



## **7.1..2 Energy – Conservation and Alternate Sources**

***GOVERNMENT COLLEGE FOR WOMEN***

***UNDER GOVERNMENT OF KERALA***

***VAZHUTHACAUD, THIRUVANANTHAPURAM, KERALA - 695014***

***Reaccredited by NAAC with 'A' Grade***

***Affiliated to University of Kerala***

KERALA PUBLIC WORKS (ELECTRICAL) DEPARTMENT

Accepted Shedule

1

Name of work:- **Government Women's college, Thiruvananthapuram- Asset maintenance of Botany, Zoology, Chemistry, Psychology, Statistics, Music, Home Science Department buildings, main building, Assembly Hall, and connected works.- Electrical works**

Sl No	Qty	Specification	Unit	Rate	Words	Amount
1		Maintenance to EI				
1.01	60	point 90.2.1.1 : Supply and wiring points according to IS 732-1989 using rigid PVC conduit of minimum size 20 mm with specials conforming to IS 9537 part III 1983 and with suitable size specials conforming to IS 3419-1988, fixing the conduit using metal saddles spacing not exceeding 50 cm or concealed suitably and with 1.00 sq mm FRLS PVC insulated stranded single core copper conductor cable 650V grade, including providing switch board main and continuous earthing with No.14 SWG bare copper,required quantity of copper earth socket, brass bolt and nut crimping/ soldering etc complete with suitable size modular type metal switch boxes, modular type front plates (white) etc. up to and including 6A modular type SP switches and making good the surface of wall, colour washing etc. complete. All the terminations in the switch boards and DB's shall be tinned and the wires shall be drawn and fixed along the periphery of the box using suitable ties, tie mounts etc as required. (RoHS compliant modular accessories).Single Control light point with 6A, plate ceiling rose - Short point	point		Rupees Eight Hundred Seventy Seven 877.17 & Paise Seventeen Only	52,630.20
1.02	204	point 90.2.1.3 : Supply and wiring points according to IS 732-1989 using rigid PVC conduit of minimum size 20 mm with specials conforming to IS 9537 part III 1983 and with suitable size specials conforming to IS 3419-1988, fixing the conduit using metal saddles spacing not exceeding 50 cm or concealed suitably and with 1.00 sq mm FRLS PVC insulated stranded single core copper conductor cable 650V grade, including providing switch board main and continuous earthing with No.14 SWG bare copper,required quantity of copper earth socket, brass bolt and nut crimping/ soldering etc complete with suitable size modular type metal switch boxes, modular type front plates (white) etc. up to and including 6A modular type SP switches and making good the surface of wall, colour washing etc. complete. All the terminations in the switch boards and DB's shall be tinned and the wires shall be drawn and fixed along the periphery of the box using suitable ties, tie mounts etc as required. (RoHS compliant modular accessories).Single control light point without ceiling rose - Short point	point		Rupees Eight Hundred Twenty Five 825.55 & Paise Fifty Five Only	1,68,412.20
1.03	12	point 90.2.1.4 : Supply and wiring points according to IS 732-1989 using rigid PVC conduit of minimum size 20 mm with specials conforming to IS 9537 part III 1983 and with suitable size specials conforming to IS 3419-1988, fixing the conduit using metal saddles spacing not exceeding 50 cm or concealed suitably and with 1.00 sq mm FRLS PVC insulated stranded single core copper conductor cable 650V grade, including providing switch board main and continuous earthing with No.14 SWG bare copper,required quantity of copper earth socket, brass bolt and nut crimping/ soldering etc complete with suitable size modular type metal switch boxes, modular type front plates (white) etc. up to and including 6A modular type SP switches and making good the surface of wall, colour washing etc. complete. All the terminations in the switch boards and DB's shall be tinned and the wires shall be drawn and fixed along the periphery of the box using suitable ties, tie mounts etc as required. (RoHS compliant modular accessories).Single control ceiling fan point with 6 A. 3 plate ceiling rose & with socket size stepped electronic regulator - Short point	point		Rupees One Thousand Three Hundred Seventy Three & Paise Forty 1.373.48 Eight Only	16,481.76

1.04	26	each	90.2.1.6 : Supply and wiring points according to IS 732-1989 using rigid PVC conduit of minimum size 20 mm with specials conforming to IS 9537 part III 1983 and with suitable size specials conforming to IS 3419-1988, fixing the conduit using metal saddles spacing not exceeding 50 cm or concealed suitably and with 1.00 sq mm FRLS PVC insulated stranded single core copper conductor cable 650V grade, including providing switch board main and continuous earthing with No.14 SWG bare copper, required quantity of copper earth socket, brass bolt and nut crimping/ soldering etc complete with suitable size modular type metal switch boxes, modular type front plates (white) etc. up to and including 6A modular type SP switches and making good the surface of wall, colour washing etc. complete. All the terminations in the switch boards and DB's shall be tinned and the wires shall be drawn and fixed along the periphery of the box using suitable ties, tie mounts etc as required. (RoHS compliant modular accessories). Combined plug point with 6 A, 5 pin plug socket controlled by 6 A, switch in the same switch board as that of light points	each	Rupees Four Hundred Thirty Nine & 439.27 Paise Twenty Seven Only	11,421.02
1.05	85	each	90.2.1.7 : Supply and wiring points according to IS 732-1989 using rigid PVC conduit of minimum size 20 mm with specials conforming to IS 9537 part III 1983 and with suitable size specials conforming to IS 3419-1988, fixing the conduit using metal saddles spacing not exceeding 50 cm or concealed suitably and with 1.00 sq mm FRLS PVC insulated stranded single core copper conductor cable 650V grade, including providing switch board main and continuous earthing with No.14 SWG bare copper, required quantity of copper earth socket, brass bolt and nut crimping/ soldering etc complete with suitable size modular type metal switch boxes, modular type front plates (white) etc. up to and including 6A modular type SP switches and making good the surface of wall, colour washing etc. complete. All the terminations in the switch boards and DB's shall be tinned and the wires shall be drawn and fixed along the periphery of the box using suitable ties, tie mounts etc as required. (RoHS compliant modular accessories). Independent plug - Short point	each	Rupees Five Hundred Eighty Five & 585.24 Paise Twenty Four Only	49,745.40
1.06	22	each	90.3.10 : Supplying and providing extra H.G conduit down rod of 19 mm dia 2 x 1.00 m long with 16/0.20 mm 3 core copper conductor flex wire conforming to relevant ISS or with the extended original wiring and giving connection etc. as required.	each	Rupees Two Hundred Eighty One & 281.27 Paise Twenty Seven Only	6,187.94
1.07	70	each	90.3.19.4 : 1200 mm 2X20W LED Lamp with box type fixture	each	Rupees One Thousand Seven Hundred Forty Nine & Paise Seventy 1,749.79 Nine Only	1,22,485.30
1.08	473	each	90.3.20.3 : Supply & installation of light fittings on TW round block Supply, conveyance installation testing and commissioning the light fittings of following types made of CRCA with 0.5mm thickness complete with all accessories and lamps etc. directly on wall or ceiling with PVC round block neatly painted to suit the fitting and giving connection with required length of 16/0.20mm 3 core copper conductor flex wire conforming to relevant ISS and giving connections as required. 1200 mm 1X20W LED Lamp with box type fixture	each	Rupees One Thousand Two Hundred 1,211.03 Eleven & Paise Three Only	5,72,817.19
1.09	73	each	90.3.24.3 : Supply & installation of light fittings suspended on ball & socket arrangement with 19 mm down rod Supply, conveyance, installation, testing and commissioning the light fittings of following types made of .5mm thick CRCA sheet accessories and lamps etc. including supplying and fixing ball and socket arrangements on PVC round block, suspension down rod of 19mm dia MS conduit up to 2x30cm length including painting and wiring the down rod with 16/0.20mm 3 core round copper conductor flex wire conforming to relevant ISS or extending the original wiring and giving connections etc. a required. 1200 mm 1X20W LED Lamp with box type fixture	each	Rupees One Thousand Four Hundred 1,444.79 Forty Four & Paise Seventy Nine Only	1,05,469.67

