<C03CRD06_Sec>-Net A	1500	8
26	CHP-<C03CRD06_Sec:Net B>(CHP CR):BEM1SB LINK4	BEM1SB:< C03CRD06 RIO>(MCC-1C CR) - <C03CRD06_Sec>-Net B	1500	8
27	CHP-<C03CRD06_Pri:Net A>(CHP CR):BEM2PA LINK1	BEM2PA:<C03CRD06 RIO>(MCC-1C CR) -<C03CRD06_Pri>-Net A	1500	8
28	CHP-<C03CRD06_Pri:Net B>(CHP CR):BEM2PB LINK2	BEM2PB:< C03CRD06 RIO>(MCC-1C CR) -<C03CRD06_Pri>-Net B	1500	8
29	CHP-<C03CRD06_Sec:Net A>(CHP CR):BEM2SA LINK3	BEM2SA:< C03CRD06 RIO>(MCC-1C CR) -<C03CRD06_Sec>-Net A	1500	8
30	CHP-<C03CRD06_Sec:Net B>(CHP CR):BEM2SB LINK4	BEM2SB:< C03CRD06 RIO>(MCC-1C CR) - <C03CRD06_Sec>-Net B	1500	8
	CHP CR and MCC-1C CR – C09CRD19 & RIO			
31	CHP-<C09CRD19_Pri:Net A>(CHP CR):BEM1PA LINK1	BEM1PA:<C09CRD19 RIO>(MCC-1C CR) -<C09CRD19_Pri>-Net A	1500	8
32	CHP-<C09CRD19_Pri:Net B>(CHP CR):BEM1PB LINK2	BEM1PB:< C09CRD19 RIO>(MCC-1C CR) -<C09CRD19_Pri>-Net B	1500	8
33	CHP-<C09CRD19_Sec:Net A>(CHP	BEM1SA:< C09CRD19 RIO>(MCC-1C	1500	8

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	CR):BEM1SA LINK3	CR) -<C09CRD19_Sec>-Net A		
34	CHP-<C09CRD19_Sec:Net B>(CHP CR):BEM1SB LINK4	BEM1SB:< C09CRD19 RIO>(MCC-1C CR) - <C09CRD19_Sec>-Net B	1500	8
35	CHP-<C09CRD19_Pri:Net A>(CHP CR):BEM2PA LINK1	BEM2PA:<C09CRD19 RIO>(MCC-1C CR) -<C09CRD19_Pri>-Net A	1500	8
36	CHP-<C09CRD19_Pri:Net B>(CHP CR):BEM2PB LINK2	BEM2PB:< C09CRD19 RIO>(MCC-1C CR) -<C09CRD19_Pri>-Net B	1500	8
37	CHP-<C09CRD19_Sec:Net A>(CHP CR):BEM2SA LINK3	BEM2SA:< C09CRD19 RIO>(MCC-1C CR) -<C09CRD19_Sec>-Net A	1500	8
38	CHP-<C09CRD19_Sec:Net B>(CHP CR):BEM2SB LINK4	BEM2SB:< C09CRD19 RIO>(MCC-1C CR) - <C09CRD19_Sec>-Net B	1500	8
CHP-RIO Connectivity: MCC-1D RIO C03CRD11 controller and RIO				
39	CHP-<C03CRD11_Pri:Net A>(MCC-1D RIO):BEM1PA LINK1	BEM1PA:< C03CRD11 RIO>(MCC-1D RIO) -< C03CRD11_Pri>-Net A	10	8
40	CHP-< C03CRD11_Pri:Net B>(MCC-1D RIO):BEM1PB LINK2	BEM1PB:< C03CRD11 RIO>(MCC-1D RIO) -< C03CRD11_Pri>-Net B	10	8
41	CHP-< C03CRD11_Sec:Net A MCC-1D RIO):BEM1SA LINK3	BEM1SA:< C03CRD11 RIO>(MCC-1D RIO) -< C03CRD11_Sec>-Net A	10	8
42	CHP-< C03CRD11_Sec:Net B>(MCC-1D RIO):BEM1SB LINK4	BEM1SB:< C03CRD11 RIO>(MCC-1D RIO) - < C03CRD11_Sec>-Net B	10	8
MCC-1D RIO C06CRD23 controller and RIO				
43	CHP-<C06CRD23_Pri:Net A>(MCC-1D RIO):BEM1PA LINK1	BEM1PA:< C06CRD23 RIO>(MCC-1D RIO) -< C06CRD23_Pri>-Net A	10	8
44	CHP-< C06CRD23_Pri:Net B>(MCC-1D RIO):BEM1PB LINK2	BEM1PB:< C06CRD23RIO>(MCC-1D RIO) -< C06CRD23_Pri>-Net B	10	8
45	CHP-< C06CRD23_Sec:Net A MCC-1D RIO):BEM1SA LINK3	BEM1SA:< C06CRD23 RIO>(MCC-1D RIO) -< C06CRD23_Sec>-Net A	10	8
46	CHP-< C06CRD23_Sec:Net B MCC-1D RIO):BEM1SB LINK4	BEM1SB:< C06CRD23 RIO>(MCC-1D RIO) - < C06CRD23_Sec>-Net B	10	8
CER/STN LAN to Stacker Reclaimer PLC for Wireless Connectivity				
47	U#1 CER-SLAN L3COMSW-A PORT – 2/MM-MC-1A	MM MC-2A(TG Bldg. roof) - Net A	250	8
48	U#1 CER-SLAN L3COMSW-B PORT – 2/MM-MC-1B	MM MC-2B(TG Bldg. roof) - Net B	250	8
	SPARE QUANTITY		770	8
Total quantity			**46600 m**	**392**

Four core multi-mode, multi-tube cables : 48 segments, both ends need terminations
Number of Terminations : 392
Cables should be terminated using SC pigtails and tested.

Table – 2.21: 4-core multi-mode cable segment (for for Station C&I and MUWP connectivity) – Indicative

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
Station C&I/Station LAN and MUWP connectivity-maxDNA Connectivity				
1	L3CORESW-A/PORT 18 (CER U#1 STN LAN)	MM MC-1A(TG Bldg/Boiler. roof) - Net A	500	8

2	L3CORESW-B/PORT 18 (CER U#1 STN LAN)	MM MC-1B(TG Bldg/Boiler. roof) - Net B	500	8
	SPARE QUANTITY		250	8
Total quantity			**1250**	**24**

Four core multi-mode, multi-tube cables : 2 segments, both ends need terminations
Number of Terminations : 24
Cables should be terminated using SC pigtails and tested.

Table – 2.22: 12-core single-mode cable segment details (for service building, other stage connectivity)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
1	SERVICE BUILDING (ENCLOSURE NWEN01-NET A)	STATION LAN– L3COMSW-A PORT 10 (panel NWPS01)	1000m	8
2	SERVICE BUILDING (ENCLOSURE NWEN01-NET B)	STATION LAN– L3COMSW-B PORT 10 (panel NWPS02)	1000m	8
3	PI SERVER	STATION LAN– L3COMSW-A (panel NWPS01)	2000m	8
4	DATA CONCENTRATOR	STATION LAN– L3COMSW-A (panel NWPS01)	2000m	8
5	SWITCH YARD	STATION LAN– L3COMSW-A (panel NWPS01)	2000m	8
	SPARE	SPARE	2000m	
Total quantity			**10000m**	**40**

Twelve core single-mode, multi-tube cables : 5 segments, both ends need terminations
Number of Terminations : 40
Cables should be terminated using SC pigtails and tested.

3. Scope of Services:

Termination and Testing of the Fiber Optic Cable

The scope of services for Termination and Testing of the fiber optic cable shall be as per **Table 3.1: Scope of Services** below:

Table – 3.1: Scope of Services

Sl. No.	Description	Quantity	Unit Price	Total Price
1	**Termination:** Termination of Fiber optic cable cores using Pigtails by fusion splicing methods. **Testing, System Integration and Documentation:** i. Fiber optic cable healthiness must be tested before & after installation for all individual fibers. ii. System Integration including connecting patch cords from LIU to fiber ports of Ethernet switch and / or converters. iii. Documentation: All Standard Test certificates/reports and data sheets where applicable should be submitted. iv. Demonstration at site MOM with BHEL site stating successful completion of supply, installation & demonstration of OFC at site.	1080		

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2	Travel, lodging & boarding charges and transportation of men and material to site for carrying out the above activities (**minimum 11 visits, and each visit should comprise of 6 working days each excluding journey days)**	
OPTIONAL SERVICES:		
3	Travel charges per trip per person for extended Site trip, in addition to the above, if warranted. These charges will be payable only after above mentioned visits are completed.	
4	Charges (inclusive of all expenses) per day for one person for extended Site Stay in addition to the above stay.	
5	Splicing / joining of OFC cables on per fiber basis including Splicing Boxes/Enclosures and testing to be quoted for outdoor (remote) splicing. These charges will be paid based on the actual splicing work undertaken at site, arising out of requirements of joining cables during the execution of the totals scope of activity. The exact requirement can be spelt out only during execution.	

Notes on Scope of Supply and Scope of Services:

Sl. No.	Description	Vendor Confirmation
1	All unused pigtails (including spares) shall be terminated with the connector to a bulkhead connector sleeve, protected by reusable cap on the opposite sleep port, to prevent the intrusion of foreign materials or dust.	Yes / No
2	Supplier has to provide **additional pigtails (as replacement) free of cost** in case of failed connection for any reason.	Yes / No
3	Vendor should mention the price of fiber optic cable per meter. The offered prices shall be valid for ±25% quantity of the overall scope of the purchase enquiry.	Yes / No
4	Vendor should mention the termination and testing charges on per fiber basis.	Yes / No
5	Vendor should plan for more than one visit for carrying out services. It shall be noted that different subsystems will be available at different times. A Work Completion Certificate issued by BHEL Site Engineers / Customer Engineers should be submitted after each visit.	Yes / No
6	No offer of any of the services listed above will result in technical disqualification of offer.	Yes / No

4. Completion schedule:

Vendor to furnish detailed schedule for:

4.1 Supply of cable and the concerned accessories.

4.2 Completion of fiber optic cable termination and network testing.

5. Acceptance Criteria:

5.1 Completeness of supply, as per the Table 2.1 to 2.11, and services, as per table 3.1.

5.2 Demonstration of proper working of the network.

5.3 Completeness of documentation as per specifications.

5.4 Spliced / Repaired cables are not acceptable.

6. Documents to be given along with quotation:

6.1 Detailed **technical data sheet** & cable dimensional drawings of the make quoted.

6.2 **Deviations**, if any, with respect to the above specifications with technical justifications on suitability of the vendor's alternate offer with the requirement.

6.3 **Clause wise compliance** to Purchase specifications with vendor seal and signature in each page should

be enclosed along with the offer.

7.Notes to suppliers:

i. The cable laying and termination work will be commencing approximately 2 months to 1 year from the date of supply and planned to be completed within 1 month from the day of starting.

ii. The above man days would be sufficient for the total scope of activity. In case the work is not completed within the planned visits, and incase the number of man days are not consumed due to the non-availability of work front, then BHEL will pay only travel charges as per table 3.1 point 3 above for additional visits to site.

iii. In case there is a need to stay back for completion of work, man-day charges as per table 3.1 point 4 will be paid for extra man days only if delay is due to BHEL.

iv. The terms as per table 3.1 points 3 and 4) will not be payable with purchase order, however these rates will be binding on the supplier for the offered services, to complete the activities mentioned in this tender, in case the scope of work is not completed due to any unforeseen situation.

v. Travel charges as per table 3.1 points 3 and 4) will be payable incase supplier deputes his engineer for trouble shooting purposes upon a written request from BHEL for already completed scope of activity.

vi. The charges as mentioned under table 3.1 points 3, 4 and 5 will be paid to the supplier on pro-rata basis subject to submission of completion certificate by BHEL-Site/BHEL-Engg.

Advance intimation of **one week** will be given for deputing personnel to site.

8. Pre Dispatch Inspection:

Physical inspection of cable along with submission of Factory tested test certificates for completion of the required test in line with offer.

9. Packaging for dispatches:

9.1 Acceptable tolerance is + 5 % of the standard packing length.

9.2 Sufficient packaging should be provided for protection during transportation.

10. Dispatch:

10.1 Materials should be directly dispatched to site. Services should be provided at site at the time of commissioning.

10.2 Project details and complete postal address of the site will be intimated at the time of enquiry / placement of purchase order.

11. Warranty:

Vendor shall warrant that the fiber optic cable/components will be free from defect in design, material and workmanship for a period of 12 months commencing upon the completion of commissioning (termination and testing) of the cable (segment wise) or 18 months from the date of dispatch whichever is earlier. The liability will be limited to replacement of defective parts arising solely from faulty design materials and / or workmanship.

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PROJECT : PARBATI HEP (4 X 200 MW) STAGE-II

CUSTOMER : NHPC LTD.

EQUIPMENT : OPTICAL FIBER CABLE SERVICES

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REVISION HISTORY SHEET

REV No.	DATE	NATURE OF CHANGE	REASON	PREPARED BY	REVIEWED BY
00	30.06.2016	FIRST ISSUE	---	SS	RKA

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Optical Fiber Cable services for Parbati HEP, Himachal Pradesh, India project.

1.1 Project Location: Parbati HEP, Himachal Pradesh.

1.2 Scope of Services: Fiber terminations and testing of OFC network.

Sl. No.	Description	Quantity	Unit Price	Total Price
1	**a)Termination** Termination of Fiber optic cable cores using Pigtails by fusion Splicing methods. b) **Testing, System Integration and Documentation:** i. Fiber optic cable healthiness must be tested before & after installation for all individual fibers. Site Test should include continuity & attenuation test. ii. System Integration including OFC connection to BHEL supplied LIU, using BHEL supplied patch cords to connect from LIU to BHEL supplied Ethernet switch's fiber ports/ SFPs or BHEL supplied converters. iii. Documentation: Standard Test certificates/reports for all states as per the relevant IEC, EIA and other international standards and data sheets where applicable should be submitted. iv. Demonstration at site MOM with BHEL site stating successful completion of supply, installation & demonstration of OFC at site.	336 Nos. (208 nos. MM + 128 nos. SM)		
2	Travel, lodging & boarding charges and transportation of men and material to site for carrying out the above activities (**minimum 4 visits with 2 persons and each visit should comprise of 4 working days)**	**LUMP-SUM**		
	Services (to be quoted as optional) 3, 4, 5			
3	Travel, lodging & boarding charges and transportation of men and material to site (**estimated 1 visit comprising of 4 working days stay at site)**	**LUMP-SUM**		
4	Travel charges per trip for per person for extended Site Stay, in addition to the above stay at site, if warranted. These charges will be payable only after visit, as given in clause 1.2 sl. no. 2, is completed.	**LUMP-SUM**		
5	Charges (inclusive of all expenses) per day for one person for extended Site Stay in addition to the above stay at site for supervision activity. These charges will be payable only after above mentioned days are consumed.	**LUMP-SUM**		

Notes on Scope of Supply and Scope of Services:

i. Supplier has to provide additional pigtails (as replacement) free of cost in case of failed connection for any reason.

ii. Termination and testing of full network comprising all listed cables/Segments (+ 10%). (Travel & other expenses for termination per person to be included & will not be payable by BHEL). Vendor should mention the termination and testing charges on per fiber basis. The offered prices for termination should be Valid for + 25% quantity of the overall scope of the purchase.

iii. No offer of any of the services listed above will result in technical disqualification of offer.

iv. Vendor should also submit optional quote for additional visit and additional stay as per sl no 3, 4 & 5 from clause 1.2.

v. Supply of Optical Fiber cables, HDPE pipe, HDPE couplers and Laying of Optical Fiber cables and HDPE conduit will be in BHEL site scope.

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2**. General:**

a. Material has to be directly sent to site and service shall be provided at site.
b. The installations are at **PARBATI HEP (4 x 200 MW) Stage-II** in Himachal Pradesh. Full Details of Address of the site will be intimated at time of placing PO.
c. Any deviations with respect to the above specification should be brought out in the offer, Otherwise offer may be rejected.
d. The man days as per clause 1.2 sl. no.2 would be sufficient for the total scope of activity. In case the work is not completed within the planned visit, an additional visit of 4 days as per clause 1.2 sl. no.3 may be used or a visit of different number of days other than 4 days may be employed by combining clause 1.2 sl. no. 4 (for travel) & 5 (for per day stay at site).
e. In case there is a need to stay back for completion of work, man-day charges as per clause 1.2 sl. no.5 will be paid for extra man days only if delay is due to BHEL.
f. The terms clause 1.2 sl. no3, 4 & 5 will not be payable with purchase order. However these rates will be binding on the supplier for the offered services, to complete the activities mentioned in this tender, in case the scope of work is not completed due to any unforeseen situation.
g. Travel charges as per clause 1.2 sl. No 4 & man day charges as per clause 1.2 sl. No 5 will be payable incase supplier deputes his engineer for trouble shooting purposes upon a written request from BHEL for already completed scope of activity.
h. The charges as mentioned under clause 1.2 sl. no1 & 2 will be paid to the supplier on pro-rata basis subject to submission of completion certificate by BHEL-Site/BHEL-Engg.

Advance intimation of one week will be given for deputing personnel to site.

3. Acceptance Criteria:

- Completeness of services as per 1.2 (Scope of Services).
- Demonstration of proper working of the network.
- Completion of work certificate obtained from BHEL site Engineers / Customer Engineers.

4. Cable Segments: The cable segments for the project are mentioned as follows:

Table –: Multi-mode cable Segment Details – Indicative

Sl. No.	From Device	To Device	Actual Distance (in m)	Terminations
1.	UCB1 Line 1	RI/O1-Line 1	110	8
2.	UCB1 Line 2	RI/O1 Line 2	110	8
3.	UCB1 Line 1	RI/O2-Line 1	220	8
4.	UCB1 Line 2	RI/O2 Line 2	220	8
5.	UCB1 Line A	DVR-Line A	80	8
6.	UCB1 Line B	DVR Line B	80	8
7.	UCB2 Line 1	RI/O1-Line 1	120	8
8.	UCB2 Line 2	RI/O1 Line 2	120	8
9.	UCB2 Line 1	RI/O2-Line 1	170	8
10.	UCB2 Line 2	RI/O2 Line 2	170	8

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11.	UCB2 Line A	DVR-Line A	80	8
12.	UCB2 Line B	DVR Line B	80	8
13.	UCB3 Line 1	RI/O1-Line 1	120	8
14.	UCB3 Line 2	RI/O1 Line 2	120	8
15.	UCB3 Line 1	RI/O2-Line 1	110	8
16.	UCB3 Line 2	RI/O2 Line 2	110	8
17.	UCB3 Line A	DVR-Line A	80	8
18.	UCB3 Line B	DVR Line B	80	8
19.	UCB4 Line 1	RI/O1-Line 1	130	8
20.	UCB4 Line 2	RI/O1 Line 2	130	8
21.	UCB4 Line 1	RI/O2-Line 1	120	8
22.	UCB4 Line 2	RI/O2 Line 2	120	8
23.	UCB4 Line A	DVR-Line A	80	8
24.	UCB4 Line B	DVR Line B	80	8
25.	LCBCS Line A	COMMON R/O Line A	80	8
26.	LCBCS Line B	COMMON R/O Line B	80	8
Total			**3000**	**208**

Table –: Single-mode cable Segment Details – Indicative

Sl. No.	From Device	To Device	Actual Distance (in m)	Terminations
1.	NWPC01 - Line A	LCBCS-A - Line A	100	8
2.	NWPC01 - Line B	LCBCS-B - Line B	100	8
3.	NWPC01 - Line A	LCBSS-A - Line A	80	8
4.	NWPC01 - Line B	LCBSS-B - Line B	80	8
5.	UCB 1A - Line A	LCBSS A - Line A	80	8
6.	UCB 1B - Line B	LCBSS B - Line B	80	8
7.	UCB 2A - Line A	LCBSS A - Line A	120	8
8.	UCB 2B - Line B	LCBSS B - Line B	120	8
9.	UCB 3A - Line A	LCBSS A - Line A	130	8
10.	UCB 3B - Line B	LCBSS B - Line B	130	8
11.	UCB 4A - Line A	LCBCS A - Line A	140	8
12.	UCB 4B - Line B	LCBCS B - Line B	140	8
13.	LCBES A - Line A	LCBCS A - Line A	50	8
14.	LCBES B - Line B	LCBCS B - Line B	50	8
15.	LCBGIS A - Line A	LCBCS A - Line A	300	8
16.	LCBGIS B - Line B	LCBCS B - Line B	300	8
Total			**2000**	**128**

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PROJECT : NORTH KARANPURA (3X660 MW)

CUSTOMER : NTPC LTD

EQUIPMENT : FIBER OPTIC CABLE, ACCESSORIES AND SERVICES

REVISION HISTORY SHEET

REV No.	DATE	NATURE OF CHANGE	REASON	PREPARED BY	CHECKED BY	REVIEWED BY
00	08.07.2016	FIRST ISSUE	---	ATA	BNS	DP

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1. General

The fiber optic cable is required for NORTH KARANPURA (3X660MW) project at near Tandwa Chatra Distt., Jharkhand. The scope of work broadly involves the supply of OFC, termination and testing of the entire Fiber Optic Network.