1.1	20	each	od79309/2020_2021 : Supply, conveyance, installation, testing and commissioning Recessed Mounted GreenSquare Philips Make LED Light Fittings RC 140B LED30S-6500 PSU WH 220-240V 50HZ lamp,suitable for 600x600 mm square grid including supply and providing suitable lamps and giving connections with the extended original wiring etc. as required .	each	4,147.91	Rupees Four Thousand One Hundred Forty Seven & Paise Ninty One Only	82,958.20
1.11	8	each	od80320/2020_2021 : Supply, conveyance, installation, testing and commissioning Recessed Mounted FullGlow panel Philips Make LED Light Fittings RC 380B LED -30S/6500 G4 L60 W60 PSU OD light fitting suitable for 600x600 mm square grid or in existing chain and giving connections with the extended original wiring etc. as required. (Excluding GST)	each	4,268.86	Rupees Four Thousand Two Hundred Sixty Eight & Paise Eighty Six Only	34,150.88
1.12	910	each	od67461/2020_2021 : Supply and renewing Essential LED tube light 1200mm 20W 865 T8 IND 1 ( Excluding GST)	each	374.67	Rupees Three Hundred Seventy Four & Paise Sixty Seven Only	3,40,949.70
1.13	40	each	90.4.5.2 : Supply, conveyance, installation, testing and commissioning of ceiling fans of the following sizes using standard accessories excluding resistance type regulator, wiring the down rod with 16/0.20mm PVC insulated and PVC sheathed 650/1100V grade 3 core round copper conductor flex wire or with extended original wiring etc. as required.1200mm sweep -5star rated ceiling fan complete with 300mm down rod , canopies, shackeles and blades and resistance type regulator working on 230V/240V single phase A/C	each	1,862.03	Rupees One Thousand Eight Hundred Sixty Two & Paise Three Only	74,481.20
1.14	120	each	1.48 : Supplying and fixing extra conduit down rod of 20 cm length G.I. pipe 15 mm dia, heavy gauge including painting etc. as required. (Note : More than 5 cm length shall be rounded to the nearest 10 cm and 5 cm or less shall be ignored)	each	34.48	Rupees Thirty Four & Paise Forty Eight Only	4,137.60
1.15	20	each	od79521/2020_2021 : Supply, conveyance, installation, testing and commissioning of 400mm sweep wall fan ( Excluding GST)	each	1,786.06	Rupees One Thousand Seven Hundred Eighty Six & Paise Six Only	35,721.20
1.16	20	each	od76728/2020_2021 : Supply,Conveyance,installation ,testing and commissioning of 36/40 W, 4000 lumen LED, IP 66 street light fitting with aluminium housing, stove enameled CRCA sheet steel reflector cover, acrylic cover complete with THD <10%, power factor >0.98, RoHS compliant, duly wired up for use on 230 V AC supply,n the existing GI pipe and giving connections as required. (Crompton.osram.Baiai Havells or its equivalent)(Excluding GST)	each	4,575.11	Rupees Four Thousand Five Hundred Seventy Five & Paise Eleven Only	91,502.20
1.17	12	each	90.15.4.3 : Supply Conveyance, installation, testing and commissioning of 70W LED street light output greater than 105lumen/W 4000-6000 K with IP 66 protection LED Chip make Cree/Lumilled/Nichea with power factor greater than 0.95 at full load, internal surge protection up to 8 KV,and Aluminium pressure die-cast Powder coated housing,acrylic cover complete with THD Less than 10%, power factor greater than 0.98, RoHS compliant, duly wired up for use on 230 V AC supply. Driver compartment should be seperatly accessible for maintenance (LM 79&80 certificates from NABL accredited Third party lab to be produced mentioning chip manufacturer)	each	7,418.72	Rupees Seven Thousand Four Hundred Eighteen & Paise Seventy Two Only	89,024.64
1.18	110	metre	90.6.4.3 : Supply and drawing 650/1100 V grade FRLS PVC insulated stranded single core copper conductor cables conforming to IS 694 part I 1990 in the existing surface / recess conduit as required including giving necessary connections of the following sizes.1.00 sq.mm 3 Run	metre	83.97	Rupees Eighty Three & Paise Ninty Seven Only	9,236.70
1.19	135	metre	1.17.6 : Supplying and drawing following sizes of FRLS PVC insulated copper conductor, single core cable in the existing surface / recessed steel/ PVC conduit as required.6 x 1.5 sq. mm	metre	132.41	Rupees One Hundred Thirty Two & Paise Forty One Only	17,875.35