2. Scope of Supply

2.1 Scope of supply includes supply of list of items and their quantities as per *Table 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7 , 2.8 and 2.9: "Bill of Materials"*. ~~Fiber optic cable should be supplied as per *"Technical specifications"*, mentioned in ***PSPEC PS4042668,*** *HDPE conduit and coupling as per* ***PSPEC PS4042673***~~ *and other accessory components as per* ***PSPEC PS4042525.*** The locations & distances are mentioned in *Tables 2.10 to 2.18. (Cable Segment Details)*. These measurements and lengths mentioned in the tables are **indicative**.

Table – 2.1: Bill of Materials for common system (SAC) connectivity

Sl No	Description	PSPEC reference	Material Code	Quantity
~~1~~	~~4-Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable **Make:** Aksh Fiber/ Birla Ericson / Finolex / Molex/R&M/ HFCL/Corning/DIGILINK*/ RPG*/Uniflex*~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~10000 m~~
2	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525**	PS4042525 section C-1	PR0120004460	200 Nos.
~~3~~	~~a) 2" Dia rodent proof HDPE permanently lubricated pipes.~~ ~~(To be used to lay fiber optic cables, described in sl. no. 1 at areas where cable trays are not available and while crossing roads / canals / river . Reputed make).~~ ~~b) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900002627~~	~~3000 m~~ ~~As required~~
4	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	50 m
5	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	50 nos
6	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	1000 m
7	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	60 nos
8	SC – SC Duplex MM Patch cords 5 meter **Make: As per PS4042525**	PS4042525 section C-9	PR0500004625	10 nos.
9	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required

~~*** Vendor has to submit credentials for these makes if any of these makes are quoted. Technical acceptance is subject to evaluation of credentials and approval of that particular make by M/s NTPC.**~~

Table – 2.2: Bill of Materials for Water system connectivity

Sl No	Description	PSPEC reference	Material Code	Quantity
~~1~~	~~4-Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable **Make:** Aksh Fiber/ Birla Ericson / Finolex / Molex/R&M/ HFCL/Corning/DIGILINK*/ RPG*/Uniflex*~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~10000 Meters~~
2	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525**	PS4042525 section C-1	PR0120004460	200 Nos.
~~3~~	~~a) 2" Dia rodent proof HDPE permanently lubricated pipes.~~ ~~(To be used to lay fiber optic cables, described in sl. no. 1 at areas where cable trays are not available and while crossing roads / canals~~	~~PS4042673 section 4a~~	~~PR0900002627~~	~~2000 m~~

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	~~/ river. Reputed make).~~ ~~b) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 Section 5~~		~~As required~~
4	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	50m
5	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	50 nos
6	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	1000m
7	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	60 nos
8	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required

~~***-Vendor has to submit credentials for these makes if any of these makes are quoted. Technical acceptance is subject to evaluation of credentials and approval of that particular make by M/s NTPC.**~~

Table – 2.3: Bill of Materials for Makeup water system connectivity

Sl No	Description	PSPEC reference	Material Code	Quantity
~~1.~~	~~4-Fiber single mode, multi tube construction, 9 / 125 µm outdoor armored fiber optic cable **Make:** Aksh Fiber/ Birla Ericson / Finolex / Molex/R&M/ HFCL/Corning/DIGILINK*/ RPG*/Uniflex*~~	~~PS4042668 section B-2~~	~~PR0460002012~~	~~3000 Meters~~
2.	Simplex SM SC pigtails - For terminating Fibers compatible with SM-FO cable supplied. **Make: As per PS4042525**	PS4042525 section C-2	PR0120004479	16 Nos.
~~3.~~	~~c) 2" Dia rodent proof HDPE permanently lubricated pipes. (To be used to lay fiber optic cables, described in sl. no. 1 at areas where cable trays are not available and while crossing roads / canals / river. Reputed make).~~ ~~d) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900002627~~	~~1200 meters.~~ ~~As required~~
4.	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	4 m
5.	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	4 nos
6.	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	300 m
7.	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	25 nos.
8	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required

~~***-Vendor has to submit credentials for these makes if any of these makes are quoted. Technical acceptance is subject to evaluation of credentials and approval of that particular make by M/s NTPC.**~~

Table – 2.4: Bill of Materials for AHP system connectivity

Sl No	Description	PSPEC reference	Material Code	Quantity
~~1~~	~~4-Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable **Make:** Aksh Fiber/ Birla Ericson / Finolex / Molex/R&M/ HFCL/Corning/DIGILINK*/ RPG*/Uniflex*~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~12000 Meters~~
2	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525**	PS4042525 section C-1	PR0120004460	160 Nos.

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~~3~~	~~e) 2" Dia rodent proof HDPE permanently lubricated pipes. (To be used to lay fiber optic cables, described in sl. no. 1 at areas where cable trays are not available and while crossing roads / canals / river. Reputed make).~~ ~~f) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900002627~~	~~4800 meters~~ ~~As required~~
4	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	40m
5	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	40 nos
6	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	1200m
7	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	100 nos.
8	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required

~~***Vendor has to submit credentials for these makes if any of these makes are quoted. Technical acceptance is subject to evaluation of credentials and approval of that particular make by M/s NTPC.**~~

Table – 2.5: Bill of Materials for CHP system connectivity

Sl No	Description	PSPEC reference	Material Code	Quantity
~~1~~	~~4-Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable **Make:** Aksh Fiber/ Birla Ericson / Finolex / Molex/R&M/ HFCL/Corning/DIGILINK*/ RPG*/Uniflex*~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~11000 Meters~~
2	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525**	PS4042525 section C-1	PR0120004460	240 Nos.
~~3~~	~~g) 2" Dia rodent proof HDPE permanently lubricated pipes. (To be used to lay fiber optic cables, described in sl. no. 1 at areas where cable trays are not available and while crossing roads / canals / river. Reputed make).~~ ~~h) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900002627~~	~~4400 Meters~~ ~~As required~~
4	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	80m
5	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	80 nos
6	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	1100m
7	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	90 nos.
8	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required

~~***Vendor has to submit credentials for these makes if any of these makes are quoted. Technical acceptance is subject to evaluation of credentials and approval of that particular make by M/s NTPC.**~~

Table – 2.6: Bill of Materials for FOPH system. UNIT2 to station LAN and unit3 to station LAN connectivity

Sl No	Description	PSPEC reference	Material Code	Quantity
~~1~~	~~4-Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable **Make:** Aksh Fiber/ Birla Ericson / Finolex / Molex/R&M/ HFCL/Corning/DIGILINK*/ RPG*/Uniflex*~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~3000 Meters~~

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2	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525**	PS4042525 section C-1	PR0120004460	48 Nos.
~~3~~	~~i) 2" Dia rodent proof HDPE permanently lubricated pipes. (To be used to lay fiber optic cables, described in sl. no. 1 at areas where cable trays are not available and while crossing roads / canals / river. Reputed make).~~ ~~j) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900002627~~	~~600 meters~~ ~~As required~~
4	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	12m
5	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	12 nos
6	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	150m
7	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	12 nos.
8	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required

~~*** Vendor has to submit credentials for these makes if any of these makes are quoted. Technical acceptance is subject to evaluation of credentials and approval of that particular make by M/s NTPC.**~~

Table – 2.7: Bill of Materials for Aux Boiler system connectivity

Sl No	Description	PSPEC reference	Material Code	Quantity
~~1~~	~~4–Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable **Make:** Aksh Fiber/ Birla Ericson / Finolex / Molex/R&M/ HFCL/Corning/DIGILINK*/ RPG*/Uniflex*~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~3000 Meters~~
2	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525**	PS4042525 section C-1	PR0120004460	16 Nos.
~~3~~	~~k) 2" Dia rodent proof HDPE permanently lubricated pipes. (To be used to lay fiber optic cables, described in sl. no. 1 at areas where cable trays are not available and while crossing roads / canals / river. Reputed make).~~ ~~l) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900002627~~	~~600 meters~~ ~~As required~~
4	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	4 m
5	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	4 nos
5	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	300m
6	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	12 nos.
7	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required

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Table – 2.8: Bill of Materials for ACC system connectivity

Sl No	Description	PSPEC reference	Material Code	Quantity
~~1~~	~~4–Fiber multi-mode, multi-tube construction, 62.5 / 125 µm outdoor armored fiber optic cable **Make:** Aksh Fiber/ Birla Ericson / Finolex / Molex/R&M/ HFCL/Corning/DIGILINK*/ RPG*/Uniflex*~~	~~PS4042668 section A-2~~	~~PR0460002072~~	~~3000 Meters~~
2	Simplex MM SC pigtails - For terminating Fibers compatible with MM-FO cable supplied. **Make: As per PS4042525**	PS4042525 section C-1	PR0120004460	48 Nos.
~~3~~	~~c) 2" Dia rodent proof HDPE permanently lubricated pipes. (To be used to lay fiber optic cables, described in sl. no. 1 at areas where cable trays are not available and while crossing roads / canals / river . Reputed make).~~ ~~d) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900002627~~	~~1200 meters~~ ~~As required~~
4	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	12m
5	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	12 nos
6	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	---
7	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	6 nos.
8	SC – SC Duplex MM Patch cords 5 meter **Make: As per PS4042525**	PS4042525 section C-9	PR0500004625	10 nos
9	Any other items, excluding supply of cable trays, supporting structure etc., covered specifically or not, required for successful installation and testing.	-	-	As required

~~***Vendor has to submit credentials for these makes if any of these makes are quoted. Technical acceptance is subject to evaluation of credentials and approval of that particular make by M/s NTPC.**~~

Table – 2.9: Bill of Materials for Service Building connectivity to station LAN

Sl No	Description	PSPEC reference	Material Code	Quantity
~~1~~	~~12–Fiber single mode, multi tube construction, 9 / 125 µm outdoor armored fiber optic cable. **Make:** Aksh Fiber/ Birla Ericson / Finolex / Molex/R&M/ HFCL/Corning/DIGILINK*/ RPG*/Uniflex*~~	~~PS4042668 section B-6~~	~~PR0460002056~~	~~1000 Meters~~
2	Simplex SM SC pigtails - For terminating Fibers compatible with SM-FO cable supplied. **Make: As per PS4042525**	PS4042525 section C-2	PR0120004479	16 Nos.
~~3~~	~~e) 2" Dia rodent proof HDPE permanently lubricated pipes. (To be used to lay fiber optic cables, described in sl. no. 1 at areas where cable trays are not available and while crossing roads / canals / river. Reputed make).~~ ~~f) Items under common supply of PS4042673 section 5 also to be included~~	~~PS4042673 section 4a~~ ~~PS4042673 Section 5~~	~~PR0900002627~~	~~200 Nos.~~ ~~As required~~
4	Corrugated flexible Steel tubes.- Corrugated flexible Steel tube/hose of 1" diameter	PS4042525 Section D-2	PR0120006340	4 meters
5	Cable glands - End Glands for coupling of 1" Flexible Steel Tube/hose to Gland Plates	PS4042525 Section D-3	PR0120006359	4 nos
6	2" GI Conduit pipe (As per ISI Standards – medium duty) Reputed make	PS4042525 Section D-5	PR0120006430	100 m
7	OFC Markers - These markers shall be of Cast metal with "OFC" engraving.	PS4042525 Section D-8	PR0900007362	20 nos.
8	SC – SC Duplex MM Patch cords 5 meter **Make: As per PS4042525**	PS4042525 section C-9	PR0500004625	10 nos
9	Any other items, excluding supply of cable trays, supporting structure	-	-	As required

	etc., covered specifically or not, required for successful installation and testing.			

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TERMINATION REQUIREMENTS (TENTATIVE)

Table – 2.10: 4-core multi-mode cable segment details (for maxNET & RIO connectivity - SAC system)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
maxDNA NETWORK CONNECTIVITY DETAILS				
1	LOCATION : CPU SV U1 ; SWITCH: 8CPUSVSW1-A	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1A	150	8
2	LOCATION : CPU SV U1 ; SWITCH: 8CPUSVSW1-B	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1B	150	8
3	LOCATION : CPU SV U2 ; SWITCH: 8CPUSVSW2-A	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1A	200	8
4	LOCATION : CPU SV U2 ; SWITCH: 8CPUSVSW2-B	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1B	200	8
5	LOCATION : CPU SV U3 ; SWITCH: 8CPUSVSW3-A	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1A	250	8
6	LOCATION : CPU SV U3 ; SWITCH: 8CPUSVSW3-B	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1B	250	8
7	LOCATION : CPU REGEN ; SWITCH: 8CPUREGENSW-A	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1A	500	8
8	LOCATION : CPU REGEN ; SWITCH: 8CPUREGENSW-B	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1B	500	8
9	LOCATION : AC PLANT CR ; SWITCH: 8ACSW1-A	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1A	400	8
10	LOCATION : AC PLANT CR ; SWITCH: 8ACSW1-B	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1B	400	8
11.	LOCATION:CER(U2);SWITCH:8ACSW3-A	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1A	250	8
12.	LOCATION:CER(U2);SWITCH:8ACSW3-B	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1B	250	8
13.	LOCATION:CER(U3);SWITCH:8ACSW4-A	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1A	500	8
14.	LOCATION:CER(U3);SWITCH:8ACSW4-B	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1B	500	8
15.	LOCATION:ACS;SWITCH:8ACSSW1-A	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1A	170	8
16	LOCATION:ACS;SWITCH:8ACSSW1-B	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1B	170	8
RIO CONNECTIVITY DETAILS				
1	LOCATION : CER U1 : DPU PANEL - BEM-1 LINK-1	LOCATION : ESP U1 : RIO PANEL- BEM-1 LINK-1	500	8
2	LOCATION : CER U1 : DPU PANEL - BEM-1 LINK-2	LOCATION : ESP U1 : RIO PANEL- BEM-1 LINK-2	500	8
3	LOCATION : CER U2 : DPU PANEL - BEM-1 LINK-1	LOCATION : ESP U2 : RIO PANEL- BEM-1 LINK-1	500	8
4	LOCATION : CER U2 : DPU PANEL - BEM-1 LINK-2	LOCATION : ESP U2 : RIO PANEL- BEM-1 LINK-2	500	8
5	LOCATION : CER U3 : DPU PANEL - BEM-1 LINK-1	LOCATION : ESP U3 : RIO PANEL- BEM-1 LINK-1	500	8
6	LOCATION : CER U3 : DPU PANEL - BEM-1 LINK-2	LOCATION : ESP U3 : RIO PANEL- BEM-1 LINK-2	500	8
SERIAL DEVICE CONNECTIVITY DETAILS				
1	LOCATION : ESP U1 : RIO PANEL: SERIAL DEVICE SERVER	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1A/1B	500	8
2	LOCATION : ESP U2 : RIO PANEL: SERIAL DEVICE SERVER	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1A/1B	500	8
3	LOCATION : ESP U3 : RIO PANEL: SERIAL DEVICE SERVER	LOCATION : UNIT#1 CR : PANEL : NWPD03 : SWITCH - SACSW-1A/1B	500	8
Total quantity			**9340**	**200**

Four core multi-mode, multi-tube cables : 25 segments, both ends need terminations
Number of Terminations : 200
Cables should be terminated using SC pigtails and tested.

Table – 2.11: 4-core multi-mode cable segment details (for maxNET & RIO connectivity - WATER system)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
maxDNA NETWORK CONNECTIVITY DETAILS				

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1	LOCATION : CW/PT CHLORINATION ROOM : PANEL:XXXX SWITCH - 10CWCHSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1A	450	8
2	LOCATION : CW/PT CHLORINATION ROOM : PANEL:XXXX SWITCH - 10CWCHSW-1B	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1B	450	8
3	LOCATION : EFFLUENT TREATMENT PLANT : PANEL : XXXX : SWITCH – 10EFTRTSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1A	250	8
4	LOCATION : EFFLUENT TREATMENT PLANT : PANEL : XXXX : SWITCH – 10EFTRTSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1B	250	8
5	LOCATION : SERVICE WATER PUMP HOUSE: PANEL : XXXX : SWITCH - 10WSWSSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1A	100	8
6	LOCATION : SERVICE WATER PUMP HOUSE: PANEL : XXXX : SWITCH - 10WSWSSW-1B	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1B	100	8
7	LOCATION : COAL DECANTED WATER PUMP : PANEL : XXXX : SWITCH - 10CDWPSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1A	1000	8
8	LOCATION : COAL DECANTED WATER PUMP : PANEL : XXXX : SWITCH - 10CDWPSW-1B	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1B	1000	8
9	LOCATION : AWR CR : PANEL : XXXX : SWITCH - 10AWRSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1A	1000	8
10	LOCATION : AWR CR : PANEL : XXXX : SWITCH - 10AWRSW-1B	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1B	1000	8
11	LOCATION : SEWAGE TREATMENT PLANT : PANEL : XXXX : SWITCH – 10SWGTRTSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1A	375	8
12	LOCATION : SEWAGE TREATMENT PLANT : PANEL : XXXX : SWITCH – 10SWGTRTSW-1B	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1B	375	8
13	LOCATION : PT PLANT/PT CHEMICAL HOUSE: PANEL:XXXX SWITCH – 10PTCHSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1A	300	8
14	LOCATION : PT PLANT/PT CHEMICAL HOUSE: PANEL:XXXX SWITCH – 10PTCHSW-1B	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1B	300	8
15	LOCATION : AC FOR WS CR : PANEL : XXXX : SWITCH - 10ACWSSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1A	100	8
16	LOCATION : AC FOR WS CR : PANEL : XXXX : SWITCH - 10ACWSSW-1B	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1B	100	8
17	LOCATION : DM MAKE-UP : PANEL : XXXX : SWITCH – 10DMMKSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1A	200	8
18	LOCATION : DM MAKE-UP : PANEL : XXXX : SWITCH – 10DMMKSW-1B	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1B	200	8
19	LOCATION : DM PLANT : PANEL : XXXX : SWITCH – 10DMMKSW-1A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1A	200	8
20	LOCATION : DM PLANT : PANEL : XXXX : SWITCH – 10DMMKSW-1B	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1B	200	8
21	LOCATION:U1UCR:PANEL:NWPS01:SWITCH:L3CORESW-A	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1A	375	8
22	LOCATION:U1UCR:PANEL:NWPS02:SWITCH:L3CORESW-B	LOCATION : WATER SYSTEM MAIN CR : PANEL : NWPD03 : SWITCH - WSSW-1B	375	8
RIO CONNECTIVITY DETAILS				
	SPARE	SPARE	1000	24
Total quantity			**9700**	**200**

Four core multi-mode, multi-tube cables : 22 segments, both ends need terminations
Number of Terminations : 200
Cables should be terminated using SC pigtails and tested.

Table – 2.12:4-core single-mode cable segment details (for maxNET connectivity - MKWS system)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
maxDNA NETWORK CONNECTIVITY DETAILS				
1	MAKEUP WATER SYSTEM : PANEL : XXXX : SWITCH - 10MKWSSW-1A	LOCATION:U1UCR:PANEL:NWPS01:SWITCH:L3CORESW-A	2000	8
2	MAKEUP WATER SYSTEM : PANEL : XXXX : SWITCH - 10MKWSSW-1B	LOCATION:U1UCR:PANEL:NWPS02:SWITCH:L3CORESW-B	2000	8
	SPARE	SPARE	1000	0
Total quantity			**5000**	**16**

Four core single-mode, multi-tube cables : 2 segments, both ends need terminations
Number of Terminations : 16
Cables should be terminated using SC pigtails and tested.