1.2	32	metre	1.17.15 : Supplying and drawing following sizes of FRLS PVC insulated copper conductor, single core cable in the existing surface / recessed steel/ PVC conduit as required.6 x 2.5 sq. mm	metre	201.38	Rupees Two Hundred One & Paise Thirty Eight Only	6,444.16
1.21	310	metre	1.17.3 : Supplying and drawing following sizes of FRLS PVC insulated copper conductor, single core cable in the existing surface / recessed steel/ PVC conduit as required.3 X 1.5 sq.mm	metre	68.97	Rupees Sixty Eight & Paise Ninty Seven Only	21,380.70
1.22	600	metre	1.17.12 : Supplying and drawing following sizes of FRLS PVC insulated copper conductor, single core cable in the existing surface / recessed steel/ PVC conduit as required.3 x 2.5 sq. mm	metre	103.45	Rupees One Hundred Three & Paise Forty Five Only	62,070.00
1.23	163	metre	1.17.21 : Supplying and drawing following sizes of FRLS PVC insulated copper conductor, single core cable in the existing surface / recessed steel/ PVC conduit as required.3 x 4 sq. mm	metre	153.10	Rupees One Hundred Fifty Three & Paise Ten Only	24,955.30
1.24	405	metre	1.20.1 : Supplying and fixing of following sizes of steel conduit along with accessories in surface/recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required.20 mm	metre	173.79	Rupees One Hundred Seventy Three & Paise Seventy Nine Only	70,384.95
1.25	115	metre	1.20.2 : Supplying and fixing of following sizes of steel conduit along with accessories in surface/recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required.25 mm	metre	202.76	Rupees Two Hundred Two & Paise Seventy Six Only	23,317.40
1.26	40	each	90.10.1.3 : Supply & Fixing the following types/ sizes of boxes suitable for modular accessories in surface/ recess including making good the damages, colour washing etc as required (RoHS compliant )3 module moulded plastic box on surface	each	215.48	Rupees Two Hundred Fifteen & Paise Forty Eight Only	8,619.20
1.27	56	each	90.10.1.6 : Supply & Fixing the following types/ sizes of boxes suitable for modular accessories in surface/ recess including making good the damages, colour washing etc as required (RoHS compliant )8 module moulded plastic box on surface	each	297.00	Rupees Two Hundred Ninty Seven Only	16,632.00
1.28	14	each	1.27.1 : Supplying and fixing following size/ modules, GI box alongwith modular base & cover plate for modular switches in recess etc as required.1 or 2 Module (75mmX75mm)	each	241.38	Rupees Two Hundred Forty One & Paise Thirty Eight Only	3,379.32
1.29	68	each	1.27.2 : Supplying and fixing following size/ modules, GI box alongwith modular base & cover plate for modular switches in recess etc as required.3 Module (100mmX75mm)	each	255.17	Rupees Two Hundred Fifty Five & Paise Seventeen Only	17,351.56
1.3	92	each	1.27.5 : Supplying and fixing following size/ modules, GI box alongwith modular base & cover plate for modular switches in recess etc as required.8 Module (125mmX125mm)	each	409.65	Rupees Four Hundred Nine & Paise Sixty Five Only	37,687.80
1.31	360	each	1.24.1 : Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.5/6 amps switch	each	115.86	Rupees One Hundred Fifteen & Paise Eighty Six Only	41,709.60
1.32	80	each	1.24.3 : Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.15/16 amp switch	each	157.24	Rupees One Hundred Fifty Seven & Paise Twenty Four Only	12,579.20
1.33	320	each	1.24.4 : Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.3 pin 5/6 amp socket outlet	each	111.72	Rupees One Hundred Eleven & Paise Seventy Two Only	35,750.40
1.34	65	each	1.24.5 : Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.6 pin 15/16 amp socket outlet	each	211.03	Rupees Two Hundred Eleven & Paise Three Only	13,716.95

1.35	700	each	1.23.1 : Supplying and fixing following piano type switch / socket on the existing switch box/ cover including connections etc. as required.5/6 amps switch	5	each	46.90	Rupees Forty Six & Paise Ninty Only	32,830.00
1.36	95	each	1.23.4 : Supplying and fixing following piano type switch / socket on the existing switch box/ cover including connections etc. as required.3 pin 5/6 amp socket outlet		each	57.93	Three Only	5,503.35
1.37	24	each	1.23.5 : Supplying and fixing following piano type switch / socket on the existing switch box/ cover including connections etc. as required.6 pin 15/16 amp socket outlet		each	118.62	Paise Sixty Two Only	2,846.88
1.38	30	each	1.23.3 : Supplying and fixing following piano type switch / socket on the existing switch box/ cover including connections etc. as required.15/16 amp switch		each	103.45	Forty Five Only	3,103.50
1.39	15	each	1.58 : Supplying and fixing PVC batten/ angle holder including connection etc. as required.		each	85.52	Two Only	1,282.80
1.4	65	each	od71158/2020_2021 : Supply and fixing piano type dimmer fan regulator(excluding GST)		each	190.02	Two Only	12,351.30
1.41	60	each	od66052/2020_2021 : Supply and renewing fan condenser of ceiling fan in place of faulty ones and giving connection.		each	55.96	Only	3,357.60
1.42	415	each	od66054/2020_2021 : Cleaning the existing switch board & checking all connections attending repairs etc., as required.		each	23.14	Fourteen Only	9,603.10
1.43	487	each	od66058/2020_2021 : Cleaning the existing Ceiling fan/wall fan/exhaust , checking all connections attending repairs etc., as required.		each	29.60	Only	14,415.20
1.44	9	each	90.11.1.14 : Supply and installation of sheet steel, phosphatised and painted, dust and vermin proof enclosure of MCB DB including copper /brass bus bar, neutral link, earth bus and DIN rail suitable for fixing MCB/ isolator etc. fixed on wall using suitable anchor bolts or fixed in recess including cutting hole on the wall , making good the damages, colour washing etc. as required4 way (8+12) - double cover TPN vertical DB with provision for fixing 4P MCB / Isolator/ RCCB/ RCBO as incomer and SP/ TP MCB as outgoing (IP 42/43)		each	6,475.72	Rupees Six Thousand Four Hundred Seventy Five & Paise Seventy Two Only	58,281.48
1.45	3	each	2.3.3 : Supplying and fixing following way, single pole and neutral, sheet steel, MCB distribution board, 240 V, on surface/ recess, complete with tinned copper bus bar, neutral bus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCBIRCCB/Isolator12 way, Double door		each	1,587.57	Only	4,762.71
1.46	480	each	2.10.2 : Supplying and fixing 5 amps to 32 amps rating, 240/415 volts, "C" curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required.Single pole and netural		each	613.79	Rupees Six Hundred Thirteen & Paise Seventy Nine Only	2,94,619.20
1.47	18	each	2.14.1 : Supplying and fixing following rating, double pole, (single phase and neutral), 240 volts, residual current circuit breaker (RCCB), having a sensitivity current upto 300 milliamperes in the existing MCB DB complete with connections, testing and commissioning etc. as required.25 amps		each	2,275.85	Only	40,965.30
1.48	12	each	2.15.2 : Supplying and fixing following rating, four pole, (three phase and neutral), 415 volts, residual current circuit breaker (RCCB), having a sensitivity current upto 300 milliamperes in the existing MCB DB complete with connections, testing and commissioning etc. as required.40 amps		each	2,939.29	Only	35,271.48
1.49	14	each	2.15.1 : Supplying and fixing following rating, four pole, (three phase and neutral), 415 volts, residual current circuit breaker (RCCB), having a sensitivity current upto 300 milliamperes in the existing MCB DB complete with connections, testing and commissioning etc. as required.25 amps		each	2,891.01	Rupees Two Thousand Eight Hundred Ninty One & Paise One Only	40,474.14

1.5	8	each	215.3 : Supplying and fixing following rating. four pole. (three phase and neutral), 415 volts, residual current circuit breaker (RCCB), having a sensitivity current upto 300 milliampere in the existing MCB DB complete with connections, testing and commissioning etc. as required.63 amps	each	Rupees Three Thousand One Hundred Seventy Five & Paise Fifteen Only	3,175.15	25,401.20
1.51	145	metre	90.9.2.1 : Supply and fixing 100 x 50 mm PVC Cable Management System with base and lid along with the following accessories conforming to IEC 61084/ BS 476 & 4678 on surface / recess including cutting the wall and making good the damages in case of recessed installation as required.100 x 50 mm CMS with base and lid	metre	Rupees One Thousand & Paise Twenty One Only	1,000.21	1,45,030.45
1.52	8	metre	90.9.2.2 : Supply and fixing 100 x 50 mm PVC Cable Management System with base and lid along with the following accessories conforming to IEC 61084/ BS 476 & 4678 on surface / recess including cutting the wall and making good the damages in case of recessed installation as required.Cable divider	metre	Rupees One Hundred Twenty One & Paise Seven Only	121.07	968.56
1.53	12	each	90.9.2.3 : Supply and fixing 100 x 50 mm PVC Cable Management System with base and lid along with the following accessories conforming to IEC 61084/ BS 476 & 4678 on surface / recess including cutting the wall and making good the damages in case of recessed installation as required.External angle 90 degree	each	Rupees Two Hundred Forty One & Paise Seven Only	241.07	2,892.84
1.54	9	each	90.9.2.4 : Supply and fixing 100 x 50 mm PVC Cable Management System with base and lid along with the following accessories conforming to IEC 61084/ BS 476 & 4678 on surface / recess including cutting the wall and making good the damages in case of recessed installation as required.Flat angle 90 degree	each	Rupees Three Hundred Sixty One & Paise Seven Only	361.07	3,249.63
1.55	11	each	90.9.2.5 : Supply and fixing 100 x 50 mm PVC Cable Management System with base and lid along with the following accessories conforming to IEC 61084/ BS 476 & 4678 on surface / recess including cutting the wall and making good the damages in case of recessed installation as required.Internal angle 90 degree	each	Rupees Two Hundred Forty One & Paise Seven Only	241.07	2,651.77
1.56	5	each	90.9.2.6 : Supply and fixing 100 x 50 mm PVC Cable Management System with base and lid along with the following accessories conforming to IEC 61084/ BS 476 & 4678 on surface / recess including cutting the wall and making good the damages in case of recessed installation as required.Internal coupler	each	Rupees One Hundred Forty Two & Paise Seven Only	142.07	710.35
1.57	6	each	90.9.2.8 : Supply and fixing 100 x 50 mm PVC Cable Management System with base and lid along with the following accessories conforming to IEC 61084/ BS 476 & 4678 on surface / recess including cutting the wall and making good the damages in case of recessed installation as required.End cap	each	Rupees One Hundred Thirty Two & Paise Seven Only	132.07	792.42
1.58	6	each	90.9.2.10 : Supply and fixing 100 x 50 mm PVC Cable Management System with base and lid along with the following accessories conforming to IEC 61084/ BS 476 & 4678 on surface / recess including cutting the wall and making good the damages in case of recessed installation as required.Joint cover	each	Rupees One Hundred Two & Paise Seven Only	102.07	612.42
1.59	5	each	90.9.2.11 : Supply and fixing 100 x 50 mm PVC Cable Management System with base and lid along with the following accessories conforming to IEC 61084/ BS 476 & 4678 on surface / recess including cutting the wall and making good the damages in case of recessed installation as required.Cable retainer	each	Rupees Fifty Seven & Paise Seventy Nine Only	57.79	288.95

			Supply installation testing commissioning of Octogaonal Pole made of hot dip galvanised GI sheet 70mm top diameter, 130mm bottom diameter thickness 3mm base plate dimensions of 200x200x12mm suitable for wind speed as per IS 875 Part III single arm bracket 0.5mt including connector foundation bolt 4 nos fixed in existing RCC foundation and junctions box etc.complete 5 Meters	each	18,182.96	Rupees Eighteen Thousand One Hundred Eighty Two & Paise Ninty Six Only	18,182.96
1.61	10	metre	90.12.7.2 : Supply, laying and clamping of 1 no. PVC insulated and PVC sheathed armoured aluminium power cable, 1.1 KV grade of the following sizes using clamps noted along with the cables, spacing of clamps not exceeding 60cms, making good the damages , colour washing etc. as required.2 core 6 sq mm with factory made clamp	metre	184.38	Rupees One Hundred Eighty Four & Paise Thirty Eight Only	1,843.80
1.62	20	metre	90.12.1.2 : Supply & laying of one number PVC insulated and PVC sheathed armoured aluminium power cable of 1.1KV grade of the following sizes in ground including excavation of trench of size 35 x 75 cm, refilling the trench etc. as required but excluding sand cushioning and protective covering (in ordinary soil).2 core 6 sq mm	metre	335.65	Rupees Three Hundred Thirty Five & Paise Sixty Five Only	6,713.00
1.63	20	metre	90.12.9.2 : Supplying, laying and jointing of the following sizes of double wall corrugated (DWC) pipes made out of HDPE conforming to IS 14930 Part II for mechanical protection to underground power cables with all required accessories in ground in the existing trench50/38 mm or nearest size	metre	142.76	Rupees One Hundred Forty Two & Paise Seventy Six Only	2,855.20
1.64	48	metre	90.16.1.1 : Supply and drawing bare earthing conductors of the following sizes along with wiring/ cables and giving connection as required2.00 mm copper conductor ( 14 SWG)	metre	25.28	Rupees Twenty Five & Paise Twenty Eight Only	1,213.44
1.65	16	each	90.16.5.1 : Supply of superior quality copper earth socket for the following size of earth conductor including crimping etc. as required.2.00 mm (14 SWG)	each	17.41	Rupees Seventeen & Paise Forty One Only	278.56
1.66	1500	each	od79523/2020_2021 : Charges for dismantling the existing EI complete and conveying the same to section store(Excluding GST)	each	33.14	Rupees Thirty Three & Paise Fourteen Only	49,710.00

Total Estimate PAC RS 31,04,730.48

Tender deduct @ 16.5% below estimate rate 5,12,280.53

Total RS 25,92,449.95

Add for rounding 0.05

Total Accepted PAC Rs 25,92,450.00

GST 12% 311,094.00

  
Executive Engineer.