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Table – 2.13: 4-core multi-mode cable segment details (for maxNET & RIO connectivity - AHP system)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
maxDNA NETWORK CONNECTIVITY DETAILS				
1	LOCATION : SILO CR : PANEL : XXXX : SWITCH - 13AHPSILOSW-A	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1A	560	8
2	LOCATION : SILO CR : PANEL : CRC12 : SWITCH - 13AHPSILOSW-B	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1B	560	8
3	LOCATION : AWPH CR : PANEL : XXXX : SWITCH - 13AHAWPHPSW-A	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1A	400	8
4	LOCATION : AWPH CR : PANEL : XXXX : SWITCH - 13AHPAWPHSW-B	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1B	400	8
5	LOCATION : ESP(U1) : PANEL : XXXX : SWITCH - 13AHPESP1SW-A	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1A	500	8
6	LOCATION : ESP(U1) : PANEL : XXXX : SWITCH - 13AHPESP1SW-B	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1B	500	8
7	LOCATION : ESP(U2) : PANEL : XXXX : SWITCH - 13AHPESP2SW-A	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1A	620	8
8	LOCATION : ESP(U2) : PANEL : XXXX : SWITCH - 13AHPESP2SW-B	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1B	620	8
9	LOCATION : ESP(U3) : PANEL : XXXX : SWITCH - 13AHPESP2SW-A	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1A	750	8
10	LOCATION : ESP(U3) : PANEL : XXXX : SWITCH - 13AHPESP2SW-B	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1B	750	8
11	LOCATION:BOTTOM ASH (U1)IN MAIN PLANT BLDG:PANEL:XXXX:SWITCH-13AHPBASW1-A	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1A	510	8
12	LOCATION:BOTTOM ASH (U1)IN MAIN PLANT BLDG:PANEL:XXXX:SWITCH-13AHPBASW1-B	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1B	510	8
13	LOCATION:BOTTOM ASH (U2)IN MAIN PLANT BLDG:PANEL:XXXX:SWITCH-13AHPBASW2-A	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1A	650	8
14	LOCATION:BOTTOM ASH (U2)IN MAIN PLANT BLDG:PANEL:XXXX:SWITCH-13AHPBASW2-B	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1B	650	8
15	LOCATION:BOTTOM ASH (U3)IN MAIN PLANT BLDG:PANEL:XXXX:SWITCH-13AHPBASW3-A	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1A	780	8
16	LOCATION:BOTTOM ASH (U3)IN MAIN PLANT BLDG:PANEL:XXXX:SWITCH-13AHPBASW3-B	LOCATION : AHP CR : PANEL : NWP-AHP : SWITCH - AHPSW-1B	780	8
17	AHP SYSTEM : PANEL : NWP-AHP : SWITCH - 7AHPSW-1A	STATIONLAN SYSTEM : PANEL : NWPS01 : L3CORESW-A	600	8
18	AHP SYSTEM : PANEL : NWP-AHP : SWITCH - 7AHPSW-1B	STATIONLAN SYSTEM : PANEL : NWPS02 : L3CORESW-B	600	8
	SPARE	SPARE	1000	16
Total quantity			**11740**	**160**

Four core multi-mode, multi-tube cables : 18 segments, both ends need terminations
Number of Terminations : 160
Cables should be terminated using SC pigtails and tested.

Table – 2.14:4-core multi-mode cable segment details (for maxNET connectivity - CHP system)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
maxDNA NETWORK CONNECTIVITY DETAILS				
1	LOCATION:MCC-1A:PANEL:C01XX RIO: BEM1:LINK1	LOCATION:MCC-1B(CHP MCR):PANEL:C01XX: BEM1:LINK1	300	8
2	LOCATION:MCC-1A:PANEL:C01XX RIO: BEM1:LINK2	LOCATION:MCC-1B(CHP MCR):PANEL:C01XX: BEM1:LINK2	300	8
3	LOCATION:MCC-1A:PANEL:C01XX RIO: BEM2:LINK1	LOCATION:MCC-1B(CHP MCR):PANEL:C01XX: BEM2:LINK1	300	8
4	LOCATION:MCC-1A:PANEL:C01XX RIO: BEM2:LINK2	LOCATION:MCC-1B(CHP MCR):PANEL:C01XX: BEM2:LINK2	300	8
5	LOCATION:MCC-1A:PANEL:C02XX RIO: BEM1:LINK1	LOCATION:MCC-1B(CHP MCR):PANEL:C02XX: BEM1:LINK1	300	8
6	LOCATION:MCC-1A:PANEL:C02XX RIO: BEM1:LINK2	LOCATION:MCC-1B(CHP MCR):PANEL:C02XX: BEM1:LINK2	300	8
7	LOCATION:MCC-1A:PANEL:C02XX RIO: BEM2:LINK1	LOCATION:MCC-1B(CHP MCR):PANEL:C02XX: BEM2:LINK1	300	8
8	LOCATION:MCC-1A:PANEL:C02XX RIO: BEM2:LINK2	LOCATION:MCC-1B(CHP MCR):PANEL:C02XX: BEM2:LINK2	300	8

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9	LOCATION:MCC-1C:PANEL:C03XX RIO: BEM1:LINK1	LOCATION:MCC-1B(CHP MCR):PANEL:C03XX: BEM1:LINK1	300	8
10	LOCATION:MCC-1C:PANEL:C03XX RIO: BEM1:LINK2	LOCATION:MCC-1B(CHP MCR):PANEL:C03XX: BEM1:LINK2	300	8
11	LOCATION:MCC-1C:PANEL:C03XX RIO: BEM2:LINK1	LOCATION:MCC-1B(CHP MCR):PANEL:C03XX: BEM2:LINK1	300	8
12	LOCATION:MCC-1C:PANEL:C03XX RIO: BEM2:LINK2	LOCATION:MCC-1B(CHP MCR):PANEL:C03XX: BEM2:LINK2	300	8
13	LOCATION:MCC-1C:PANEL:C04XX RIO: BEM1:LINK1	LOCATION:MCC-1B(CHP MCR):PANEL:C04XX: BEM1:LINK1	300	8
14	LOCATION:MCC-1C:PANEL:C04XX RIO: BEM1:LINK2	LOCATION:MCC-1B(CHP MCR):PANEL:C04XX: BEM1:LINK2	300	8
15	LOCATION:MCC-1C:PANEL:C04XX RIO: BEM2:LINK1	LOCATION:MCC-1B(CHP MCR):PANEL:C04XX: BEM2:LINK1	300	8
16	LOCATION:MCC-1C:PANEL:C04XX RIO: BEM2:LINK2	LOCATION:MCC-1B(CHP MCR):PANEL:C04XX: BEM2:LINK2	300	8
17	LOCATION:MCC-1C:PANEL:C05XX RIO: BEM1:LINK1	LOCATION:MCC-1B(CHP MCR):PANEL:C05XX: BEM1:LINK1	300	8
18	LOCATION:MCC-1C:PANEL:C05XX RIO: BEM1:LINK2	LOCATION:MCC-1B(CHP MCR):PANEL:C05XX: BEM1:LINK2	300	8
19	LOCATION:MCC-1C:PANEL:C05XX RIO: BEM2:LINK1	LOCATION:MCC-1B(CHP MCR):PANEL:C05XX: BEM2:LINK1	300	8
20	LOCATION:MCC-1C:PANEL:C05XX RIO: BEM2:LINK2	LOCATION:MCC-1B(CHP MCR):PANEL:C05XX: BEM2:LINK2	300	8
21	LOCATION:MCC-1C:PANEL:C06XX RIO: BEM1:LINK1	LOCATION:MCC-1B(CHP MCR):PANEL:C06XX: BEM1:LINK1	300	8
22	LOCATION:MCC-1C:PANEL:C06XX RIO: BEM1:LINK2	LOCATION:MCC-1B(CHP MCR):PANEL:C06XX: BEM1:LINK2	300	8
23	LOCATION:MCC-1C:PANEL:C06XX RIO: BEM2:LINK1	LOCATION:MCC-1B(CHP MCR):PANEL:C06XX: BEM2:LINK1	300	8
24	LOCATION:MCC-1C:PANEL:C06XX RIO: BEM2:LINK2	LOCATION:MCC-1B(CHP MCR):PANEL:C06XX: BEM2:LINK2	300	8
25	LOCATION:MCC1A:PANEL:C01XX RIO:MC	LOCATION:MCC-1B(CHP MCR):PANEL:NWPD03:SWITCH:CHPSW-1A	300	8
26	LOCATION:MCC1A:PANEL:C03XX RIO:MC	LOCATION:MCC-1B(CHP MCR):PANEL:NWPD03:SWITCH:CHPSW-1A	300	8
27	CHP SYSTEM : PANEL : NWP-CHP : SWITCH - CHPSW-1A	STATIONLAN SYSTEM : PANEL : NWPS01 : L3CORESW-A	1000	8
28	CHP SYSTEM : PANEL : NWP-CHP : SWITCH - CHPSW-1B	STATIONLAN SYSTEM : PANEL : NWPS02 : L3CORESW-B	1000	8
	SPARE	SPARE	1200	16
Total quantity			**11000**	

Four core single-mode, multi-tube cables : 28 segments, both ends need terminations
Number of Terminations : 240
Cables should be terminated using SC pigtails and tested.

Table – 2.15: 4-core multi-mode cable segment details (for FOPH system connectivity (network connectivity to Station LAN, UNIT 2 TO Station LAN and Unit 3 to station LAN)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
1	FOPH SYSTEM-NET A SWITCH (DCS panel)	STATION LAN– L3CORESW-A SWITCH (panel NWPS01)	650	8
2	FOPH SYSTEM-NET B SWITCH(DCS panel)	STATION LAN– L3CORESW-B SWITCH (panel NWPS02)	650	8
3	UNIT 2 NET A SWITCH: HMIUPLINK A	STATION LAN– L3CORESW-A SWITCH (panel NWPS01)	250	8
	UNIT 2 NET A SWITCH: HMIUPLINK B	STATION LAN– L3CORESW-B SWITCH (panel NWPS02)	250	8
	UNIT 3 NET A SWITCH: HMIUPLINK A	STATION LAN– L3CORESW-A SWITCH (panel NWPS01)	500	8
	UNIT 3 NET A SWITCH: HMIUPLINK B	STATION LAN– L3CORESW-B SWITCH (panel NWPS02)	500	8
	SPARE	SPARE	200m	0
Total quantity			**3000 m**	**48**

Four core multi-mode, multi-tube cables : 2 segments, both ends need terminations
Number of Terminations : 48
Cables should be terminated using SC pigtails and tested.

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Table – 2.16: 4-core multi-mode cable segment details (for AUX BOILER system connectivity (network connectivity to Station LAN)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
1	AUX BLR SYSTEM-NET A SWITCH (DCS panel)	STATION LAN– L3CORESW-A SWITCH (panel NWPS01)	1500	8
2	AUX BLR SYSTEM-NET B SWITCH(DCS panel)	STATION LAN– L3CORESW-B SWITCH (panel NWPS02)	1500	8
Total quantity			**3000m**	**16**

Four core multi-mode, multi-tube cables : 2 segments, both ends need terminations
Number of Terminations : 16
Cables should be terminated using SC pigtails and tested.

Table – 2.17: 4-core multi-mode cable segment details (for ACC system connectivity (network connectivity to respective UNITs)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
1	UNIT1:ACC SYSTEM-NET A SWITCH (DCS panel)	LOCATION:UNIT-1: PANEL:NWPA03:SWITCH:1HMIUPL-A	400	8
2	UNIT1: ACC SYSTEM-NET B SWITCH(DCS panel)	LOCATION:UNIT-1: PANEL:NWPA03:SWITCH:1HMIUPL-A	400	8
3	UNIT2:ACC SYSTEM-NET A SWITCH (DCS panel)	LOCATION:UNIT-2: PANEL:NWPA03:SWITCH:2HMIUPL-A	550	8
4	UNIT2: ACC SYSTEM-NET B SWITCH(DCS panel)	LOCATION:UNIT-2: PANEL:NWPA03:SWITCH:2HMIUPL-A	550	8
5	UNIT3:ACC SYSTEM-NET A SWITCH (DCS panel)	LOCATION:UNIT-3: PANEL:NWPA03:SWITCH:2HMIUPL-A	400	8
6	UNIT3: ACC SYSTEM-NET B SWITCH(DCS panel)	LOCATION:UNIT-3: PANEL:NWPA03:SWITCH:2HMIUPL-A	400	8
	SPARE	SPARE	300m	0
Total quantity			**3000m**	**48**

Four core multi-mode, multi-tube cables : 6 segments, both ends need terminations
Number of Terminations : 48
Cables should be terminated using SC pigtails and tested.

Table – 2.18: 12-core single-mode cable segment details (for service building)

Sl. No.	From Device	To Device	Actual Distance (in meters)	Terminations (numbers)
1	SERVICE BUILDING (ENCLOSURE NWEN01-NET A)	STATION LAN– L3COMSW-A (panel NWPS01)	275m	8
2	SERVICE BUILDING (ENCLOSURE NWEN01-NET B)	STATION LAN– L3COMSW-B (panel NWPS02)	275m	8
	SPARE	SPARE	450m	0
Total quantity			**1000m**	**16**

Twelve core single-mode, multi-tube cables : 2 segments, both ends need terminations
Number of Terminations : 16
Cables should be terminated using SC pigtails and tested.

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3. Scope of Services:

Termination and Testing of the Fiber Optic Cable

The scope of services for Termination and Testing of the fiber optic cable shall be as per **Table 3.1: Scope of Services** below:

Table – 3.1: Scope of Services

Sl. No.	Description	Quantity	Unit Price	Total Price
1	**Termination:** Termination of Fiber optic cable cores using Pigtails by fusion splicing methods. **Testing, System Integration and Documentation:** i. Fiber optic cable healthiness must be tested before & after installation for all individual fibers. ii. System Integration including connecting patch cords from LIU to fiber ports of Ethernet switch and / or converters. iii. Documentation: All Standard Test certificates/reports and data sheets where applicable should be submitted. iv. Demonstration at site MOM with BHEL site stating successful completion of supply, installation & demonstration of OFC at site.	944		
2	Travel, lodging & boarding charges and transportation of men and material to site for carrying out the above activities (**minimum 8 visits, and each visit should comprise of 6 working days each excluding journey days)**			
OPTIONAL SERVICES:				
3	Travel charges per trip per person for extended Site trip, in addition to the above, if warranted. These charges will be payable only after above mentioned visits are completed.			
4	Charges (inclusive of all expenses) per day for one person for extended Site Stay in addition to the above stay .			
5	Splicing / joining of OFC cables on per fiber basis including Splicing Boxes/Enclosures and testing to be quoted for outdoor (remote) splicing. These charges will be paid based on the actual splicing work undertaken at site, arising out of requirements of joining cables during the execution of the totals scope of activity. The exact requirement can be spelt out only during execution.			

Notes on Scope of Supply and Scope of Services:

Sl. No.	Description	Vendor Confirmation
1	All unused pigtails (including spares) shall be terminated with the connector to a bulkhead connector sleeve, protected by reusable cap on the opposite sleep port, to prevent the intrusion of foreign materials or dust.	Yes / No
2	Supplier has to provide **additional pigtails (as replacement) free of cost** in case of failed connection for any reason.	Yes / No
3	Vendor should mention the price of fiber optic cable per meter. The offered prices shall be valid for ±25% quantity of the overall scope of the purchase enquiry.	Yes / No
4	Vendor should mention the termination and testing charges on per fiber basis.	Yes / No

5	Vendor should plan for more than one visit for carrying out services. It shall be noted that different subsystems will be available at different times. A Work Completion Certificate issued by BHEL Site Engineers / Customer Engineers should be submitted after each visit.	Yes / No
6	No offer of any of the services listed above will result in technical disqualification of offer.	Yes / No

4. Completion schedule:

Vendor to furnish detailed schedule for:

4.1 Supply of cable and the concerned accessories.

4.2 Completion of fiber optic cable termination and network testing.

5. Acceptance Criteria:

5.1 Completeness of supply, as per the Table 2.1 to 2.9, and services, as per table 3.1.

5.2 Demonstration of proper working of the network.

5.3 Completeness of documentation as per specifications.

5.4 Spliced / Repaired cables are not acceptable.

6. Documents to be given along with quotation:

6.1 Detailed **technical data sheet** & cable dimensional drawings of the make quoted.

6.2 **Deviations**, if any, with respect to the above specifications with technical justifications on suitability of the vendor's alternate offer with the requirement.

6.3 **Clause wise compliance** to Purchase specifications with vendor seal and signature in each page should be enclosed along with the offer.

7. Notes to suppliers:

i. The cable laying and termination work will be commencing approximately 2 months to 1 year from the date of supply and planned to be completed within 1 month from the day of starting.

ii. The above man days would be sufficient for the total scope of activity. In case the work is not completed within the planned visits, and incase the number of man days are not consumed due to the non-availability of work front, then BHEL will pay only travel charges as per table 3.1 point 3 above for additional visits to site.

iii. In case there is a need to stay back for completion of work, man-day charges as per table 3.1 point 4 will be paid for extra man days only if delay is due to BHEL.

iv. The terms as per table 3.1 points 3 and 4) will not be payable with purchase order, however these rates will be binding on the supplier for the offered services, to complete the activities mentioned in this tender, in case the scope of work is not completed due to any unforeseen situation.

v. Travel charges as per table 3.1 points 3 and 4) will be payable incase supplier deputes his engineer for trouble shooting purposes upon a written request from BHEL for already completed scope of activity.

vi. The charges as mentioned under table 3.1 points 3, 4 and 5 will be paid to the supplier on pro-rata basis subject to submission of completion certificate by BHEL-Site/BHEL-Engg.

Advance intimation of **one week** will be given for deputing personnel to site.

8. Pre Dispatch Inspection:

Physical inspection of cable along with submission of Factory tested test certificates for completion of the required test in line with offer.

9. Packaging for dispatches:

9.1 Acceptable tolerance is + 5 % of the standard packing length.

9.2 Sufficient packaging should be provided for protection during transportation.

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10. Dispatch:

10.1 Materials should be directly dispatched to site. Services should be provided at site at the time of commissioning.

10.2 Project details and complete postal address of the site will be intimated at the time of enquiry / placement of purchase order.

11. Warranty:

Vendor shall warrant that the fiber optic cable/components will be free from defect in design, material and workmanship for a period of 12 months commencing upon the completion of commissioning (termination and testing) of the cable (segment wise) or 18 months from the date of dispatch whichever is earlier. The liability will be limited to replacement of defective parts arising solely from faulty design materials and / or workmanship.

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PROJECT : Kothagudem (1 x 800 MW)

CUSTOMER : TSGENCO

EQUIPMENT : OPTICAL FIBER CABLE

TITLE **Purchase Specification OFC accessories for Kothagudem (1 x 800 MW)**	Dept Code 404	DRN.	NAME	SIGN	DATE
		PREPARED	ABHISHEK RANJAN		11.08.2016
		APPROVED	REETESH KUMAR A		11.08.2016

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REVISION HISTORY SHEET

REV No.	DATE	NATURE OF CHANGE	REASON	PREPARED BY	REVIEWED BY
00	11.08.2016	FIRST ISSUE	---	AR	RKA

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1. Supply and services:

Supply & Services of OFC accessories for TSGENCO at Kothagudem (1 x 800 MW) project.

1.1 Project Location: Kothagudem, Telangana.

1.2 Scope of Supply: Supply of OFC accessories as per "Technical specification" (Purchase Spec.# PS/404/2525) and quantities as mentioned in the tables below:

1.2a. Bill of Material: Bill of material will be as per Table no. 1, 2 and 3. For each line items, technical specification may be referred in **PS4042525 REV.06**

Table 1: OFC accessories for DCS

Sl. No.	Description	Material Code	Total (Main & Reserve Line)
2	SINGLEMODE , SIMPLEX SC FIBRE PIGTAIL	PR0120004479	**320 Nos**
3	2" GI CONDUIT PIPE	PR0120006430	**600 meters**
5	Corrugated flexible Steel tube/hose 1"	PR0120006340	**80 mtrs**
6	Glands For Coupling	PR0120006359	**80 Nos**
7	OFC Markers (at every 50 meters of OFC outside)	PR0900007362	**120 Nos**

Table 2: OFC accessories for Station LAN

Sl. No.	Description	Material Code	Total (Main & Reserve Line)
2	SINGLEMODE , SIMPLEX SC FIBRE PIGTAIL	PR0120004479	**168 Nos**
3	2" GI CONDUIT PIPE	PR0120006430	**276 meters**
5	Corrugated flexible Steel tube/hose 1"	PR0120006340	**42 mtrs**
6	Glands For Coupling	PR0120006359	**42 Nos**
7	OFC Markers (at every 50 meters of OFC outside)	PR0900007362	**132 Nos**

NOTE: There will be two lines of 12core SM OFC from CCR (CNP51) to Raw Water Pump House (CNE81). Out of 12, 4 to be terminated and 8 to be spliced to 4core SM OFC as shown in Annexure-II attached.