**SMART CITY THIRUVANANTHAPURAM LTD.**  
**4th Floor, Annexe Building,**  
**Municipal Corporation of TVPM, Vikas Bhavan,**  
**Vikas Bhavan**  
**Kerala – 695 033, India**  
**Tel:+91-471 -2339944**  
**E-mail: smartcityvm@gmail.com**  
**Website: <https://smartcityvm.in/sctl/>**  
**NOTICE INVITING TENDER (NIT)**

**NIT No. SCTL/PRJ/132/2018/RFP-Solar/01**

**Issued Date: 10/06/2019**

Smart City Thiruvananthapuram Limited (SCTL) invites **online bids** from eligible bidders for “**Selection of Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram**” under the Smart Cities Mission Program of Government of India as per details given below:

S.No.	Particulars	Details
1	Name of Work	Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram
2	Location of Work	Thiruvananthapuram ABD Area
3	Brief description of Work	Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram.
4	Duration of Completion of Work	6 months including rainy season from signing the contract. O&M of 5 years from System Acceptance Date. The Defects Liability Period will be 3 years from the date of final completion certificate issued by SCTL for commissioning of the plant on all sites.
5	Estimated Cost of Work	Rs. 3,48,39,534.11 /-
6	Bid Validity period	180 days from the due date for submission of tenders (or such extended date).
7	Bid submission Fee	Rs.7,500/-
8	Earnest Money Deposit (EMD)	Rs.1,00,000/-
9	Classification of Contractor	As per eligibility criteria of in RFP

S.No.	Particulars	Details
10	Mode of selection of Contractor	Open Tender by e-tendering mode. <b>Lowest Quoting Bidder (L1 bidder) to be selected.</b>
11	RFP documents to be downloaded from (Date)	<b>10/06/2019; 1730 Hrs IST</b>
12	RFP Sale Start Date	<b>10/06/2019; 1730 Hrs IST</b>
13	RFP Sale End Date	<b>04/07/2019; 1730 Hrs IST</b>
14	Last Date and time for receipt of Pre-bid queries	<b>15/06/2019; 1730 Hrs IST</b>
15	Pre-Bid Conference	Pre-Bid Conference to be held; <b>17/06/2019; 15:00 Hrs.</b>
16	RFP Online Submission End Date	<b>04/07/2019; 1730 Hrs IST</b>
17	Last Date for Submission of Physical Copies of Required Documents	<b>05/07/2019; 1730 Hrs IST</b>
18	Opening of Technical Bid	<b>08/07/2019; 1500 Hrs IST</b>
19	Declaration of Results of Technical Evaluation on website	<b>To be intimated later</b>
20	Date & Time of Opening Price Bid	<b>To be intimated later to technically shortlisted bidders</b>
21	Issue of LoA to the Selected Bidder (Contractor)	<b>To be intimated later</b>
22	Websites for Tender	<a href="https://etenders.kerala.gov.in/nicgep/app">https://etenders.kerala.gov.in/nicgep/app</a> and <a href="https://smartcityvm.in/sctl/">https://smartcityvm.in/sctl/</a>

### E-Bidding Submission Guidelines

1. Bid documents including the Bill of Quantities (BoQ) can be downloaded free of cost from the Websites <https://etenders.kerala.gov.in/nicgep/app>; and <https://smartcityvm.in/sctl/>. All bid documents are to be submitted **online** and in the designated cover(s)/ envelope(s) on the designated website in the ITB. Tender/ bids shall be accepted only through online mode on the designated website in the ITB and no manual submission of the same shall be entertained.
2. Late Bids will not be accepted; online submission due time will be as per local server time. A bid submission fee shall be remitted online during the time of bid submission.
3. The hard copies of certificates and documents, as detailed in Instructions to the Bidders, shall be submitted subsequently after online submission of bids in a separate cover by registered post/speed post before the date and time of opening of technical bid.
4. Price Bid also shall be submitted through online only.

5. Details regarding remittance of Bid Submission Fee and Bid Security, Bid preparation and submission are mentioned in the bid document.
6. The bids shall be opened online at the office of the SCTL in the presence of the authorised representatives of the Bidders, who wish to attend at the above address. If the tender opening date happens to be on a holiday or non-working day due to any other valid reason, the tender opening process will be done on the next working day at same time and place.
7. Tenders/ bids received online without the details mentioned in Instructions to the Bidders will not be considered and shall be summarily rejected.
8. More details can be had from the office of the 'Smart City Thiruvananthapuram Limited' during working hours 10 am to 5 pm IST till pre-bid query date. All other existing conditions related to bidding in force in the Kerala Public Works Department will be applicable in this tender also unless expressly defined in the bidding document.
9. The SCTL shall not be responsible for any failure, malfunction or breakdown of the electronic system while downloading or uploading the documents by the Bidder during the e-procurement process.
10. Details required for e-payment (Details of bank account having core banking facility and email address of the contractor) shall be furnished along with the tender. Tenders not accompanied by these details will be rejected. All subsequent government orders (Government of Kerala and Govt. of India) connected to tenders and any revision in the rates of taxes would also be applicable to this tender.
11. The Smart City Thiruvananthapuram Limited reserves the right to accept or reject any or all tenders without assigning any reason thereof.