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Table 3: OFC accessories for PLC

Sl. No.	Description	Material Code	Total (Main & Reserve Line)
2	SINGLEMODE , SIMPLEX SC FIBRE PIGTAIL	PR0120004479	**160 Nos**
3	2" GI CONDUIT PIPE	PR0120006430	**252 meters**
5	Corrugated flexible Steel tube/hose 1”	PR0120006340	**40 mtrs**
6	Glands For Coupling	PR0120006359	**40 Nos**
7	OFC Markers (at every 50 meters of OFC outside)	PR0900007362	**42 Nos**

1.3 Services: Fiber terminations and testing of OFC network.

Sl. No.	Description	Quantity	Unit Price	Total Price
1	**a)Termination** Termination of Fiber optic cable cores using Pigtails as per Annexure-I by fusion splicing methods. Splicing at CNP51 and CNE81 to be done as shown in Annexure-II. b) **Testing, System Integration and Documentation:** i. Fiber optic cable healthiness must be tested before & after installation for all individual fibers. Site Test should include continuity & attenuation test. ii. System Integration including OFC connection to BHEL supplied LIU, using BHEL supplied patch cords to connect from LIU to BHEL supplied Ethernet switch’s fiber ports/ SFPs or BHEL supplied converters. iii. Documentation: Standard Test certificates/reports for all states as per the relevant IEC, EIA and other international standards and data sheets where applicable should be submitted. iv. Demonstration at site MOM with BHEL site stating successful completion of installation &	648 Nos.		

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	demonstration of OFC at site.			
2	Travel, lodging & boarding charges and transportation of men and material to site for carrying out the above activities (**estimated 4 visits comprising of 5 working days stay at site)**	**LUMP-SUM**		
Services (to be quoted as optional) 3, 4, 5				
3	Travel, lodging & boarding charges and transportation of men and material to site (**estimated 1 visit comprising of 5 working days stay at site)**	**LUMP-SUM**		
4	Travel charges per trip for per person for extended Site Stay, in addition to the above stay at site, if warranted. These charges will be payable only after visit, as given in clause 1.3 sl. no. 2, is completed.	**LUMP-SUM**		
5	Charges (inclusive of all expenses) per day for one person for extended Site Stay in addition to the above stay at site for supervision activity. These charges will be payable only after above mentioned days are consumed.	**LUMP-SUM**		

Notes on Scope of Supply and Scope of Services:

i. Supplier has to provide additional pigtails (as replacement) free of cost in case of failed connection for any reason.

ii. Termination and testing of full network comprising all listed cables/Segments (+ 10%). (Travel & other expenses for termination per person to be included & will not be payable by BHEL). Vendor should mention the termination and testing charges on per fiber basis. The offered prices for termination should be Valid for + 25% quantity of the overall scope of the purchase.

iii. Vendor should also submit optional quote for additional visit and additional stay as per sl no 3, 4 & 5 from clause 1.3.

iv. Laying of Optical Fiber cables will be in BHEL site scope.

2. General:

a. Material has to be directly sent to site and service shall be provided at site.

b. The installations are at Kothagudem (1 X 800 MW) in Telangana. Full Details of Address of the site will be intimated at time of placing PO.

c. **Any deviations with respect to the above specification should be brought out in the offer, Otherwise offer may be rejected.**

d. The man days as per clause 1.3 sl. no.2 would be sufficient for the total scope of activity. In case the work is not completed within the planned visit, an additional visit of 5 days as per clause 1.3 sl. no.3 may be used or a visit of different number of days other than 5 days may be employed by combining clause 1.3 sl. no. 4 (for travel) & 5 (for per day stay at site).

e. In case there is a need to stay back for completion of work, man-day charges as per clause 1.3 sl. no.5 will be paid for extra man days only if delay is due to BHEL.

f. The terms clause 1.3 sl. no3, 4 & 5 will not be payable with purchase order. However these rates will be binding on the supplier for the offered services, to complete the activities mentioned

in this tender, in case the scope of work is not completed due to any unforeseen situation.
g. Travel charges as per clause 1.3 sl. no4 & man day charges as per clause 1.3 sl. No 5 will be payable incase supplier deputes his engineer for trouble shooting purposes upon a written request from BHEL for already completed scope of activity.
h. The charges as mentioned under clause 1.3 sl. no1 & 2 will be paid to the supplier on pro-rata basis subject to submission of completion certificate by BHEL-Site/BHEL-Engg.

Advance intimation of one week will be given for deputing personnel to site.

3. Documents to Be Given Along With Quotation

Compliance sheet, Detailed BOM, Technical data sheet ALONG WITH MAKES AND DATASHEET OF ALL EQUIPMENT.

4. Acceptance Criteria:

- Completeness of supply as per 1.2a (Material) & 1.3 (Scope of Services).
- Demonstration of proper working of the network.
- Datasheet/drawing of pigtails, test certificate & documentation as per sl. no. 3 above
- Completion of work certificate obtained from BHEL site Engineers / Customer Engineers.

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ANNEXURE-I (OFC SEGMENT LIST)

DCS OFC Cable Segment List

CCR to remote Control rooms

Sl No	From	To	No. of Terminations	OFC Cable	Distance (meters)
1	CNP21 Panel CCR	CNE82 enclosure at MRS system(MAIN)	8	4 core Single Mode	350
2	CNP21 Panel CCR	CNE82 enclosure at MRS system(RED.)	8	4 core Single Mode	350
3	CNP31 at CCR Unit	CNE84 enclosure at CWT Room(MAIN)	8	4 core Single Mode	550
4	CNP31 at CCR Unit	CNE84 enclosure at CWT Room(RED.)	8	4 core Single Mode	550
5	CNP31 at CCR	CNE84 enclosure at FOHS Room(MAIN)	8	4 core Single Mode	410
6	CNP31 at CCR	CNE84 enclosure at FOHS Room(RED.)	8	4 core Single Mode	410
7	CNP31 at CCR	CAF50 at AUX BOILER Room(MAIN)	8	4 core Single Mode	400
8	CNP31 at CCR	CAF50 at AUX BOILER Room(RED.)	8	4 core Single Mode	400
9	CNP31 at CCR	ENCLOSURE at CPU(MAIN)	8	4 core Single Mode	260
10	CNP31 at CCR	ENCLOSURE at CPU(RED.)	8	4 core Single Mode	260
11	CNP31 at CCR	CNR11 panel at CHP(MAIN)	8	4 core Single Mode	1500
12	CNP31 at CCR	CNR11 panel at CHP(RED.)	8	4 core Single Mode	1500
13	CNP31 at CCR	CNR01 panel at AHP(MAIN)	8	4 core Single Mode	1500
14	CNP31 at CCR	CNR01 panel at AHP(RED.)	8	4 core Single Mode	1500

ACN controller in CCR/CER to Remote I/O module in remote locations

CW/ACW RIO					
1	CRE34/35/36 panel at CCR(CWP-A)	CRE81 panel at CWP LCR(MAIN)	8	4 core Single Mode	550
2	CRE34/35/36 panel at CCR(CWP-A)	CRE81 panel at CWP LCR(RED.)	8	4 core Single Mode	550

3	CRE37/38/39 panel at CCR(CWP-B)	CRE82 panel at CWP LCR(MAIN)	8	4 core Single Mode	550
4	CRE37/38/39 panel at CCR(CWP-B)	CRE82 panel at CWP LCR(RED.)	8	4 core Single Mode	550
5	CRE40/41/42 panel at CCR(CWP-C)	CRE83 panel at CWP LCR(MAIN)	8	4 core Single Mode	550
6	CRE40/41/42 panel at CCR(CWP-C)	CRE83 panel at CWP LCR(RED.)	8	4 core Single Mode	550
5	CRE43/44/45 panel at CCR(CWP-D)	CRE84 panel at CWP LCR(MAIN)	8	4 core Single Mode	550
6	CRE43/44/45 panel at CCR(CWP-D)	CRE84 panel at CWP LCR(RED.)	8	4 core Single Mode	550
5	CRE55/56 panel at CCR(CWP-E)	CRE85/86 panel at CWP LCR(MAIN)	8	4 core Single Mode	550
6	CRE55/56 panel at CCR(CWP-E)	CRE85/86 panel at CWP LCR(RED.)	8	4 core Single Mode	550
CPU RIO					
1	CRE71 panel at CCR	CRE87/88/89 panel at CPU LCR(MAIN)	8	4 core Single Mode	260
2	CRE71 panel at CCR	CRE87/88/89 panel at CPU LCR(RED.)	8	4 core Single Mode	260
3	CRE72 panel at CCR	CRE90/91/92 panel at CPU LCR(MAIN)	8	4 core Single Mode	260
4	CRE72 panel at CCR	CRE90/91/92 panel at CPU LCR(RED.)	8	4 core Single Mode	260
5	CRE73 panel at CCR	CRE93/94/95 panel at CPU LCR(MAIN)	8	4 core Single Mode	260
6	CRE73 panel at CCR	CRE93/94/95 panel at CPU LCR(RED.)	8	4 core Single Mode	260
Raw Water Breakers RIO					
1	CRE57/58/59 Panel at CCR	CNP51 Panel at CCR(MAIN)	4(at CRE57)	4 core Single Mode	100
2	CRE57/58/59 Panel at CCR	CNP51 Panel at CCR(RED.)	4(at CRE57)	4 core Single Mode	100
3	CNE81 Enclosure at Raw Water Pump House	Raw Water Pump House CRE96 Panel (MAIN)	4(at CRE96)	4 core Single Mode	100
4	CNE81 Enclosure at Raw Water Pump House	Raw Water Pump House CRE96 Panel (RED.)	4(at CRE96)	4 core Single Mode	100

NOTE **Splicing to be done at CNP51 & CNP52 at CCR and CRE81 at Raw Water Pump House as per diagram attached(Annexure-II)**

Ash Handling Plant RIO

1	AHP Control Room	RIO-2(MAIN)	8	4 core Single Mode	1500
2	AHP Control Room	RIO-2(RED.)	8	4 core Single Mode	1500

Coal Handling Plant RIO

1	CHP Control Room	RIO-2(MAIN)	8	4 core Single Mode	500
2	CHP Control Room	RIO-2 (RED.)	8	4 core Single Mode	500
3	CHP Control Room	RIO-3 (MAIN)	8	4 core Single Mode	900
4	CHP Control Room	RIO-3 (RED.)	8	4 core Single Mode	900
5	CHP Control Room	RIO-4 (MAIN)	8	4 core Single Mode	900
6	CHP Control Room	RIO-4 (RED.)	8	4 core Single Mode	900
		TOTAL	320		25000

PLC OFC Cable Segment List

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)
1	CNP34 Panel in CCR/CER	AC SYSTEM(MAIN)	8	4 core Single Mode	100
2	CNP34 Panel in CCR/CER	AC SYSTEM (RED.)	8	4 core Single Mode	100
3	CNP34 Panel in CCR/CER	PT PLANT PLC (MAIN)	8	4 core Single Mode	700
4	CNP34 Panel in CCR/CER	PT PLANT PLC (RED.)	8	4 core Single Mode	700
5	CNP34 Panel in CCR/CER	CNP51 PANEL in CCR(MAIN)	4(at CNP34)	4 core Single Mode	100
6	CNP34 Panel in CCR/CER	CNP51 PANEL in CCR(RED.)	4(at CNP34)	4 core Single Mode	100
7	CNE81 Panel in Raw Water Pump House	RAW WATER PLC(MAIN)	4(at PLC)	4 core Single Mode	100
8	CNE81 Panel in Raw Water Pump House	RAW WATER PLC(RED.)	4(at PLC)	4 core Single Mode	100
9	CNP34 Panel in CCR/CER	CW CHLORINATION (MAIN)	8	4 core Single Mode	550
10	CNP34 Panel in CCR/CER	CW CHLORINATION (RED.)	8	4 core Single Mode	550
11	CNP34 Panel in CCR/CER	DM PLANT (MAIN)	8	4 core Single Mode	420
12	CNP34 Panel in CCR/CER	DM PLANT (RED.)	8	4 core Single Mode	420
13	CNP34 Panel in CCR/CER	WASTE WTR EFF. TREATMENT PLANT(MAIN)	8	4 core Single Mode	800
14	CNP34 Panel in CCR/CER	WASTE WTR EFF. TREATMENT PLANT(RED.)	8	4 core Single Mode	800
15	CNP34 Panel in CCR/CER	ESP(MAIN)	8	4 core Single Mode	550
16	CNP34 Panel in CCR/CER	ESP(RED.)	8	4 core Single Mode	550
17	CNP34 Panel in CCR/CER	FIRE WTR SYSTEM(MAIN)	8	4 core Single Mode	400
18	CNP34 Panel in CCR/CER	FIRE WTR SYSTEM(RED.)	8	4 core Single Mode	400
19	CNP34 Panel in CCR/CER	COMPRESSED AIR SYSTEM(MAIN)	8	4 core Single Mode	350
20	CNP34 Panel in CCR/CER	COMPRESSED AIR SYSTEM(RED.)	8	4 core Single Mode	350
21	CNP34 Panel in CCR/CER	FLU GAS ANALYZER(MAIN)	8	4 core Single Mode	1000
22	CNP34 Panel in CCR/CER	FLU GAS ANALYZER(RED.)	8	4 core Single Mode	1000
		TOTAL	160		**9940**

NOTE **Splicing to be done at CNP51 & CNP52 at CCR and CRE81 at Raw Water Pump House as per diagram attached(Annexure-II)**

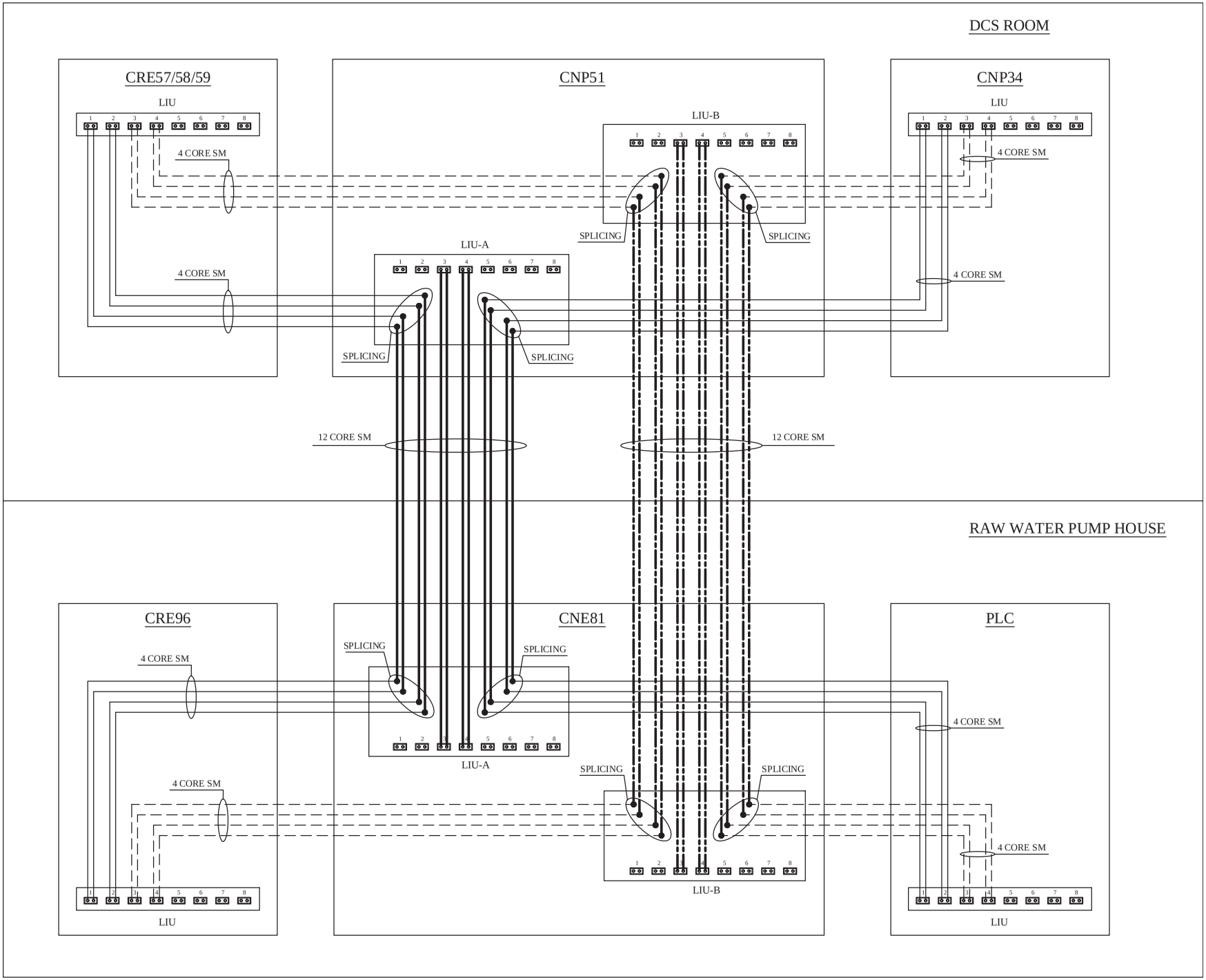
Station LAN OFC Cable Segment List

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)
1	CNP51 Panel in CCR/CER	CNE61/SLAN enclosure at Service Building	8	4 core Single Mode	250
2	CNE61/SLAN enclosure at Service Building	CNE62/SLAN enclosure at Service Building	8	4 core Single Mode	150
3	CNE62/SLAN enclosure at Service Building	CNE63/SLAN enclosure at Service Building	8	4 core Single Mode	150
4	CNE63/SLAN enclosure at Service Building	CNP52 Panel in CCR/CER	8	4 core Single Mode	250
5	CNP52 Panel in CCR/CER	CNP51 Panel in CCR/CER	8	4 core Single Mode	10
6	CNP51 Panel in CCR/CER	CNE64/SLAN enclosure at Office sheds	8	4 core Single Mode	700
7	CNP51 Panel in CCR/CER	CNE65/SLAN enclosure at WTP(DM PLANT)	8	4 core Single Mode	420
8	CNP52 Panel in CCR/CER	CNE66/SLAN enclosure at FWPH	8	4 core Single Mode	500
9	CNP52 Panel in CCR/CER	CNE67/SLAN enclosure at Stores	8	4 core Single Mode	550
10	CNP52 Panel in CCR/CER	CNE68/SLAN enclosure at EC Plant	8	4 core Single Mode	700
11	CNP52 Panel in CCR/CER	CNE69/SLAN enclosure at Security gate	8	4 core Single Mode	800
12	CNP52 Panel in CCR/CER	CNE68/SLAN enclosure at Switchyard	8	4 core Single Mode	550
13	CNP51 Panel in CCR/CER	CNR01 at AHP Control Room	8	4 core Single Mode	1500
14	CNP52 Panel in CCR/CER	CNR11 at CHP Control Room	8	4 core Single Mode	1500
15	CNE67/SLAN enclosure at Stores	ESP Control Room	8	4 core Single Mode	200
16	CNE67/SLAN enclosure at Stores	FIRE STATION	8	4 core Single Mode	200
17	CNE67/SLAN enclosure at Stores	WEIGH BRIDGE	8	4 core Single Mode	200
18	CNE66/SLAN enclosure at FWPH	CWPH	8	4 core Single Mode	200
19	CNE66/SLAN enclosure at FWPH	Chemical Room	8	4 core Single Mode	200
		Total	152		**9030**

12 Core SM cable from CCR to Raw Water Pump House

Sl No	From	To	No of Terminations	OFC Cable	Distance (meters)
1	CNP51 Panel in CCR/CER	CNE81 Enclosure at RWPH (MAIN)	8	12 core Single Mode	4400
2	CNP51 Panel in CCR/CER	CNE81 Enclosure at RWPH (RED.)	8	12 core Single Mode	4400
		Total	16		**8800**
NOTE:	**Terminations and splicings as per Annexure-II**				

ANNEXURE-II


DCS ROOM
CRE57/58/59
LIU
4 CORE SM
4 CORE SM
CNP51
LIU-B
SPLICING
SPLICING
LIU-A
SPLICING
SPLICING
CNP34
LIU
4 CORE SM
4 CORE SM
12 CORE SM
12 CORE SM
RAW WATER PUMP HOUSE
CRE96
4 CORE SM
4 CORE SM
LIU
CNE81
SPLICING
SPLICING
LIU-A
SPLICING
SPLICING
LIU-B
PLC
4 CORE SM
4 CORE SM
LIU

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भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division
PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE: PR: 003- Rev 00

SPECIAL COMMERCIAL CONDITIONS OF CONTRACT

Reference is brought to BHEL's Instructions to Bidders (Document Ref: CE: PR: 001- Rev 00) and General Commercial Conditions for Contract (Document Ref: CE: PR: 002- Rev 00).These documents along with required annexures are available in our website: _____NIL_____ .These two documents along with Special Conditions of Contract annexed to this RFQ will form an integral part of the contract as and when the RFQ culminates into a Purchase Order / Contract.

RFQ No: _NKR00000164_____ **RFQ Date:** _AS PER EPS_____
Due Date: _AS PER EPS_____**Projects:** NTPC- NABINAGAR STN C&I & SG (3x660MW), NORTH KARANPURA (3X660MW), GADARWARA (2X800 MW), FGUTPP-IV UNCHAHAR (1X500MW), SURATHGARH UNIT 7&8, PARBATI-II (4X200MW), KOTHAGUDEM (1X800MW)

Item Description: Accessories for Fiber optic cable laying & termination and services at Project sites.

~~**Purchase Executives:** In cases where tender documents are bulky, or due to some reasons tender documents are required to be submitted by hand, the offers are to be handed over to either of the following Purchase Officers~~:

~~**E-mail IDs:** In case offers are sent through E-mail, please send the offers to both of the following email IDs:~~

E-tendering: **Applicable** / ~~Not Applicable.~~

Type of Bid: **Three Part Bid** (Refer ITB for details)
Reverse Auction: ~~Not Applicable~~ / Will be intimated during commercial clarifications to technically acceptable vendors~~.~~
In case BHEL does not resort to Reverse Auction, the price bids and price impacts (if any) shall be opened as per BHEL's standard practice.

Splitting of tendered quantity to MSE vendors: The tendered quantity ~~will~~ /will not be split to MSE vendors subject to submission of relevant documents by vendors. **Refer clause H of Instructions to Bidders for conditions applicable and for information on documents to be submitted.**

Destination: Items are to be directly despatched to BHEL's Site Office or Stores/Customer's Stores located at/near _NABINGAR, NORTH KARANPURA, GADARWARA, UNCHAHAR SURATGARH, PARBATHI,& KOTHAGUDEM_ District/City in _BIHAR, JHARKHAND MADHYA PRADESH, UTTAR PRADESH, RAJASTHAN, HIMACHAL PRADESH & TELANGANA,_____ States respectively.
Road Permit, if applicable, will be issued by BHEL along with Despatch Clearance.

Project Benefits:

- **Indigenous scope of supply:**
  - **a)** Project is Mega Power Project or Ultra Mega Power Project: Eligible for "NIL" Excise Duty. Necessary documents for availing Excise Duty exemption by suppliers will be furnished by BHEL. **Applicable for Nabinagar, North Karanpura, Gadarwara, Parbati & Surathgarh Projects only .No Benefit for Unchahar & Kothagudem Projects**
  - ~~b) Physical Export project: Eligible for complete exemption of Excise Duty & Sales Tax. Necessary documents for availing such benefits will be furnished by BHEL to suppliers.~~
  - ~~c) Nuclear Power Project under a special category: Eligible for claiming Terminal Excise Duty benefit from DGFT as per present EXIM policy. Confirm submission of following in original:~~
    - ~~Disclaimer Certificate (Annexure- XI)~~
    - ~~Copy of Excise Invoice attested by Suptd of Central Excise authorities with signature and seal, in blue ink, to enable BHEL to claim terminal Excise duty benefit from DGFT.~~
- **Imported scope of supply:**
  - ~~a) Project is Mega Power Project or Ultra Mega Power Project: Eligible for "NIL" Customs Duty.~~ **Merit Duty Applicable**
  - ~~b) Physical Export project: Eligible for complete exemption of Customs Duty.~~

Terms of Delivery:
Indicate station of despatch: _____
Indicate place of manufacturing (wherever applicable): _____

- **Indigenous scope of supply:** Ex-works (including Packing & Forwarding charges but excluding Taxes & Duties): _____
- **Imported scope of supply:** F.C.A. (for air consignments) /F.O.B. (for sea consignments)

(including Packing, Forwarding, Handling, Ancillary charges like processing of Sight Draft/ Letter of Credit, negotiation of bank documents, Export declaration, Country of Origin etc): _____

S NO.	TERMS	BHEL ACCEPTABLE TERM	BIDDER'S CONFIRMATION	DEVIATION IF ANY
01	**Validity**	The offer will be valid for a period of 120 days from the date of technical bid opening.	**AGREE**	
02	**Excise Duty & Cess** **Refer Note below**	If applicable, indicate current rate of Excise Duty and maximum rate of Excise Duty (against proof of Excise Invoice). However, for calculation purpose and arriving at "Total Cost to BHEL" maximum rate of Excise Duty will be considered. In case Excise Duty remains firm throughout the contract, the same shall be specifically indicated. Otherwise, maximum Excise Duty will be considered for arriving at lowest bidder. However, reimbursement of Excise Duty shall be at actuals against proof of Excise Invoice only. (Within contractual delivery). ~~Physical export contract eligible for complete exemption of Excise duty against submission of necessary documents by BHEL like ARE-1/CT-1 form~~.	**APPLICABLE / NOT APPLICABLE** Present rate of Excise Duty with CESS .....% Maximum rate of Excise Duty with CESS ……% **CONFIRMED**	
03	**Central Sales Tax (CST)**	If applicable, indicate current rate of sales tax against form "C". For issue of original form "C", vendor has to furnish "E1/E2" form. To enable vendor give E1/E2 form, photocopy of C form will be issued by BHEL. Please confirm submission of "E1/E2 Sale form". ~~For physical export project, Sales Tax is exempted against necessary documents furnished by BHEL~~.	**APPLICABLE / NOT APPLICABLE** Present Sales Tax rate against form "C" ……. % **CONFIRMED**	
04	**Value Added Tax (VAT)**	If applicable, indicate current rate of VAT. When VAT is applicable, BHEL ROD's/ Nodal Agency's Name, TIN No. and address to be indicated in invoice. (Note that two original invoice and one tax invoice should be submitted to BHEL).	**APPLICABLE / NOT APPLICABLE** VAT rate at present ……. % **NOTED**	
05	**Octroi**	If applicable, indicate current rate of octroi.	**AGREE** Present Octroi rate ……..%	
06	**Freight Charges (for indigenous scope of supply) freight charges to be quoted Separately for each project .**	Freight charges shall be to vendor's account. Quote lumpsum reasonable Freight charges separately in priced offer, plus service tax if any. Vendor's offer will be evaluated on "Total cost basis" including freight charges. Vendor shall book the consignment through their approved Road carriers on "Freight pre-paid" and door delivery consignee copy attached basis. Freight charges to be claimed from BHEL along with POD (Proof of Delivery) on original L/R.	**AGREED** and quoted as lumpsum amount in price bid. Service Tax _____% (extra /inclusive in freight charges)	
07	**Service Tax on E&C and Training Charges**	If applicable, indicate current rate of Service Tax _____% Service Tax Regn. No. _____ Confirmation that Service Tax register is maintained~~.~~	**APPLICABLE / NOT APPLICABLE** **CONFIRMED**	

NOTE: 1.For the items which will be dispatched from sub vendors works to customer project site directly, the taxes and duties i.e. ED+Cess, CST or VAT, payable by your vendors, will NOT be reimbursable by BHEL.
2. For the items, which will be shipped from Vendor works, taxes and duties as applicable will be reimbursed by BHEL against documentary evidences.

08	~~**Parting of license for imported raw materials**~~	~~In case of Mega project, Ultra Mega project and Physical Export project where Custom Duty and Excise Duty are NIL and vendor is importing any raw materials / components for the enquired item, same are eligible for Zero Customs duty. As per EXIM policy, BHEL will part the import licence with the vendors to obtain import licence by themselves and custom clear the raw materials/ components by availing zero customs duty. Hence, please furnish list of raw materials / components to be imported by you with Quantity and CIF value (for which BHEL has to share import licence). The benefit due to the above shall be passed on to BHEL and confirmed in the quotation.~~ ~~If there are no imported raw materials/components, same shall be confirmed in the offer.~~	**AGREE** CIF value …….. **Yes, benefit passed-on to BHEL in the priced quotation.** **We confirm that there are no imported components.**	
09	**Delivery Period**	Within 06 weeks from the date of issue of approved documents or manufacturing clearance by BHEL, whichever is later.	**AGREE** …… weeks	
10	**Guarantee/ Warranty**	**18** months for from the date of delivery of goods or **12** months from the date of commissioning of goods, whichever is earlier for **Nabinagar & Gadarwara Projects.** **24** months for from the date of delivery of goods or **18** months from the date of commissioning of goods, whichever is earlier for **North Karanpura, Unchahar & Parbati Projects**. **36** months for from the date of delivery of goods or 30 months from the date of commissioning of goods, whichever is earlier for Surathgarh **& Kothagudem Projects.**	**AGREE**	
11	**Inspection agency**	Materials will be inspected by : • BHEL • Customer/Consultant/BHEL nominated Third Party Inspection Agency (TPIA)	**AGREE**	
12	**Terms of Payment at the time of material supply**	Refer Clause "**F**" of Instructions to Bidder for BHEL standard Payment terms and loading factors applicable for non-compliance against payment terms: **Indigenous Scope:** ~~a)Supply with E&C~~ b)**Supply with Supervision of E&C** **c**~~) Supply only~~ **Imported Scope:** ~~d)Supply with E&C~~ **e)Supply with Supervision of E&C** ~~f) Supply only~~ Note: Kindly indicate if High Sea Sales will be operated. If yes, confirm submission of relevant documents as per Annexure V.	**AGREE** **YES / NO** **CONFIRMED**	
13	~~**Performance Bank Guarantee (PBG)**~~	~~PBG will be applicable for a period of 18 months + claim period of 6 months for a value equal to 10% of the basic value of the purchase order.~~ ~~Refer Clause "**G**" of Instructions to Bidders.~~	**AGREE**	
14	~~**Terms of Payment not related to material supply**~~	~~**For Training:**~~ ~~100% will be paid in 45 days from the date of completion of Training or 15 days from the date of submission of complete set of documentation, whichever is later.Separate invoice shall be submitted for Training charges along with documentary evidence.~~ ~~**For Engineering & Documentation Charges:**~~ ~~100% will be paid in 45 days from the date of approval of~~	**AGREE**	

		~~final documents or 15 days from the date of submission of invoice, whichever is later. Separate invoice to be submitted for Engineering & documentation charges.~~		
15	**Mode of despatch**	**Indigenous Scope:** By Road on Door Delivery Consignee Copy attached basis through your approved transporter (unless otherwise indicated in Despatch Instructions), only on receipt of Despatch Clearance from BHEL. **Imported Scope:** By Air/Sea through BHEL approved Consolidator/Freight Forwarder, only on receipt of Despatch Clearance from BHEL.	**AGREE**	
16	**Despatch Documents**	Complete set of despatch documents (original + 1 photocopy set) as per Purchase Order shall be forwarded to BHEL directly. Depending upon the project/customer demands, despatch documents may include one or more documents from the following: Commercial Invoice, Excise Invoice (if ED is applicable), Lorry Receipt (L/R), Packing List, Air Way Bill (AWB), Country of origin certificate, Warranty Certificate, Insurance Intimation letter, NIL Short Shipment Certificate, Original Performance Bank Guarantee (directly from issuing bank to BHEL), POD (Proof of Delivery) on original L/R, ~~Disclaimer Certificate (as per BHEL format attached as Annexure XI) along with ER-1 form & attested excise invoice (as per project demands like Nuclear Power plant) etc.~~ **The precise list of despatch documents needed for a particular project will be specified in the Purchase Order.** One set of Invoice, Packing List and L/R or AWB shall be e-mailed/faxed immediately to BHEL-EDN after despatch.	**AGREE**	
17	**O & M Manuals**	As built Drawings, O & M Manuals and other approved documents shall be furnished in required no. of sets as per Specification/Purchase Order. Note: Supply of above documents (O&M) in required no. of sets along with material shall be indicated in packing list. If not mentioned BHEL may insist for submission in required sets once again.	**AGREE**	
18	**Quantity Tolerance**	If applicable, indicate Quantity tolerance for each of the line item. ~~For Impulse/seamless/ GI pipes one random length applicable for each variety of pipes.~~	**CONFIRMED**	Quantity Tolerance ..... % Per Variety
19	**Evaluation criteria for tendered item**	~~Itemwise evaluation of tendered item.~~ ~~Splitting of tendered quantity to MSE vendors (if any) is applicable.~~ OR Items will not be split on item wise lowest offer. Items to be evaluated and procured as a package.	**AGREE**	
20	**Integrity Commitment**	Integrity commitment will be applicable in the tender process and execution of contracts as mentioned in clause "**I**" of Instructions to Bidders.	**AGREE**	

Note: **1. Evaluation will be done on total packages basis combining all projects. Vendors to maintain same unit price for same item for all projects.**

With this, it is inferred that vendor has understood and accepts all terms & conditions as indicated in Instructions to Bidders (Document Ref: CE: PR: 001- Rev 00) & General Commercial Conditions for Contract (Document Ref: CE: PR: 002- Rev 00).

VENDOR'S SIGNATURE WITH SEAL

NOTE: The above filled-in and signed-sealed document (in original) shall be furnished as part of Part-I Bid without fail. If no deviations are brought, it will be treated as if all terms and conditions of this enquiry are accepted by vendor without any deviation.

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भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division
PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE: PR: 002- Rev 00

GENERAL COMMERCIAL CONDITIONS FOR CONTRACT

These 'General Commercial Conditions for Contract for Purchase' hereinafter referred to as GCC apply to all enquiries, tenders, requests for quotations, orders, contracts and agreements concerning the supply of goods and the rendering of related services (hereinafter referred to as "deliveries") to Bharat Heavy Electricals Limited and any of its units, regions or divisions (hereinafter referred to as "BHEL" or the Purchaser) or its projects / customers.

Any deviations from or additions to these GCC require BHEL's express written consent. The general terms of business or sale of the vendor shall not apply to BHEL. Acceptance, receipt of shipments or services or effecting payment shall not mean that the general terms of business or sale of the vendor have been accepted.

Orders, agreements and amendments thereto shall be binding if made or confirmed by BHEL in writing. Only the Purchasing department of BHEL is authorized to issue the Purchase Order or any amendment thereof.

Definitions: Throughout these conditions and in the specifications, the following terms shall have the meanings assigned to them, unless the subject matter or the context requires otherwise.

a) 'The Purchaser' means Bharat Heavy Electricals Limited, Electronics division, Mysore road, Bangalore 560 026, a Unit of Bharat Heavy Electricals Limited (A Govt. of India Undertaking) incorporated under the Companies Act having its registered office at BHEL House, Siri Fort, New Delhi-110049, India and shall be deemed to include its successors and assigns. It may also be referred to as BHEL.
b) 'The vendor' means the person, firm, company or organization on whom the Purchase Order is placed and shall be deemed to include the vendor's successors, representative heirs, executors and administrator as the case may be. It may also be referred to as Seller, Contractor or Supplier.
c) 'Contract' shall mean and include the Purchase Order incorporating various agreements, viz. tender/ RFQ, offer, letter of intent / acceptance / award, the General Conditions of Contract and Special Conditions of Contract for Purchase, Specifications, Inspection / Quality Plan, Schedule of Prices and Quantities, Drawings, if any enclosed or to be provided by BHEL or his authorized nominee and the samples or patterns if any to be provided under the provisions of the contract.
d) 'Parties to the Contract' shall mean the 'The Vendor' and the Purchaser as named in the main body of the Purchase Order.

Interpretation:

In the contract, except where the context requires otherwise:

a) words indicating one gender include all genders;
b) words indicating the singular also include the plural and words indicating the plural also include the singular;
c) provisions including the word "agree", "agreed" or "agreement" require the agreement to be recorded in writing, and
d) "Written" or "in writing" means hand-written, type-written, printed or electronically made, and resulting in a permanent record.

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Applicable Conditions:

1. Price Basis: All prices shall be firm until the purchase order is executed / completed in all respects. No price variations / escalation shall be permitted unless otherwise such variations / escalations are provided for and agreed by BHEL in writing in the purchase order.

2. Validity: The offer will be valid for a period of 120 days from the date of technical bid opening date. Validity beyond 120 days, if required, will be specified in the SCC (special conditions of contract).

3. Ordering and confirmation of Order: Vendor shall send the order acceptance on their company letter head within two weeks from the date of Purchase Order or such other period as specified / agreed by BHEL. BHEL reserves the right to revoke the order placed if the order confirmation differs from the original order placed. The acceptance of goods/services/supplies by BHEL as well as payments made in this regard shall not imply acceptance of any deviations.
   The purchase order will be deemed to have been accepted if no communication to the contrary is received within two weeks (or the time limit as specified / agreed by BHEL) from the date of the purchase order.

4. Documentation: After receipt of Purchase Order, vendor should submit required documents like drawings, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report , O & M Manuals and/or any other relevant documents as per Specification/Purchase Order, as and when required by BHEL/Customer.
   At any stage within the contract period, the vendor shall notify of any error, fault or other defect found in BHEL's documents /specifications or any other items for reference. If and to the extent that (taking account of cost and time) any vendor exercising due care would have discovered the error, fault or other defect when examining the documents/specifications before submitting the tender, the time for completion shall not be extended. However if errors, omissions, ambiguities, inconsistencies, inadequacies or other defects are found in the vendor's documents, they shall be corrected at his cost, notwithstanding any consent or approval.

5. Penalty:
   For delay in documentation: In the event of delay in submission of complete set of documents ((like drawings, bill of materials, datasheets, catalogues, quality plan etc. as called in tender specifications including soft copies wherever applicable) in required sets beyond three weeks (or as agreed/indicated in the Purchase Order) from the date of Purchase Order, penalty at 0.5% (half percent) per week or part thereof, limited to a maximum of 5% (five percent) of the basic material value of the Purchase Order will be applicable.

   For delay in delivery: In the event of delay in agreed contractual delivery as per Purchase Order, penalty @ 0.5 % (half percent) per week or part thereof but limited to a max of 10% (ten percent) value of undelivered portion (basic material cost) will be applicable. Delivery will commence from the date of document approval by customer / BHEL or date of issue of manufacturing clearance, whichever is later. The date for which Inspection call is issued by vendor along with test certificates / test reports / Certificate of Conformance / calibration reports, as proof of completion of manufacturing will be treated as date of deemed delivery for penalty calculation. In the absence of furnishing such document indicated above as proof of completion of manufacturing along with inspection call, actual date of inspection will be considered as date of deemed delivery and BHEL will not be responsible for delay in actual date of inspection.

   Penalty for delayed documentation/delayed delivery, if applicable, shall be deducted at the time of first payment. If penalty is applicable for duration of less than a week, penalty @ 0.5% (half percent) of the basic material value will be deducted.

6. Contract variations (Increase or decrease in the scope of supply): BHEL may vary the contracted scope as per requirements at site. If vendor is of the opinion that the variation has an effect on the agreed price or delivery period, BHEL shall be informed of this immediately in writing along with technical details. Where unit rates are available in the Contract, the same shall be applied to such additional work. Vendor shall not

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perform additional work before BHEL has issued written instructions / amendment to the Purchase Order to that effect. The work which the vendor should have or could have anticipated in terms of delivering the service(s) and functionality (i.e.) as described in this agreement, or which is considered to be the result of an attributable error on the vendor's part, shall not be considered additional work.

7. Reverse Auction: BHEL reserves the right to follow REVERSE AUCTION PROCEDURE (ONLINE BIDDING ON NETWORK) before finalising the Purchase order on technically competent bidders, as per the guidelines given in Annexure III. In case BHEL does not resort to Reverse Auction, the price bids and price impacts (if any) already submitted and available with BHEL shall be opened as per BHEL's standard practice.

8. Inspection: Prior written notice of at least 10 days shall be given along with internal test certificates / COC and applicable test certificates. Materials will be inspected by BHEL-EDN-QS/CQS or BHEL nominated Third Party Inspection Agency (TPIA) or BHEL authorized Inspection Agency or Customer / Consultant or jointly by BHEL & Customer / consultant. All tests have to be conducted as applicable in line with approved Quality plan or QA Checklist or Purchase specification and original reports shall be furnished to BHEL-EDN, Bangalore for verification / acceptance for issue of dispatch clearance.
   All costs related to inspections & re-inspections shall be borne by vendor. Whether the Contract provides for tests on the premises of the vendor or any of his Sub-contractor/s, vendor shall be responsible to provide such assistance, labour, materials, electricity, fuels, stores, apparatus, instruments as may be required and as may be reasonably demanded to carry out such tests efficiently. Cost of any type test or such other special tests shall be borne by BHEL only if specifically agreed to in the purchase order.

9. Transit Insurance: Transit insurance coverage between vendor's works and project site shall be to the account of BHEL, unless specifically agreed otherwise. However, vendor shall send intimation directly to insurance agency (as mentioned in dispatch instructions issued by BHEL) through fax/courier/e-mail, immediately on dispatch of goods for covering insurance. A copy of such intimation sent by vendor to insurance agency shall be given to BHEL along with dispatch documents. Dispatch documents will be treated as incomplete without such intimation copy. BHEL shall not be responsible for sending intimations to insurance agency on behalf of the vendor.