Signature and seal of Authority

For and on behalf of  
Chief Executive Officer,  
Smart City Thiruvananthapuram Limited



# **Smart City Thiruvananthapuram Limited National Competitive Bidding**

**Request for Proposal (RFP)**

**For**

**Selection of Contractor Selection of Contractor for Providing  
Design, Supply, Installation, Erection, Testing &  
Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted  
Solar PV Power Plant on Various Buildings  
in Thiruvananthapuram**

**Volume I: Instructions to Bidders**

**Issued: 10<sup>th</sup> June, 2019**

**By**

**Chief Executive Officer  
SMART CITY THIRUVANANTHAPURAM LIMITED**

**4th Floor, Annexe Building,  
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RFP For Selection of Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram

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The information contained in this Request for Proposal Document, (the “RFP”) or subsequently provided to Bidder(s), whether verbally or in documentary or in any other form, by or on behalf of the Smart City Thiruvananthapuram Limited (“SCTL”) or any of its employees or advisors (“SCTL Representatives”), is provided to Bidder(s) on the terms and conditions set out in this RFP and such other terms and conditions subject to which such information is provided.

This RFP is not an agreement and is neither an offer nor invitation by the SCTL to the prospective Bidders or any other person. The purpose of this RFP is to provide interested parties with information that may be useful to them in making their offers, financial or technical (“Proposals”) pursuant to this RFP. This RFP includes statements, which reflect various assumptions and assessments arrived at by the SCTL in relation to the Project. Such assumptions, assessments and statements do not purport to contain all the information that each Bidder may require. This RFP may not be appropriate for all persons, and it is not possible for the SCTL, its employees or advisors to consider the investment objectives, financial situation and particular needs of each party who reads or uses this RFP. The assumptions, assessments, statements and information contained in the RFP Document may not be complete, accurate, adequate or correct. Each Bidder should, therefore, conduct its own investigations and analysis and should check the accuracy, adequacy, correctness, reliability and completeness of the assumptions, assessments, statements and information contained in this RFP and obtain independent advice from appropriate sources.

Information provided in this RFP to the Bidder(s) is on a wide range of matters, some of which may depend upon interpretation of law. The information given is not intended to be an exhaustive account of statutory requirements and should not be regarded as a complete or authoritative statement of law. The SCTL accepts no responsibility for the accuracy or otherwise for any interpretation or opinion on law expressed herein.

The SCTL, its employees and advisors make no representation or warranty and shall have no liability to any person, including any Applicant or Bidder under any law, statute, rules or regulations or tort, principles of restitution or unjust enrichment or otherwise for any loss, damages, cost or expense which may arise from or be incurred or suffered on account of anything contained in this RFP or otherwise, including the accuracy, adequacy, correctness, completeness or reliability of the RFP and any assessment, assumption, statement or information contained therein or deemed to form part of this RFP or arising in any way for participation in this Bidding Stage.

The SCTL also accepts no liability of any nature whether resulting from negligence or otherwise howsoever caused arising from reliance of any Bidder upon the statements contained in this RFP.

The SCTL may in its absolute discretion, but without being under any obligation to do so, update, amend or supplement the information, assessment or assumptions contained in this



**RFP For Selection of Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram**

RFP. The issue of this RFP does not imply that the SCTL is bound to select a Bidder or to appoint the Selected Bidder or Contractor as the case may be, for the Project and the SCTL reserves the right to reject all or any of the Bidders or Bids without assigning any reason whatsoever.

The Bidder shall bear all its costs associated with or relating to the preparation and submission. of its Bid including but not limited to preparation, copying, postage, delivery fees, expenses associated with any demonstrations or presentations which may be required by the SCTL or any other costs incurred in connection with or relating to its Bid. All such costs and expenses will remain with the Bidder and the SCTL shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by a Bidder in preparation or submission of the Bid, regardless of the conduct or outcome of the Bidding Process.



RFP For Selection of Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram

## Abbreviations and Acronyms

GOK	Government of Kerala
GOI	Government of India
LOA	Letter of Acceptance
MoU	Memorandum of Understanding
RFP	Request for Proposal
Rs./INR	Indian Rupee

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## 1. General

### 1.1 Bidding Process

- 1.1.1 The Smart City Thiruvananthapuram Limited (the “SCTL”), is implementing various projects as part of smart city mission of the Government of India (the “GOI”). As part of this mission, the SCTL is implementing roof top solar power plants on various buildings in specific areas in Thiruvananthapuram. In continuance to this endeavour, the SCTL envisages to implement roof top solar power plants on 5 buildings (the “Project”) as mentioned in the Volume – II of this RFP. In regard to this process, it is conducting the bidding process for selection of contractor for providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram and as a part of the same, invites detailed proposals (Technical Proposal and Price Proposal, collectively referred to as the “Proposal”) from interested and eligible entities for the Project (hereinafter referred to as the “Bidder(s)”).
- 1.1.2 The scope of works consists of “Site Survey, Design & Engineering, Manufacturing, Testing at Works, Delivery to Site of Installation; Storage & Handling including Unloading & Shifting as required; Cleaning & Assembly as required, Installation inclusive of all kind of Civil, Electrical and Structural, Testing, Commissioning, Synchronizing, Operation and Maintenance of Solar Power Plant Project on designated buildings in Thiruvananthapuram City for a period of 5 years after commissioning of the project”.
- 1.1.3 The Proposal would be evaluated on the basis of the evaluation criteria set out in this Request for Proposal (RFP) document (hereinafter referred to as the “Evaluation Methodology”) in order to identify the successful bidder for the Project (hereinafter referred to as the “Successful Bidder”). The Successful Bidder would then be required to enter into an agreement with SCTL along with any other party, as SCTL may decide (hereinafter the “Contract Agreement”), as per the draft set forth in Part – III of this RFP Document and perform the obligations as stipulated therein, in respect of the Project.
- 1.1.4 Pursuant to the issue of this RFP, SCTL shall receive Proposals, prepared and submitted in accordance with the terms set forth in this RFP and other documents to be provided by SCTL pursuant to this RFP including annexure thereto (collectively referred to as

the “**RFP Document**”), as modified, altered, amended and clarified from time to time by SCTL.