10. High Sea Sales (HSS): Customs clearance of the consignment landed on Indian Sea / Air ports will be done by BHEL based on the original HSS documents provided by vendors.
    Any delay in submission of complete / correct HSS documents to BHEL may incur demurrage charges. All demurrage charges on account of incomplete / incorrect HSS documents submission by vendor will be to vendor's account and all such charges will be recovered from any of the available vendor bills with BHEL.

11. Packaging and dispatch: The Seller shall package the goods safely and carefully and pack them suitably in all respects considering the peculiarity of the material for normal safe transport by Sea / Air / Rail / Road to its destination suitably protected against loss, damage, corrosion in transit and the effect of tropical salt laden atmosphere. The packages shall be provided with fixtures / hooks and sling marks as may be required for easy and safe handling. If any consignment needs special handling instruction, the same shall be clearly marked with standard symbols / instructions. Hazardous material should be notified as such and their packing, transportation and other protection must conform to relevant regulations.
    The packing, shipping, storage and processing of the goods must comply with the prevailing legislation and regulations concerning safety, the environment and working conditions. Any Imported/Physical Exports items packed with raw / solid wood packing material should be treated as per ISPM – 15 (fumigation) and accompanied by Phytosanitory / Fumigation certificate. If safety information sheets (MSDS – Material Safety Data Sheet) exist for an item or the packaging, vendor must provide this information without fail along with the consignment.
    Each package must be marked with Consignee name, Purchase order number, Package number, Gross weight and net weight, dimensions (L x B x H) and Seller's name. Packing list of goods inside each package with PO item number and quantity must also be fixed securely outside the box to indicate the contents of each box. Total number of packages in the consignment must also be indicated.
    Separate packing & identification of items should be as follows.
    1. Main Scope - All items must be tagged with part no. & Item description.
    2. Commissioning spares - All items must be tagged with part no. & item description.
    3. Mandatory spares - All items must be tagged with part no. & item description.

(SVRao)

12. Assignment of Rights & Obligations; Subcontracting: Vendor is not permitted to subcontract the delivery or any part thereof to third party or to assign the rights and obligations resulting from this agreement in whole or in part to third parties without prior written permission from BHEL. Any permission or approval given by the BHEL shall, however, not absolve the vendor of the responsibility of his obligations under the Contract.

13. Progress report: Vendor shall render such report as to the progress of work and in such form as may be called for by the concerned purchase officer from time to time. The submission and acceptance of such reports shall not prejudice the rights of BHEL in any manner.

14. Non-disclosure and Information Obligations: Vendor shall provide with all necessary information pertaining to the goods as it could be of importance to BHEL. Vendor shall not reveal confidential information that may be divulged by BHEL to Vendor's employees not involved with the tender/ contract & its execution and delivery or to third parties, unless BHEL has agreed to this in writing beforehand. Vendor shall not be entitled to use the BHEL name in advertisements and other commercial publications without prior written permission from BHEL.

15. Cancellation / Termination of contract: BHEL shall have the right to completely or partially terminate the agreement by means of written notice to that effect. Termination of the Contract, for whatever reason, shall be without prejudice to the rights of the parties accrued under the Contract up to the time of termination.
    BHEL shall have the right to cancel/foreclose the Order/ Contract, wholly or in part, in case it is constrained to do so, on account of any decline, diminution, curtailment or stoppage of the business.

16. Risk Purchase Clause: In case of failure of supplier, BHEL at its discretion may make purchase of the materials / services NOT supplied / rendered in time at the RISK & COST of the supplier. Under such situation, the supplier who fails to supply the goods in time shall be wholly liable to make good to BHEL any loss due to risk purchase.
    In case of items demanding services at site like erection and commissioning, vendor should send his servicemen /representatives within 7 days from the service call. In case a vendor fails to attend to the service call, BHEL at its discretion may also make arrangements to attend such service by other parties at the **RISK & COST** of the supplier. Under such situation the supplier who fails to attend the service shall be wholly liable to make good to BHEL any loss due to risk purchase / service including additional handling charges due to the change.

17. Shortages: In the event of shortage on receipt of goods and/or on opening of packages at site, all such shortages shall be made good within a reasonable time that BHEL may allow from such intimation and free of cost. In case BHEL raises an insurance claim, the cost of material limited to insurance settled amount less handling charges will have to be reimbursed by the Supplier.
    Transit Damages: In the event of receipt of goods in damaged condition or having found them so upon opening of packages at site, Supplier shall make good of all such damages within a reasonable time from such intimation by BHEL. In case BHEL raises an insurance claim, the cost of material limited to insurance settled amount less handling charges will be reimbursed.

18. Remedial work: Notwithstanding any previous test or certification, BHEL may instruct the vendor to remove and replace materials/goods or remove and re-execute works/services which are not in accordance with the purchase order. Similarly BHEL may ask the vendor to supply materials or to execute any services which are urgently required for any safety reasons, whether arising out of or because of an accident, unforeseeable event or otherwise. In such an event, Vendor shall provide such services within a reasonable time as specified by BHEL.

19. Indemnity Clause: Vendor shall comply with all applicable safety regulations and take care for the safety of all persons involved. Vendor is fully responsible for the safety of its personnel or that of his subcontractor's men / property, during execution of the Purchase Order and related services. All statutory payments including PF, ESI or other related charges have to be borne by the vendor. Vendor is fully responsible for ensuring that all legal compliances are followed in course of such employment.

20. Product Information, Drawings and Documents: Drawings, technical documents or other technical information received by Vendor from BHEL or vice versa shall not, without the consent of the other party, be used for any other purpose than that for which they were provided. They may not, without the consent of the Disclosing party, otherwise be used or copied, reproduced, transmitted or communicated to third parties. All information and data contained in general product documentation, whether in electronic or any other form, are binding only to the extent that they are by reference expressly included in the contract.
    Vendor, as per agreed date/s but not later than the date of delivery, provide free of charge information and drawings which are necessary to permit and enable BHEL to erect, commission, operate and maintain the product. Such information and drawings shall be supplied in as many numbers of copies as may be agreed upon.
    All intellectual properties, including designs, drawings and product information etc. exchanged during the formation and execution of the Contract shall continue to be the property of the disclosing party.

21. Intellectual Property Rights, Licenses: If any Patent, design, Trade mark or any other intellectual property rights apply to the delivery (goods / related service) or accompanying documentation shall be the exclusive property of the Vendor and BHEL shall be entitled to the legal use thereof free of charge by means of a non-exclusive, worldwide, perpetual license. All intellectual property rights that arise during the execution of the Purchase Order/ contract for delivery by vendor and/or by its employees or third parties involved by the vendor for performance of the agreement shall belong to BHEL. Vendor shall perform everything necessary to obtain or establish the above mentioned rights. The Vendor guarantees that the delivery does not infringe on any of the intellectual property rights of third parties. The Vendor shall do everything necessary to obtain or establish the alternate acceptable arrangement pending resolution of any (alleged) claims by third parties. The Vendor shall indemnify BHEL against any (alleged) claims by third parties in this regard and shall reimburse BHEL for any damages suffered as a result thereof.

22. Force Majeure: Notwithstanding anything contained in the purchase order or any other document relevant thereto, neither party shall be liable for any failure or delay in performance to the extent said failures or delays are caused by the "Act of God" and occurring without its fault or negligence, provided that, force majeure will apply only if the failure to perform could not be avoided by the exercise of due care and vendor doing everything reasonably possible to resume its performance.
    A party affected by an event of force majeure which may include fire, tempest, floods, earthquake, riot, war, damage by aircraft etc., shall give the other party written notice, with full details as soon as possible and in any event not later than seven (7) calendar days of the occurrence of the cause relied upon. If force majeure applies, dates by which performance obligations are scheduled to be met will be extended for a period of time equal to the time lost due to any delay so caused.

    Notwithstanding above provisions, in an event of Force Majeure, BHEL reserves for itself the right to cancel the order/ contract, wholly or partly, in order to meet the overall project schedule and make alternative arrangements for completion of deliveries and other schedules.

23. Guarantee / Warranty: Wherever required, and so provided in the specifications / Purchaser Order, the Seller shall guarantee that the stores supplied shall comply with the specifications laid down, for materials, workmanship and performance. Unless otherwise specified, guarantee / warranty period shall be 30 months after the date of delivery of goods or 24 months from the date of commissioning of goods whichever is earlier. The guarantee / warranty period as described above shall apply afresh to replaced, repaired or re-executed parts of a delivery. Unless otherwise specifically provided in the Purchase Order, Vendor's liability shall be co terminus with the expiration of the applicable guarantee / warranty period.

24. Limitation of Liability: Vendor's liability towards this contract is limited to a maximum of 100% of the contract value and consequential damages are excluded. However the limits of liability will have no effect in cases of criminal negligence or wilful misconduct.
    The total liability of Vendor for all claims arising out of or relating to the performance or breach of the Contract or use of any Products or Services or any order shall not exceed the total Contract price.

(S V Rao)

25. Liability during guarantee / warranty: Vendor shall arrange replacement / repair of all the defective materials / services under its obligation under the guarantee / warranty period. The rejected goods shall be taken away by vendor and replaced / repaired. In the event of the vendor's failure to comply, BHEL may take appropriate action including disposal of rejections and replenishment by any other sources at the cost and risk of the vendor.
In case, defects attributable to vendor are detected during first time commissioning or use, vendor shall be responsible for replacement / repair of the goods as required by BHEL at vendor's cost. In all such cases expiry of guarantee / warranty will not be applicable.

26. Liability after guarantee / warranty period: At the end of the guarantee / warranty, the Vendor's liability ceases except for latent defects (latent defects are defects / performance issues notices after the guarantee / warranty has expired). The Contractor's liability for latent defects warranty for the plant and equipment including spares shall be limited to a period of six months from the end of the guarantee / warranty period of the respective plant and equipment including spares or first time commissioning whichever is later but not later than 3 (three) years from the date of shipment.

27. Compliance with Laws: Vendor shall, in performing the contract, comply with all applicable laws. The vendor shall make all remittances, give all notices, pay all taxes, duties and fees, and obtain all permits, licences and approvals, as required by the laws in relation to the execution and completion of the contract and for remedying of any defects; and the Contractor shall indemnify and hold BHEL harmless against and from the consequences of any failure to do so.

28. Settlement of Disputes: Except as otherwise specifically provided in the Purchase Order, decision of BHEL shall be binding on the vendor with respect to all questions relating to the interpretation or meaning of the terms and conditions and instructions herein before mentioned and as to the completion of supplies/work/services, other questions, claim, right, matter or things whatsoever in any way arising out of or relating to the contract, instructions, orders or these conditions or otherwise concerning the supply or the execution or failure to execute the order, whether arising during the schedule of supply/work or after the completion or abandonment thereof. Any disputes or differences among the parties shall to the extent possible be settled amicably between the parties thereto, failing which the disputed issues shall be settled through arbitration. Vendor shall continue to perform the contract, pending settlement of dispute(s).

29. Arbitration Clause: In case amicable settlement is not reached in the event of any dispute or difference arising out of the execution of the Contract or the respective rights and liabilities of the parties or in relation to interpretation of any provision in any manner touching upon the Contract, such dispute or difference shall (except as to any matters, the decision of which is specifically provided for therein) be referred by either party to the sole arbitration of an Arbitrator appointed by the Executive Director/ General Manager of the purchasing unit/ region/ division of BHEL. Vendor shall have no objection even if the Arbitrator so appointed is an employee of BHEL or has ever dealt/ had to deal with any matter relating to this Contract.
Subject as aforesaid the provisions of the Arbitration and Conciliation Act, 1996 of India or any statutory modification or re-enactment thereof and the rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause. It is a term of contract that the party initiating arbitration shall specify the dispute or disputes to be referred to arbitration under this clause together with the amount or amounts claimed in respect of each such dispute. The venue for the arbitration shall be Bangalore, India. The award of the arbitrator shall be a speaking award and shall be final, conclusive and binding on all parties to this contract.
The cost of arbitration shall be borne equally by the parties. Notwithstanding the existence of any dispute or difference or any reference for the arbitration, the vendor shall proceed with and continue without hindrance the performance of the work under the contract with due diligence and expedition in a professional manner.

30. Applicable Laws and Jurisdiction of Courts: Prevailing Indian laws both substantive and procedural, including modifications thereto, shall govern the Contract. Subject to the conditions as aforesaid, the competent courts in BANGALORE alone shall have jurisdiction to consider over any matters touching upon this contract.

(SVRao)

31. General Terms: That any non-exercise, forbearance or omission of any of the powers conferred on BHEL and /or any of its authorities will not in any manner constitute waiver of the conditions hereto contained in these presents.
That the headings used in this agreement are for convenience of reference only.
That all notices etc., to be given under the Purchase order shall be in writing, type script or printed and if sent by registered post or by courier service to the address given in this document shall be deemed to have been served on the date when in the ordinary course, they would have been delivered to the addressee.

(SV Rao)

32. Fraud Prevention Policy: The bidder along with its associate/collaborators/sub-contractors/ sub-vendors/consultants/service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice.

ಭಾರತ್ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division
PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE: PR: 001- Rev 00

INSTRUCTIONS TO BIDDERS (Common for all RFQs)

Bidder is requested to read the instructions carefully and submit their quotation covering all the points:

A. GENERAL INSTRUCTIONS:

1. Any Purchase Order resulting from this enquiry shall be governed by the Instructions to Bidders (document reference: CE: PR: 001 – Rev 00), General Conditions of Contract (document reference: CE: PR: 002 - Rev 00) and Special Conditions of Contract, if any, of the enquiry.
2. 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.
3. Bidders (also includes the term suppliers / contractors wherever used in this document) are instructed to quote their most competitive price and best delivery, etc. in the offer. Prices should be indicated in both figures & words. **(Please also refer clause 11 under section B)**
4. Regret letter (either through post or by mail) indicating reasons for not quoting must be submitted without fail, in case of non-participation in this tender. If a bidder fails to respond against 3 consecutive tenders for the same item, he will be liable for removal as a registered vendor of BHEL.
5. Procurement directly from the manufacturers shall be preferred. However, if the OEM / Principal insist on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacturer / supplier in the same tender. Moreover, either the agent could bid on behalf of the manufacturer / supplier or the manufacturer / supplier could bid directly but not both. In case bids are received from the manufacturer / supplier and his agent, bid received from the agent shall be ignored.
6. Consultant / firm (and any of its affiliates) shall not be eligible to participate in the tender/s for the related goods for the same project if they were engaged for consultancy services for the same project.
7. If an Indian representative / associate / liaison office quotes on behalf of a foreign based bidder, such representative shall furnish compulsorily the following documents:
   a. Authorization letter to quote and negotiate on behalf of such foreign-based bidder.
   b. Undertaking from such foreign based bidder that such contract will be honored and executed according to agreed scope of supply and commercial terms and conditions.
   c. Undertaking shall be furnished by the Indian representative stating that the co-ordination and smooth execution of the contract and settlement of shortages / damages / replacement / repair of imported scope till system is commissioned and handed over to customer will be the sole responsibility of the Indian representative / associates / agent / liaison office.
   d. Refer **Annexure X** on "Guidelines for Indian Agents".
8. In case of imported scope of supply, customs clearance & customs duty payment will be to BHEL account after the consignment is received at Indian Airport / Seaport. Bidders must provide all original documents required for completing the customs clearance along with the shipment. Warehousing charges due to

incomplete or missing documentation will be recovered from the supplier's bill. All offers for imported scope of supply must be made from any of the gateway ports (within the country) indicated. **(Refer Annexure I)**

9. The offers of the bidders who are on the banned list and also the offers of the bidders, who engage the services of the banned firms, shall be rejected. The list of the banned firms is available on BHEL website: **www.bhel.com**
10. Business dealings with bidders will be suspended if they are found to have indulged in any malpractices / misconduct which are contrary to business ethics like bribery, corruption, fraud, pilferage, cartel formation, submission of fake/false/forged documents, certificates, information to BHEL or if they tamper with tendering procedure affecting the ordering process or fail to execute a contract, or rejection of 3 consecutive supplies or if their firms / works are under strike / lockout for a long period.

B. <u>GUIDELINES FOR PREPARATION OF OFFER:</u>

1. Quotation shall be submitted in Single Part Bid, Two Part Bid or Three Part Bid, as called for in the tender:
   - **SINGLE PART BID**: Technical and Commercial Bid with prices along with price summary & filled in BHEL Standard Commercial terms and conditions in a single sealed envelope.
   - **TWO PART BID**: Unpriced offer i.e. "Techno-commercial Bid" with filled in BHEL Standard Commercial terms and conditions in a sealed envelope **along with the copy of the "Price Bid" without the prices** should be enclosed in one cover and the cover must be super scribed **"Techno-commercial offer)** and Priced offer i.e. "Price Bid" containing price summary in a separate sealed envelope and must be super scribed **"Price Bid"**. Both these envelopes shall be enclosed in a single sealed envelope super scribed with enquiry number due date of tender and any other details as called for in the tender document.
   - **THREE PART BID**: Pre-qualification Bid (Part-I), Techno Commercial Bid with filled in BHEL Standard Commercial terms and conditions (Part-II), and Price Bid (Part-III). All three envelopes shall be enclosed in a single sealed envelope super scribed with enquiry number due date of tender and any other details as called for in the tender document.

   If any of the offers (Part I, Part II or Part III) are not submitted before the due date and time of submission or if any part of the offer is incomplete the entire offer of the bidder is liable for rejection.

2. Supplier shall ensure to super scribe each envelope with RFQ number, RFQ Date, RFQ Due date and time, Item Description and Project clearly & boldly. Also mention on the envelope whether it is "Techno Commercial Bid" or "Price Bid" or "Pre-Qualification Bid". Pease ensure complete address, department name and purchase executive name is mentioned on the envelope (before dropping in the tender box or handing over) so that the tender is available in time for bid opening.
3. BHEL standard Commercial Terms and Conditions (duly filled, signed & stamped) must accompany Technical-Commercial offer without fail and should be submitted in original only. Xerox copy will not be accepted.
4. Any of the terms and conditions not acceptable to supplier, shall be explicitly mentioned in the Techno-Commercial Bid. If no deviations are brought out in the offer it will be treated as if all terms and conditions of this enquiry are accepted by the supplier without deviation.
5. Deviation to this specification / item description, if any, shall be brought out clearly indicating "DEVIATION TO BHEL SPECIFICATION" without fail, as a part of Techno-Commercial Bid. If no deviations are brought out in the offer it will be treated as if the entire specification of this enquiry is accepted without deviation.
6. Suppliers shall submit one set of original catalogue, datasheets, bill of materials, dimensional drawings, mounting details and / or any other relevant documents called in purchase specification as part of Technical Bid.
7. "Price Bid" shall be complete in all respects containing price break-up of all components along with all

applicable taxes and duties, packing & forwarding charges (if applicable), freight charges (if applicable) etc. Once submitted no modification / addition / deletion will be allowed in the "Price Bid." Bidders are advised to thoroughly check the unit price, total price to avoid any discrepancy.

8. In addition, bidder shall also quote for erection & commissioning charges (E&C charges), documentation charges, service charges, testing Charges (type & routine), training charges, service tax, etc. wherever applicable. The price summary must indicate all the elements clearly.
9. Vendors should indicate "lump sum" charges (including To & Fro Fare, Boarding, Lodging, Local Conveyance etc.) for Supervision of Erection, Commissioning and handing over to customer. The quotation shall clearly indicate scope of work, likely duration of commissioning, pre-commissioning checklist and service tax (if any).
10. Wherever bidders require PAC (Project Authority Certificate) for import of raw materials, components required for Mega Power Projects, Export Projects or other similar projects wherein supplies are eligible for customs duty benefits, lists and quantities of such items and their values (CIF) has to be mentioned in the offer. Prices must be quoted taking into account of such benefits.
11. All quotations shall be free from corrections /overwriting. Corrections if any should be authenticated with signature and seal. Any typographical error, totaling mistakes, currency mistake, multiplication mistake, summing mistakes etc. observed in the price bids will be evaluated as per **Annexure II** "Guidelines for dealing with Discrepancy in Words & Figures – quoted in price bid". BHEL decision will be final.