- 1.1.5 The RFP Document including this RFP and all attached documents are and shall remain the property of SCTL and are transmitted to the Bidders solely for the purpose of preparation and the submission of their respective Proposals in accordance herewith. Bidders are to treat all information as strictly confidential and shall not use it for any purpose other than for preparation and submission of their Proposals. SCTL will not return any Proposal or any information provided along therewith.
- 1.1.6 Any condition or qualification or any other stipulation contained in the Proposal shall render the Proposal liable to rejection as a non-responsive Proposal.
- 1.1.7 This RFP is not transferable.
- 1.1.8 SCTL has adopted a single stage two-part process (collectively the “**Bidding Process**”) for selection of the contractor for the Project. Under this process, the Bid shall be invited under two parts. Eligibility and qualification of the bidder will be first examined based on the details submitted under first part (the “**Technical Proposal**”) with respect to eligibility and qualifications criteria prescribed in this RFP. At the end of the qualification, SCTL shall shortlist technically shortlisted bidders (as defined and determined pursuant to this RFP) who are eligible for evaluation of their second part of the Proposal i.e. price part (the “**Price Proposal**”) as part of the Bidding Process comprising the RFP including selection of the Successful Bidder in accordance with the RFP. The Price Proposal under the second part (the “**Price Proposal**”) shall be opened of only those Bidders whose Technical Bids are responsive to eligibility and qualifications requirements as per this RFP.
- 1.1.9 In the Proposal stage, the Bidders are being called upon by this RFP to submit their Proposals in accordance with this RFP and other RFP Documents that may be provided by SCTL pursuant to this RFP. As a part of the Proposal stage of the Bidding Process, the Bidders are required to submit two envelopes in online mode as per procedure mentioned in the e-procurement portal as per the Notice Inviting Tender (the “**NIT**”) issued containing their (i) Technical Proposal and (ii) Price Proposal as part of their complete Proposal. For clarity, it is mentioned that the Price Proposal will be in the form of Price Bill of Quantities (the “**BoQ**”) to be submitted in online mode only.
- 1.1.10 The SCTL reserves the right to reject the Proposal of a Bidder without evaluating the Technical Proposal if the contents of Technical Proposal are not substantially responsive with the requirements of this RFP Document.
- 1.1.11 The Bidders who meet eligibility criteria (the “**Technically Qualified Bidders**”) shall be considered for evaluation of their Price Proposal.

1.1.12 The Bidder quoting the “**lowest quoted price**” shall be the Preferred Bidder. The calculation of lowest quoted price shall be as later defined in this RFP.

1.1.13 The Bidders are expected to carry out, at their own cost due diligence for the Project as may be required to submit their Proposals for providing services under the Project.

1.1.14 Details of the process of selection, including the schedule of Bidding Process (as provided in Appendix 1 of the RFP Document, Part I), are spelt out in this RFP.

Without prejudice to the foregoing the SCTL may, at any stage of the Bidding Process, verify whether the Bidders are maintaining their commitments and eligibility status as per the requirements of the RFP.

## 1.2 Contractual Framework

1.2.1 The SCTL will enter into a contract with the Successful Bidder in respect of the scope of work covered under this RFP alongwith any other party that the SCTL may decide.

## 2. Instruction to Bidders

### 2.1 General

- 2.1.1 Bidders eligible in terms of this RFP for the Project are eligible to submit Proposal in response to this RFP Document. Bidders shall acknowledge receipt of this RFP Document and notify their intention to bid for the Project in the format provided as **Appendix 2: Format of Acknowledgement of RFP Document and Notification of Intent to Submit Proposal**
- 2.1.2 No Bidder shall submit more than one Proposal for the Project. A Bidder bidding individually or as a member of a Consortium shall not be entitled to submit another Proposal either individually or as a member of any Consortium, as the case may be. Any such Proposal shall be summarily rejected.
- 2.1.3 Unless the context otherwise requires, the terms not defined in this RFP, but defined in other RFP Documents i.e. the Contract Agreement or the Scope of Services and Systems Specification for the Project or any corrigendum/addendum/clarifications/modifications issued shall have the meaning assigned thereto in respective document.
- 2.1.4 Notwithstanding anything to the contrary contained in this RFP, the detailed terms specified in the draft Contract Agreement shall have overriding effect; provided, however, that any conditions or obligations imposed on the Bidder hereunder shall continue to have effect in addition to its obligations under the Contract Agreement.
- 2.1.5 Bidders shall, as part of their Proposal provide updates, in respect of any information submitted with their response to the RFP Document, which has till the date of submission of their response to this RFP Document changed or altered or modified, and shall continue to meet the qualification criteria set out in the RFP Document.
- 2.1.6 The Price Proposal should be furnished in the format at **Appendix 10: Format of Price Proposal Letter**, clearly indicating the Proposal amount in both figures and words, in Indian Rupees only, and signed by the Bidder's authorised signatory. In the event of any difference between figures and words, the amount indicated in words shall be taken into account.
- 2.1.7 The Price Proposal shall consist of Composite O&M Cost and Capex Cost to be included in the quoted price by the Bidder and shall be payable by the SCTL to the Contractor, as per the terms and conditions of this RFP and the provisions of the Contract Agreement.

- 2.1.8 The Bidder shall deposit a Bid Security in accordance with the provisions of this RFP.
- 2.1.9 The Successful Bidder shall be required to, inter alia: (i) enter into the Contract Agreement, (ii) adhere to the provisions of the Contract Agreement so entered into, and (iii) implement the Project in accordance with the terms of the said Contract Agreement.
- 2.1.10 Notwithstanding anything stated elsewhere in these documents, SCTL shall have the right to seek updated information from the Bidders to ensure their continued eligibility. Bidders shall provide evidence of their continued eligibility in a manner that is satisfactory to SCTL. A Bidder may be disqualified if it is determined by SCTL, at any stage of the Bidding Process, that the Bidder will be unable to fulfil the requirements of the Project or the Bidder fails to continue to satisfy the eligibility criteria. Supplementary information or documentation may be sought from Bidders at any time and must be provided within a reasonable timeframe as stipulated by SCTL.
- 2.1.11 A Bidder or member of Consortium which has earlier been barred or blacklisted by SCTL/ any other entity of GOI or GOK by any state government or central government /department/agency in India from participating in any bidding process shall not be eligible to submit a Proposal at any stage, either individually or as member of a Consortium, if such bar subsists as on the Proposal Due Date. The Bidder (all members in case of a Consortium) shall be required to furnish an affidavit as per format provided in **Appendix 5: Format for Affidavit Certifying no Blacklisting**.
- 2.1.12 A Power of Attorney nominating the person for signing the Proposal, for and on behalf of the Bidder, as its Authorized Signatory shall be furnished by the Bidder, as per the format enclosed at **Appendix 4: Format for Power of Attorney for Signing of Proposal**.

## 2.2 Bid Related

- 2.2.1 Bidder shall submit bids under CAPEX Model for the mentioned scope of works as mentioned in RFP.
- 2.2.2 Water and Power for installation & commissioning of the Solar Power Plant shall be arranged by the Bidder at its own cost.
- 2.2.3 Water for cleaning of the Solar panels during Operation and Maintenance shall be in the scope of the Bidder during the entire tenure of the contract. Bidder shall arrange for the calibrated meter for quantification of the energy consumption generated by the power plant.