C. <u>GUIDELINES FOR OFFER SUBMISSION:</u>

1. Offers / Quotations must be dropped in tender box before 13.00 Hrs. on or before due date mentioned in RFQ. The offers are to be dropped in the proper slot of the Tender Box kept in our reception area with caption "CE, SC&PV, DEFENCE." Tenders are opened on 3 days in a week (Monday/Wednesday/Friday). Tender must be deposited in the slot corresponding to the day (Monday - Box no.4/Wednesday - Box no. 6 /Friday - Box no.8) while depositing the offer. **(This clause will not be applicable for e-tenders)**
2. E-Mail / Internet / EDI offers received in time shall be considered only when such offers are complete in all respects. In case of offers received through E-mail, please send the offer to the email ID specified in the SCC of the tender. (Refer to SCC document of tender)
3. In cases where tender documents are bulky, or due to some reasons tender documents are required to be submitted by hand or through posts/couriers, the offers are to be handed over either of the two officers whose names are mentioned in the RFQ. (Refer to SCC document of tender)
4. Tenders will be opened on due date, time and venue as indicated in the RFQ in the presence of bidders at the venue indicated in the RFQ. In case of e-procurement, bidders can see tender results till seven days after due date and time.
5. Vendor will be solely responsible:
   a. For submission of offers before due date and time. Offers submitted after due date and time will be treated as "Late offers" and will be rejected.
   b. For submission of offers in the correct compartment of the tender box based on the day of due date (Monday/Wednesday/Friday). Please check before dropping your offer in the correct tender box.
   c. For depositing offers in proper sealed condition in the tender box. If the bidder drops the tender in the wrong tender box or if the tender document is handed over to the wrong person BHEL will not be responsible for any such delays.
   d. For offers received through email etc., suppliers are fully responsible for lack of secrecy on information and ensuring timely receipt of such offers in the tender box before due date & time.
   e. In case of e-tender, all required documents should be uploaded before due date and time. Availability of power, internet connections, etc. will be the sole responsibility of the vendor. Wherever assistance is

needed for submission of e-tenders, help line numbers and executives of service provider of BHEL may be contacted.
Service provider: M-junction
Website address: https://bheleps.buyjunction.in/
Helpline no.: 033-66106426/6217/6013/6046/6176 (9:30 am to 5:30 pm)
9163348283/9163348284/9163348285/9163348286/8584008116 (5:30 pm to 8:30 pm)

Purchase Executive / BHEL will not be responsible for any of the activities relating to submission of offer.

D. PROCESSING OFFERS RECEIVED:

1. Any discount / revised offer submitted by the supplier on its own shall be accepted provided it is received on or before the due date and time of offer submission (i.e. Part-I bid). The discount shall be applied on pro-rata basis to all items unless specified otherwise by the bidder.
2. Changes in offers or Revised offers given after Part-I bid opening shall not be considered as a part of the original offer unless such changes / revisions are requested by BHEL.
3. In case there is no change in the technical scope and / or specifications and / or commercial terms & conditions, the supplier will not be allowed to change any of their bids after Technical bids are opened (after the due date and time of tender opening).
4. In case of changes in scope and/ or technical specifications and/ or commercial terms & conditions by BHEL and it accounts for price implications from vendors, all techno-commercially acceptable bidders shall be asked by BHEL (after freezing the scope, technical specifications and commercial terms & conditions) to submit the impact of such changes on their price bid. Impact price will be applicable only for changes in technical specification / commercial conditions by BHEL. The impact price must be submitted on or before the cut-off date specified by BHEL and the original price bid and the price impact bid will be opened together at the time of price bid opening.
5. BHEL EDN reserves the right to adopt Reverse Auction or standard Price Bid Opening procedure for price evaluation, at its discretion. This will be decided after completion of technical evaluation of tender. **(Refer Annexure III for Guidelines for Reverse Auction)**.
6. Un-opened bids (including price bids) will be returned to the respective bidders after release of PO and receipt of order acknowledgement from the successful bidder.
7. After receipt of Purchase Order, supplier should submit required documents like drawings, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report , O & M Manuals and / or any other relevant documents as per Specification / Purchase Order, as and when required by BHEL / Customer.
8. Any deviation to the terms and conditions not mentioned in the quotation by supplier in response to this enquiry will not be considered, if put forth subsequently or after issue of Purchase Order, unless clarification is sought for by BHEL EDN and agreed upon in the Purchase Order.
9. Evaluation shall be on the basis of delivered cost (i.e. “Total Cost to BHEL").
   “Total Cost to BHEL” shall include total basic cost, packing & forwarding charges, taxes and duties, freight charges, insurance, service tax for services, any other cost indicated by vendor for execution of the contract and loading factors (for non-compliance to BHEL Standard Commercial Terms & Conditions). Benefits arising out of Nil Import Duty on Mega Projects, Physical Imports or such 100% exemptions (statutory benefits), customer reimbursements of statutory duties (like Excise Duty, CST, VAT) will also be taken into account at the time of tender evaluation. (wherever applicable and as indicated in SCC document of tender)

10. For evaluation of offers in foreign currency, the exchange rate (TT selling rate of SBI) shall be taken as under:

Single part bids:	Date of tender opening
Two/three part bids:	Date of Part-I bid opening
Reverse Auction:	Date of Part-I bid opening

In case of Performance Bank Guarantee (PBG) also, exchange rate will be considered as mentioned above for converting foreign currency to Indian currency and vice versa.

If the relevant day happens to be a bank holiday, then the exchange rate as on the previous working day of the bank (SBI) shall be taken.

11. Ranking (L-1, L-2 etc.) shall be done only for the techno-commercially acceptable offers.

E. INFORMATION ON PAYMENT TERMS:

1. All payments will be through Electronic Fund transfer (EFT). Vendor has to furnish necessary details as per BHEL standard format **(Refer Annexure IV)** for receiving all payments through NEFT. (Applicable for Indian vendors only)
2. In case of High Sea Sales transaction, customs clearance of the consignment landed on Indian Sea / Air ports will be done by BHEL based on the original HSS documents provided by vendors. All warehousing charges due to delay in submission of complete and or correct HSS documents to BHEL will be to suppliers account only. Such recovery will be made out of any of the available bills. **(Refer Annexure V)**.
3. Statutory deductions, if any, will be made and the deduction certificate shall be issued. In case vendor does not provide PAN details, the TDS deduction shall be at the maximum percentage stipulated as per the provisions of Income Tax Act. (Applicable for Indian vendors only).
   Foreign vendors shall submit relevant details of their bankers like Swift Code, Banker's Name & Address etc.
4. Vendors must submit bills & invoices along with required supporting documents in time. Incomplete documentation / delayed submission of invoice / documents will result in corresponding delay in payment.

F. STANDARD PAYMENT TERMS OF BHEL-EDN

Purchase Orders for indigenous procurement

Refer Annexure-XII for Highsea sales payment

(a) SUPPLY WITH E&C:

1) 85% of basic value (excluding E&C charges) + 100% of taxes, duties and freight charges will be paid in 45 days from the date of dispatch or 15 days from the date of submission of complete set of documentation whichever is later.
2) 15% of basic value (retention money), (excluding E&C charges) will be paid in 15 days from the date of submission of documents against supplementary invoice with proof of completion of E&C along with E & C charges (if any)

(b) SUPPLY WITH SUPERVISION OF E&C:

1) 90% basic value (excluding E&C charges) + 100% of taxes, duties and freight charges will be paid in 45 days from the date of dispatch or 15 days from the date of submission of complete set of documentation whichever is later.
2) 10% of basic value (retention money), (excluding E&C charges) will be paid in 15 days from the date of completion of erection and commissioning against supplementary invoice with proof of completion of E&C along with supervision charges (if any)

(c) SUPPLY ONLY:

1) 100% of PO value with taxes, duties and freight will be paid in 45 days from the date of dispatch or 15 days from the date of submission of complete set of documentation whichever is later.

Purchase orders for import procurement:

(d) SUPPLY WITH E&C:

1) 85% of the basic value (excluding E&C charges) will be paid in 45 days, against usance draft of 45 days, from the date of AWB/BOL on submission of complete set of documents.
2) 15% of basic value (retention money), (excluding E&C charges) will be paid in 15 days from the date of completion of E&C along with E & C charges against supplementary invoice with proof of completion of E&C (if any).

(e) SUPPLY WITH SUPERVISION OF E&C:

1) 90% of the value of the order will be paid on the 45th day, against usance draft of 45 days, from the date of AWB/BOL on submission of complete set of documents.
2) 10% of basic value (retention money) will be paid in 15 days from the date of completion of erection and commissioning against supplementary invoice with proof of completion of E&C along with supervision charges (if any).

(f) SUPPLY ONLY:

1) 100% of PO value will be paid against usance draft of 45 days from the date of dispatch or 15 days from the date of submission of complete set of documents whichever is later.

LOADING FACTORS FOR PAYMENT TERMS:

1) For offers received with requests for negotiation of documents through bank loading will be 15% of basic value (all bank charges to be borne by the seller).
(This loading factor is applicable only for purchase orders for indigenous supply).

2) In all cases where credit period is 30 days but not in line with the above mentioned standard payment terms offered loading applicable will be 5% of basic value.
(This loading factor is applicable only for purchase orders for indigenous supply).

3) For offers received with Letter of Credit payment term in place of sight draft payment term, loading applicable will be 5% of basic value. Additional loading of 5% will be applicable for payment terms as Letter of Credit with usance of less than 45 days.
(This loading factor is applicable only for purchase orders for imported supply).

4) For offers received with Sight Draft payment terms with usance of less than 45 days, loading of 5% will be applicable.
(This loading factor is applicable only for purchase orders for imported supply).

5) All payment terms with credit period of less than 30 days for indigenous supply and any other variation of payment terms are liable for rejection.

6) Standard payment terms indicated in para F (a), (b), (c), (d), (e) and (f) will not attract any loading.

Note 1: Basic value of Purchase Order mentioned above will include all components of the purchase order and will exclude only taxes, duties, freight and E&C charges (wherever applicable).

Wherever the Purchase Order is split into import portion and indigenous portion of supply the retention money will be 15% or 10% (as applicable) of both purchase order values put together.

Note 2: ***If the E&C could not be completed till the end of the Warranty period due to reasons not attributable to the supplier, BHEL may consider releasing the retention money to the supplier against Bank Guarantee for equivalent value valid for an initial period of one year.***

G. <u>Bank guarantee (BG) / Performance bank guarantee (PBG):</u>

1. Bank guarantee (BG) / Performance bank guarantee (PBG) will be applicable as called in the tender documents refer SCC. Such PBG shall be valid for a period as called in SCC for a value equal to 10 % of the basic value of the purchase order. No deviation for the duration of PBG / BG will be permitted.
    a. PBG shall be from any of the BHEL consortium of bankers **(refer Annexure VI)**.
    b. PBGs from nationalized banks are also acceptable.
    c. PBG should be sent directly by the bank to the dealing executive mentioned in the purchase order located at the address mentioned in the purchase order. PBG should be in the format indicated. **(Refer annexures VII & VIII respectively)**. No deviation to these formats will be allowed.
    d. Confirmation from any of the BHEL consortium of banks or any of the Indian Public Sector Banks is essential for the acceptance of PBGs issued by foreign banks (located outside India).
    e. Expired BGs / PBGs will be returned only after expiry of the claim period or on completion of the contractual obligation.
    f. Non acceptance for submission of PBG will attract loading as indicated below
        i. Loading will be equal to the percentage of value for which BG / PBG is not provided. (Ex: if PBG / BG is given for 3 % of the basic value against 10% specified, loading applicable will be 7% (10 – 3 = 7 %). This value will be added to the quoted price while evaluating the lowest offer.

H. <u>PROVISONS APPLICABLE FOR MSE VENDORS (MICRO AND SMALL ENTERPRISES)</u>

Vendors who qualify as MSE vendors are requested to submit applicable certificates (as specified by the Ministry of Micro, Small and Medium Enterprises) at the time of vendor registration. Vendors have to submit any of the following documents along with the tender documents in the Part I / Technical bid cover to avail the applicable benefits.

a. Valid NSIC certificate or
b. Entrepreneur's Memorandum part II (EM II) certificate (deemed valid for 2 years).
c. EM II certificate with CA certificate **(in the prescribed format given in Annexure IX)** applicable for the year certifying that the investment in plant and machinery of the vendor is within permissible limits as per the MSME Act 2006 for relevant status where the deemed validity is over.
d. Documents submitted for establishing the credentials of MSE vendors must be valid as on the date of part I / technical bid opening for the vendors to be eligible for the benefits applicable for MSE vendors. Documents submitted after the Part I / Technical bid opening date will not be considered for this tender.

<u>PURCHASE PREFERENCE FOR MSE VENDORS:</u>

e. MSE vendors quoting within a price band of L1 + 15% shall be allowed to supply up to 20% of the requirement against this tender provided
    1. The MSE vendor matches the L1 price
    2. L1 price is from a non MSE vendor
    3. L1 price will be offered to the nearest vendor nearest to L1 in terms of price ranking (L2 - nearest to L1). In case of non-acceptance by the MSE vendor (L2) next ranking MSE vendor will be offered who is within the L1 + 15% band (if L3 is also within 15% band).
    4. 20% of the 20% (i.e. 4% of the total enquired quantity) will be earmarked for SC/ST owned MSE firms provided conditions as mentioned in (1) and (2) are fulfilled.

5. In case no vendor under SC / ST category firms are meeting the conditions mentioned in (1) and (2) or have not participated in the tender, in such cases the 4% quantity will be distributed among the other eligible MSE vendors who have participated in the tender.
6. Serial no. 1 to 5 will not be applicable wherever it is not possible to split the tendered quantity / items on account of customer contract requirement, or the items tendered are systems. Such information that tendered quantity will not be split will be indicated in the SCC.

I. INTEGRITY COMMITMENT IN THE TENDER PROCESS, AND EXECUTION OF CONTRACTS:

1. Commitment by BHEL:

   BHEL commits to take all measures necessary to prevent corruption in connection with the Tender process and execution of the Contract. BHEL will, during the tender process, treat all bidder / suppliers in a transparent and fair manner, and with equity.

2. Commitment by Bidder(s)/ Contractor(s):

   a. The Bidder(s)/ Contractor(s) commit(s) to take all measures to prevent corruption and will not directly or indirectly try to influence any decision or benefit which he is not legally entitled to.
   b. The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding or any actions to restrict competition.
   c. The Bidder(s)/ Contractor(s) will not commit any offence under the relevant Acts. The Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain or pass on to others, any information or document provided by BHEL as part of business relationship.
   d. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract and shall adhere to the relevant guidelines issued from time to time by Government of India/ BHEL.

   If the Bidder(s) / Contractor(s), before award or during execution of the Contract commit(s) a transgression of the above or in any other manner such as to put his reliability or credibility in question, BHEL is entitled to disqualify the Bidder(s) / Contractor (s) from the tender process or terminate the contract and/ or take suitable action as deemed fit.

PURCHASE EXECUTIVE

ANNEXURE - I

LIST OF INTERNATIONAL GATEWAY AIRPORTS

For airbased consignment, terms of delivery will be on FCA basis from following listed airports only. This list is valid from 01.03.2013 to 28.02.2015.Vendors are requested to verify this list for use after 28.02.2015.

SCHEDULE NO	COUNTRY	CURRENCY CODE	AIRPORT
D01	UK	GBP	LONDON (HEATHROW)
D02	UK	GBP	NEW CASTLE
D03	UK	GBP	OXFORD. CHETLAM
D04	UK	GBP	BRISTOL. WELLINGBOROUGH
D05	UK	GBP	BIRMINGHAM
DO6	UK	GBP	EAST MIDLANDS
D07	UK	GBP	MANCHESTER
D08	UK	GBP	LEEDS
D09	UK	GBP	GLASGOW
D10	FRANCE	EURO	PARIS (ROISSY) & LYON
D11	SWEDEN	EURO	STOCKHOLM
D12	SWEDEN	EURO	GOTHENBERG & MALMO
D13	ITALY	EURO	ROMA, MILAN
D14	ITALY	EURO	TURIN, BOLOGNA, FLORENCE
D15	NETHERLANDS	EURO	AMSTERDAM, ROTTERDAM
D16	AUSTRIA	EURO	VIENNA, LINZ, GRAZ
D17	BELGIUM	EURO	ANTWERP, BRUSSELS
D18	DENMARK	DKK	COPENHAGEN
D19	JAPAN	JPY	TOKYO, OSAKA
D20	SINGAPORE	SGD	SINGAPORE
D21	CANADA	CAD	TORONTO
D22	CANADA	CAD	MONTREAL
D23	USA	USD	NEW YORK, BOSTON
D24	USA	USD	CHICAGO
D25	USA	USD	SAN FRANCISCO, LOS ANGELES
D26	USA	USD	ALANTA, HOUSTON
D27	GERMANY	EURO	MUNICH, KOLN, DUSSELDORF, HANNOVER, HAMBURG, STUTTGART, DAMSTADT, MANIHIEM, NURUMBERG
D28	GERMANY	EURO	FRANKFURT
D29	GERMANY	EURO	BERLIN
D30	SWITZERLAND	SFR	BASLE, ZURICH, GENEVA
D31	SPAIN	EURO	BARCELONA
D32	AUSTRALIA	AUD	SYDNEY
D33	AUSTRALIA	AUD	MELBOURNE
D34	AUSTRALIA	AUD	PERTH
D35	CZECH	EURO	PRAGUE
D36	HONG KONG	HKD	HONG KONG
D37	NEW ZELAND	NZD	AUCKLAND
D38	RUSSIA	USD	MOSCOW
D39	SOUTH KOREA	USD	KIMPO INTERNATIONAL, INCHEON
D40	FINLAND	EURO	HELSINKI
D41	ROMANIA	EURO	BUCHAREST
D42	NORWAY	EURO	OSLO
D43	IRELAND	EURO	DUBLIN
D44	ISRAEL	USD	TEL AVIV
D45	UAE	USD	DUBAI
D46	OMAN	USD	MUSCAT
D47	EGYPT	USD	CAIRO
D48	TAIWAN	USD	TAIPEI
D49	UKRAINE	USD	KIEV
D50	CHINA	USD	SHANGHAI, SHENZHEN
D51	PHILIPINES	USD	MANILA
D52	MALAYSIA	USD	KUALALUMPUR, PE NANG
D53	CYPRUS	USD	LARNACA
D54	SOUTH AFRICA	USD	JOHANNESBERG, DURBAN
D55	SLOVAKIA	EURO	BARTISLOVA
D56	SAUDI ARABIA	SAR	RIYADH
D57	TURKEY	EURO	ISTANBUL
D58	THAILAND	USD	BANGKOK
D59	BRAZIL	USD	SAO PAULO, RIO DE JANEIRO

ANNEXURE – II

DISCREPANCY IN WORDS & FIGURES – QUOTED IN PRICE BID

Following guidelines will be followed in case of discrepancy in words & figures-quoted in price bid:

(a) If, in the price structure quoted for the required goods/services/works, there is discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by the quantity), the unit price shall prevail and the total price corrected accordingly, 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 corrected accordingly.

(b) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected; and

(c) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject to (a) and (b) above.

(d) If there is such discrepancy in an offer, the same shall be conveyed to the bidder with target date upto which the bidder has to send his acceptance on the above lines and if the bidder does not agree to the decision of the purchaser, the bid is liable to be ignored.

ANNEXURE-III
GUIDELINES FOR REVERSE AUCTION PROCEDURE

Against this enquiry for the subject item/ system with detailed scope of supply as per enquiry specifications, BHEL may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit "online sealed bid" in the Reverse Auction. Non-submission of "online sealed bid" by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.
3. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.
4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.
5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.
6. Bidders have to fax the Compliance form before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.
7. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL" like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.
8. Reverse auction will be conducted on scheduled date & time.
9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.
10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, as provided on case-to-case basis to Service provider within two working days of Auction without fail.
11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.
12. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the "Business Rules of Reverse Auction", which will be communicated before the Reverse Auction.
13. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action as per extant BHEL guidelines, shall be initiated by BHEL and the results of the RA scrapped/ aborted.
14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
15. In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

16. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.

Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'Process compliance form' (to the designated service provider) as well as 'Online sealed bid' in the Reverse Auction. Non-submission of 'Process compliance form' or 'Online sealed bid' by the agreed bidder(s) will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).

The bidders have to necessarily submit online sealed bid less than or equal to their envelope sealed price bid already submitted to BHEL along with the offer. ***The envelope sealed price bid of successful L1 bidder in RA, if conducted, shall also be opened after RA and the order will be placed on lower of the two bids (RA closing price & envelope sealed price) thus obtained. The bidder having submitted this offer specifically agrees to this condition and undertakes to execute the contract on thus awarded rates.***

If it is found that L1 bidder has quoted higher in online sealed bid in comparison to envelope sealed bid for any item(s), the bidder will be issued a warning letter to this effect. However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com)."

As a reminder to the bidders, system will flash following message (in RED Color) during the course of 'online sealed bid':

"Bidders to submit online sealed bid less than or equal to their envelope sealed bid already submitted to BHEL"

ANNEXURE - IV

Electronic Funds Transfer (EFT) OR

Paylink Direct Credit Form

Please Fill up the form in **CAPITAL LETTERS** only.

TYPE OF REQUEST(Tick one): _____ CREATE _____ CHANGE

BHEL Vendor / Supplier Code:

Company Name :

Permanent Account Number(PAN):

Address

City: PINCODE STATE

Contact Person(s)

Telephone No:

Fax No:

e-mail id:

1 Bank Name:

2 Bank Address:

3 Bank Telephone No:

4 Bank Account No:

5 Account Type: Savings/Cash Credit

6 9 Digit Code Number of Bank and branch appearing on MICR cheque issued by Bank

7 Bank IFSC Code(applicable for NEFT)

8 Bank IFSC code(applicable for RTGS) (Indian Financial System Code)

A I hereby certify that the particulars given above are true, correct and complete and that I, as a representative for the above named Company, hereby authorise BHEL, EDN, Bangalore to electronically deposit payments to the designated bank account.

B If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information, I would not hold BHEL / transfering Bank responsible.

C This authority remains in full force until BHEL, EDN,Bangalore receives written notification requesting a change or cancellation.

D I have read the contents of the covering letter and agree to discharge the responsibility expected of me as a participant under ECS / EFT.

Date:

Authorised Signatory:

Designation: Telephone No. with STD Code

Company Seal

Bank Certificate

We certify that_____has an Account No_____ with us and we confirm that the bank details given above are correct as per our records.

Date: (……...)

Place: Signature

Please return completed form **along with a blank cancelled cheque or photocopy** thereof to:

Bharath Heavy Electricals Ltd,

Attn:

Electronics Division, Mysore Road,

BANGALORE - 560 026

In case of any Querry, please call concerned purchase executive.

ANNEXURE - V
PRESENT PROCEDURE FOR SALE IN TRANSIT (HIGH SEA SALES)

In case of High Sea Sales, vendor should submit following documents:

1. **ORIGINAL HIGH SEA SALES AGREEMENT**
   - Sale agreement (on Rs. 200/- non-judicial stamp paper & notarised with 2 witnesses with identity) has to be signed between BHEL and the Party importing material. The date of the sale documents should be in between the date of House Air Way Bill / Bill of Lading and before landing of the goods in Indian origin.
   - The date of the stamp paper should be prior to the Air Way Bill / Bill of Lading date.
   - Following shall be included in the High Sea Sales Agreement:
     "THE BUYER ALSO UNDERTAKE DISCHARGES, THE OBLIGATION AND FULFILLMENT OF CONDITIONS, IF ANY, ATTACHED TO THE IMPORTATION, ASSESSMENT AND CLEARANCE OF THE GOODS IN TERMS CUSTOMS TARIFF ACT 1975, THE CUSTOMS ACT 1962 & RULES & REGULATIONS MADE THERE UNDER AND OTHER RELEVANT ACTS, ORDERS, NOTIFICATIONS**".**

2. **ORIGINAL INVOICES: INDIGENOUS RUPEE INVOICE & FOREIGN CURRENCY INVOICE**
   - Prices should be C.I.F., designated airport/seaport basis.
   - I.E.C., C.S.T., K.S.T. Nos. to be mentioned.
   - Description of item (Nomenclature), Unit & Quantity in both the Foreign Currency & the Indigenous Invoice in Rupee shall be exactly as per Purchase Order Description of item, Quantity and Unit. The Indigenous Invoice value shall be exactly as per Purchase Order value.
   - Seller should give Foreign Currency Invoice from the original consignor. The Foreign Currency Invoice value should be at least 2% (two per cent) less than the Indigenous Rupee Invoice value in equivalent foreign currency.

4. **ORIGINAL HOUSE AIR WAY BILL/ BILL OF LADING**
   - The sale agents should duly endorse House Air Way Bill (HAWB) for air shipments or original Bill of Lading (O.B.L.) for sea shipments and Foreign Currency Invoice in favour of BHEL-EDN.

5. **ORIGINAL CARGO ARRIVAL NOTICE FROM FORWARDER**.

6. **ORIGINAL DELIVERY ORDER ISSUED IN NAME OF BHEL-EDN.**

7. **ORIGINAL PACKING LIST.**

8. **A LETTER TO THE COMMISSIONER OF CUSTOMS FOR EFFECTING ABOVE SALE.**

9. **A LETTER TO THE DEPUTY ASSESSOR (OCTROI) FOR EFFECTING ABOVE SALE IN FAVOUR OF BHEL**.

REMARKS: In case vendor needs any clarifications on the above, the same may be sought in writing.

Annexure-VI
BHEL MEMBER BANKS (LIST OF CONSORTIUM BANKS)

BANK GUARANTEE (BG) SHALL BE ISSUED FROM THE FOLLOWING BANKS ONLY:

	Nationalised Banks		**Nationalised Banks**
1	Allahabad Bank	19	Vijaya Bank
2	Andhra Bank		**Public Sector Banks**
3	Bank of Baroda	20	IDBI
4	Canara Bank		**Foreign Banks**
5	Corporation Bank	21	CITI Bank N.A
6	Central Bank	22	Deutsche Bank AG
7	Indian Bank	23	The Hongkong and Shanghai Banking Corporation Ltd. (HSBC)
8	Indian Overseas Bank	24	Standard Chartered Bank
9	Oriental Bank of Commerce	~~25~~	~~The Royal Bank of Scotland N.V.~~
10	Punjab National Bank	26	J P Morgan
11	Punjab & Sindh Bank		**Private Banks**
12	State Bank of India	27	Axis Bank
13	State Bank of Hyderabad	28	The Federal Bank Limited
14	Syndicate Bank	29	HDFC Bank
15	State Bank of Travancore	30	Kotak Mahindra Bank Ltd
16	UCO Bank	31	ICICI Bank
17	Union Bank of India	32	IndusInd Bank
18	United Bank of India	33	Yes Bank

Note:

- All BGs must be issued from BHEL consortium banks listed above.
- BHEL may accept BG from other Nationalised Banks also which are not listed above.
- BG will not be accepted from Scheduled Banks and Co-operative Banks.
- In case BG is issued from a bank located outside Indian territory and is issued in foreign currency, the BG must be routed through and confirmed by any one of the above mentioned consortium banks or any of the Indian Public Sector Banks.
- This list is subject to changes. Hence vendors are requested to check this list every time before issuing BGs.

ANNEXURE-VII

BANK GUARANTEE FOR PERFORMANCE SECURITY

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of the Bharat Heavy Electricals Limited [1] (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at _____ through its Unit at……..(name of the Unit) having awarded to (Name of the Vendor / Contractor / Supplier) having its registered office at_____[2] hereinafter referred to as the 'Contractor/Supplier', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No……dated ……[3] valued at Rs……[4] (Rupees ----------)/FC……(in words……..) for ……[5] (hereinafter called the 'Contract') and the Contractor having agreed to provide a Contract Performance Guarantee, equivalent to ……% (…. Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

we, ……, (hereinafter referred to as the Bank), having registered/Head office at ……. and inter alia a branch at …… being the Guarantor under this Guarantee, hereby, irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer a maximum amount Rs ---------- (Rupees ----------) without any demur, immediately on a demand from the Employer, .
Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____ _____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor/ Supplier in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment thereunder and the contractors/supplier shall have no claim against us for making such payment.

We the ……bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

We …….. BANK further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Contractor/Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Contractor/Supplier and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor/Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Contractor/Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

This Guarantee shall remain in force upto and including…….. [6] and shall be extended from time to time for such period as may be desired by Employer.
This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor/Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writing on or before the ……[7]we shall be discharged from all liabilities under this guarantee thereafter.

We, …… BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.
Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed…… [8]
b) This Guarantee shall be valid up to ……[9]

c) Unless the Bank is served a written claim or demand on or before _____[10] all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of
(Name of the Bank)

Dated…….
Place of Issue…….

[1] *NAME AND ADDRESS OF EMPLOYER I.e Bharat Heavy Electricals Limited*

[2] *NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.*

[3] *DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE*

[4] *PROJECT/SUPPLY DETAILS*

[5] *BG AMOUNT IN FIGURES AND WORDS*

[6] *VALIDITY DATE*

[7] *DATE OF EXPIRY OF CLAIM PERIOD*

[8] *BG AMOUNT IN FIGURES AND WORDS.*

[9] *VALIDITY DATE*

[10] *DATE OF EXPIRY OF CLAIM PERIOD*

ANNEXURE-VIII

Note for performance bank guarantee:

1. To be executed in Rs. 100/- Non-Judicial stamp paper.
2. To be submitted by issuing bank to Purchase Dept. directly. Please give BHEL address to banker.
3. Do not enclose with Bank document.
4. Modifications and additions/deletions to this BG format shall not be permitted.
5. **In Case of Bank Guarantees submitted by Foreign Vendors-**

   a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.

   b. **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**

   b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.

   b.2 **In case, Foreign Vendors intend to provide BG from** Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.

   b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.

   b.4 The BG should clearly specify that the demand or other document can be presented in electronic form.

Annexure - IX
Certificate by Chartered Accountant on Letter Head

This is to certify that M/s …….……. …… ……(Hereinafter referred to as `Company') having its registered office at ……. is registered under MSMED Act 2006, (Entrepreneur Memorandum No (Part-II …… dtd …… Category: …… (Micro/Small). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as on date**…….. as per MSMED Act 2006 is as follows:**

1. **For Manufacturing Enterprises:** Investment in plant and machinery (i.e., original cost excluding land and building and the items specified by the Ministry of Small Industries vide its notification No.S.O.1722 (E) dated October 5, 2006:

2. **For Service Enterprises:** Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:
   Rs. …….Lacs.

The above investment of Rs. …… Lacs in within permissible limit of Rs…… Lacs for…….Micro / Small (Strike off which is not applicable) Category under MSMED Act 2006.

Date:

(Signature)

Name -
Membership Number -
Seal of Chartered Accountant

Guidelines for Indian Agents

ANNEXURE - X

- Definition of Indian Agent: An Indian Agent of foreign prinicipal is an individual, a partnership, an association of persons, a private or pubile company, that carries our specific obligation(s) towards processing of BHEL tender or finalization or execution of BHEL's contract on behalf of the foreign supplier.

In case of yes, vendor to note the following and reply accordingly:

i. BHEL shall deal directly with foreign vendors, wherever required, for procurement of goods. However, if the foreign principal desires to avail of the services of an Indian agent, then the foreign principal should ensure compliance to regulatory guidelines - which require mandatory submission of an Agency Agreement.

ii. It shall be incumbent on the Indian agent and the foreign principal to adhere to the relevant guidelines of Government of India, issued from time to time.

iii. The Agency Agreement should specify the precise relationship between the foreign OEM / foreign principal and their Indian agent and their mutual interest in the business. All services to be rendered by agent/ associate, whether of general nature or in relation to the particular contract, must be clearly stated by the foreign supplier/ Indian agent. Any payment, which the agent or associate receives in India or abroad from the OEM, whether as commission or as a general retainer fee should be brought on record in the Agreement and be made explicit in order to ensure compliance to laws of the country.

iv. Any agency commission to be paid by BHEL to the Indian agent shall be in Indian currency only.

v. Tax deduction at source is applicable to the agency commission paid to the Indian agent as per the prevailing rules.

vi. In the absence of any agency agreement, BHEL shall not deal with any Indian agent (authorized representatives / associate / consultant, or by whatever name called) and shall deal directly with the foreign principal only for all correspondence and business purposes.

vii. The "Guidelines for Indian Agents of Foreign Suppliers" enclosed at annexure –'A' shall apply in all such cases.

viii. The supply and execution of the Purchase Order (including indigenous supplies/ service) shall be in the scope of the OEM/ foreign principal. The OEM/ foreign principal should submit their offer inclusive of all indigenous supplies/ services and evaluation will be based on 'total cost to BHEL'. In case OEM/ foreign principal recommends placement of order(s) towards indigenous portion of supplies/ services on Indian supplier(s)/ agent on their behalf, the credentials/ capacity/ capability of the Indian supplier(s)/ agent to make the supplies/ services shall be checked by BHEL as per the extant guidelines of Supplier Evaluation, Approval & Review Procedure (SEARP), before opening of price bids. In this regard, details may be checked as per Annexure-B (copy enclosed). It will be the responsibility of the OEM/ foreign principal to get acquainted with the evaluation requirements of Indian supplier/ agent as per SEARP available on www.bhel.com.

The responsibility for successful execution of the contract (including indigenous supplies/ services) lies with the OEM/ foreign principal. All bank guarantees to this effect shall be in the scope of the OEM/ foreign principal.

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Vendor's Signature with Seal

Annexure-A

Guidelines for Indian Agents of Foreign Suppliers

1.0 There shall be compulsory registration of agents for all Global (Open) Tender and Limited Tender. An agent who is not registered with BHEL shall apply for registration in the registration form in line with SEARP.

1.1 Registered agents will file an authenticated Photostat copy duly attested by a Notary Public/Original certificate of the Principal confirming the agency agreement and giving the status being enjoyed by the agent and the commission/ remuneration/ salary/ retainership being paid by the principal to the agent before the placement of order by BHEL.

1.2 Wherever the Indian representatives have communicated on behalf of their principals and the foreign parties have stated that they are not paying any commission to the Indian agents, and the Indian representative is working on the basis of salary or as retainer, a written declaration to this effect should be submitted by the party (i.e. Principal) before finalizing the order.

2.0 Disclosure of particulars of agents/ representatives in India, if any.

2.1 Tenderers of Foreign nationality shall furnish the following details in their offers:

2.1.1 The Bidder(s)/ Contractor(s) of foreign origin shall disclose the name and address of the agents/ representatives in India if any and the extent of authorization and authority given to commit the Principals. In case the agent/ representative be a foreign Company, it shall be confirmed whether it is existing Company and details of the same shall be furnished.

2.1.2 The amount of commission/ remuneration included in the quoted price(s) for such agents/ representatives in India.

2.1.3 Confirmation of the Tenderer that the commission/ remuneration, if any, payable to his agents/ representatives in India, may be paid by BHEL in Indian Rupees only.

2.2 Tenderers of Indian Nationality shall furnish the following details in their offers:

2.2.1 The Bidder(s)/ Contractor(s) of Indian Nationality shall furnish the name and address of the foreign principals, if any, indicating their nationality as well as their status, i.e. whether manufacturer or agents of manufacturer holding the Letter of Authority of the Principal specifically authorizing the agent to make an offer in India in response to tender either directly or through the agents/ representatives.

2.2.2 The amount of commission/ remuneration included in the price (s) quoted by the Tenderer for himself.

2.2.3 Confirmation of the foreign principals of the Tenderer that the commission/ remuneration, if any, reserved for the Tenderer in the quoted price(s), may be paid by BHEL in India in equivalent Indian Rupees on satisfactory completion of the Project or supplies of Stores and Spares in case of operation items.

2.3 In either case, in the event of contract materializing, the terms of payment will provide for payment of the commission/ remuneration, if any payable to the agents/ representatives in India in Indian Rupees on expiry of 90 days after the discharge of the obligations under the contract.

2.4 Failure to furnish correct and detailed information as called for in paragraph 2.0 above will render the concerned tender liable to rejection or in the event of a contract materializing, the same liable to termination by BHEL. Besides this there would be a penalty of banning business dealings with BHEL or damage or payment of a named sum.

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Disclaimer Certificate For Deemed Export Benefits

I, (Name & Designation) …..on behalf of M/s. ….. (Name and address of the supplier) hereby certify that we have supplied the following goods to M/s….. (Name and address of the recipient):

S.No.	Inv. No. & date	Description of goods	Unit	Qty.	Value

1. We are the manufacturer exporters/suppliers and are registered/not registered with Central Excise and have not availed and will not avail CENVAT facility in respect of the input/components used in aforesaid supplies. We have also not availed and will not avail rebate on the inputs/components used in aforesaid supplies.

OR

We are the suppliers and our supporting manufacturer(s) is/are registered/not registered with Central Excise and have not availed and will not avail CENVAT facility in respect of the inputs/components used in aforesaid supplies.

2. We also certify that we have not been issued any Advance Authorization/Duty Free Import Authorization in respect of the aforesaid supplied goods and have not availed any benefit thereon.

3. We further state that we have not drawn nor will draw any benefit for deemed export and we have no objection if M/s…… (Name and address of the recipient) draws the deemed export benefits on the supplies mentioned above. (Required to be given in case benefits are claimed by recipient of goods).

OR

We have not given disclaimer certificate to M/s…… (Name and address of the recipient) and will not give disclaimer certificate, in future, in respect of these supplies for claiming deemed export benefits (Required to be given in case benefits are claimed by DTA suppliers).

Annexure-XII
High sea sales payment term:

"Purchase Orders for HSS procurement

(a) SUPPLY WITH E&C:

85% basic value will be paid in 45 days from the date of signing of High Sea Sale agreement or 15 days from the date of submission of complete set of documentation whichever is later. 15% of basic value (retention money), will be paid in 15 days from the date of completion of erection and commissioning against supplementary invoice with proof of completion of E&C

(b) SUPPLY WITH SUPERVISION OF E&C:

90% basic value will be paid in 45 days from the date of signing of High Sea Sale agreement or 15 days from the date of submission of complete set of documentation whichever is later. 10% of basic value (retention money), will be paid in 15 days from the date of completion of Supervision of erection and commissioning against supplementary invoice with proof of completion of E&C

(c) SUPPLY ONLY:

100% basic value will be paid in 45 days from the date of signing of High Sea Sale agreement or 15 days from the date of submission of complete set of documentation whichever is later.

LOADING FACTORS FOR PAYMENT TERM:

In all cases where credit period is 30 days with the above offered standard payment terms, loading applicable will be 5% of basic value.

All payment terms with credit period of less than 30 days and any other variation of payment terms are liable for rejection."

GUIDELINES FOR QUOTING IN E-PROCUREMENT SYSTEM

1. **Vendor to quote for optional services also as per BOM of scope of services in respective project specification. Evaluation and ranking will be done including optional services also.**
2. **Total quantity required for each item for all projects is mentioned in EPS portal. However quantity of each item required for each project is mentioned in request for quotation given with tender documents.**
3. Vendor is requested to fill up the "Global Discount" column of the e-tender price bid if any discount to be offered for consideration of price evaluation. Discount mentioned anywhere else will deemed to be invalid.
4. Price quoted by vendors in the EPS portal price bid will be final and other price quoted anywhere else in the attachment will deemed to be invalid.
5. Final comparative statement will subject to evaluation considering the other price impacts like loading factor and project benefits (refer attached special commercial conditions for project benefit).
6. Any technical or commercial clarification for this tender can be raised on or before 30.01.2017. No clarification will be entertained by BHEL after given cutoff date.
7. Applicable special commercial condition for the tender is attached along with tender documents. Submit duly filled and signed SCC along with your offer. Commercial terms quoted in SCC only will be considered for evaluation.
8. Any deviation in commercial terms, if sought by any vendor, should be clearly brought out in SCC. Any commercial term deviation mentioned anywhere else shall be ignored and not be considered for evaluation.
9. Sufficient time has been given to vendors for quoting in EPS. However If any new vendor is not having Digital Signature Certificate (Signing + Encryption) and willing to participate in the tender, vendor need to inform BHEL at least before four days of due date for tender submission and request BHEL for extension of due date. Vendor has to submit the proof of application for getting new DSC and expected date of getting new DSC. Based on the above BHEL will take suitable action. If any vendor is requesting for due date extension for getting fresh DSC and not quoting for the tender even after due date extension, it will be viewed seriously by BHEL.
10. Evaluation methodology:

    a. Bidder's PQR bid only will be opened first for review and evaluation by BHEL. In case the bidders offer do not meet the PQR, then corresponding techno-commercial offer will not be considered for further evaluation in the tender. Technical bids of ONLY those bidders who meet PQR shall be opened for review and further consideration. Offer of only those supplier who qualify in techno-commercial bid will be considered for price bid opening.
    b. Above guideline does not prohibit any vendor to submit their offer along with clause wise deviation from the specification/commercial terms in SCC. Changes, if any, in technical specification / Scope etc shall be informed to Participating bidders only.

Annexure for Freight and E&C charge

Sl No.	Project	Freight Charge	E&C Charge (Refer scope of services in specification)	Remarks
1	FGUTPP-IV UNCHAHAR (1X500MW)			Breakup to be given for services as separate attachment as per specification
2	GADARWARA (2X800 MW)			Breakup to be given as separate attachment as per specification
3	NTPC- NABINAGAR STN C&I			Breakup to be given as separate attachment as per specification
4	NTPC- NABINAGAR SG			Breakup to be given as separate attachment as per specification
5	NORTH KARANPURA (3X660MW)			Breakup to be given as separate attachment as per specification
6	PARBATI-II (4X200MW)			Breakup to be given as separate attachment as per specification
7	KOTHAGUDEM (1X800MW)			Breakup to be given as separate attachment as per specification
8	SURATHGARH UNIT 7&8			Breakup to be given as separate attachment as per specification
	Total			

NOTE

1 'Total of Freight charge and E&C charge for all project is only to be put in EPS. Vendors have to mandatorily give breakup for freight charge and E&C charge for each project in attachment to price bid.

Vendor signature and seal