- 2.2.4 The scheme targets installation of grid-connected roof mounted solar power plant project on the top of existing structure on designated buildings in Thiruvananthapuram City. The generated solar power will be used by the buildings.
- 2.2.5 In case management of the assets created under this RFP / Contract is transferred from SCTL to any other organisation / departments such Thiruvananthapuram Municipal Corporation etc., this tender / Contract will remain valid with the successor department/ organisation. The term SCTL will be read as the name of successor department/ organisation.
- 2.2.6 The bidding process under this RFP of the roof mounted solar power scheme is on CAPEX Model.
- 2.2.7 The scope of work shall include Site Survey, Design & Engineering, Manufacturing, Testing at Works, Delivery to Site of Installation; Storage & Handling including Unloading & Shifting as required; Cleaning & Assembly as required, Installation inclusive of all kind of Civil, Electrical and Structural, Testing, Commissioning, Synchronizing, Operation and Maintenance of Solar Power Plant Project on designated buildings in Thiruvananthapuram City for a period of 5 years after commissioning of the project and shall ensure that the plant operates as per the SCTL's requirement. The solar panel installed on given structures shall have minimum power generation (of 4Kwh/Kwp/year) conforming to the Performance Ratio (PR) at the time of commissioning and related Capacity Utilization Factor (CUF) as per the Global Horizontal Irradiance (GHI) levels of the locations. The power generated from the solar power project will be fed to the respective substation at 440V MV level as per MNRE guideline.
- 2.2.8 It is in scope of successful Bidder to undertake all Site surveys, obtain all required approvals from the relevant authorities, carry out Design and Drawings for all the components of the work as per SCTL's requirement and submit the same to the SCTL for review and approval, Prepare Good for Construction Drawings, submit maintenance manual to the SCTL for approval.
- 2.2.9 Sale of Power: The power generated from the solar power project will be fed to the respective substations at 440 V MV level.
- 2.2.10 Bids are invited from the prospective bidders to furnish Capital Cost of the PV Solar Plant and year by year per unit O&M charges for the unit rate of the commissioned roof mounted structure top Solar PV System for 5 years from the date of commissioning of the project.

- 2.2.11 O&M Charges in any year shall either be equal to or more than the O&M Charges in the immediately preceding year.
- 2.2.12 This is a ZERO Deviation Bidding Process. Bidder is to ensure compliance of all provisions of the Bid Document and submit their Bid accordingly. Bids with any deviation to the bid conditions shall be liable for rejection.
- 2.2.13 The Bid shall include all the costs related to above Scope of Work in the quoted Capital Cost and O&M Charges. Bidder shall quote for the entire facilities on a “single responsibility” basis such that the total Bid Price covers all the obligations mentioned in the Bidding Documents in respect of Design, Supply, Erection, Testing and Commissioning including Warranty, Operation & Maintenance for a period of 5 years goods and services including spares required, if any, during O&M period from the date of commissioning. The Bidder has to take all permits, approvals and licenses, Insurance etc., provide training before transfer/ handover after the contract period to SCTL/ Corporation of Thiruvananthapuram and such other items and services required to complete the scope of work mentioned herein this document.
- 2.2.14 The price and the quoted O&M Charges quoted on lump sum turnkey basis and the Bidder is responsible for the total Scope of Work as described.
- 2.2.15 The Bid price and the quoted O&M Charges shall remain firm and fixed and shall be binding on the Successful Bidder till completion of work irrespective of his actual cost of execution of the project. No escalation will be granted on any reason whatsoever. The Bidder shall not be entitled to claim any additional charges, even though it may be necessary to extend the completion period for any reasons whatsoever.
- 2.2.16 The Bid price and the quoted O&M Charges shall be exclusive of Goods and Service Tax (“GST”) which shall be paid extra at actuals as per applicable norms at the time of payment. The prices quoted by the firm shall be complete in all respect and no price variation/ adjustment is allowed.
- 2.2.17 The operation & maintenance of Solar Photovoltaic Power Plant would include wear, tear, overhauling, machine breakdown, insurance, and replacement of defective modules, invertors/Power Conditioning Unit (PCU), spares, consumables & other parts for a period of 5 years under CAPEX model.
- 2.2.18 The Bid price and the quoted O&M Charges shall be specified in sanction letter based on Successful Bidder’s quote. The project cost shall be in accordance with all terms, conditions, specifications and other conditions of the Contract as accepted by the

SMART CITY THIRUVANANTHAPURM LIMITED and incorporated into the sanction letter.

2.2.19 The Bidder shall complete the Price Bid for CAPEX and O&M Costs furnished in the RFP Documents.

## **2.3 Additional Requirements for a Consortium**

- 2.3.1 The Proposal shall be signed by the duly authorised signatory of the Lead Member and shall be legally binding on all the members of the Consortium.
- 2.3.2 The Proposal should contain the information for each member, wherever required; and
- 2.3.3 The number of members in the Consortium shall be limited to two.
- 2.3.4 A Bidder who submits Proposal in its individual capacity or as part of a Consortium cannot participate as a member of any other Consortium or Bidder submitting the Proposal.

## **2.4 Change in Composition of Consortium**

- 2.4.1 The composition or constitution of the Consortium qualified during the RFP Stage, shall not be altered during the Proposal Stage. After signing of the Contract, the request for change in Consortium will be dealt with as per the provisions of the Contract.

## **2.5 Number of Proposals**

Each Bidder shall submit only one (1) Proposal in response to this RFP Document. Any entity, which submits or participates in more than one Proposal will be disqualified and will also cause the disqualification of Consortium/Bidder of which it is a member or part of.

## **2.6 Proposal Preparation Cost**

The Bidder shall be responsible for all the costs associated with the preparation of its Proposal, site visits and other costs and its participation in the Bidding Process. The SCTL will not be responsible or in any way liable for such costs, regardless of the conduct or outcome of the bidding.

## 2.7 Verification of Documents

The SCTL reserve the right to verify all statements, information and documents submitted by the Bidder in response to the RFP Document. Failure of the SCTL to undertake such verification shall not relieve the Bidder of its obligations or liabilities hereunder to submit true and correct information; nor will it affect any rights of the SCTL.

## 2.8 Contents of RFP Document

The RFP Document consists of three Parts as listed below and would include any addenda issued in accordance with Clause 2.13.1.

Part I	Instructions to Bidders
Part II	Scope of Services and System Specifications
Part III	Draft Contract Agreement

## 2.9 Language

The Proposal, and all related correspondence and documents related to the Proposal exchanged between the Bidder and the SCTL shall be written in the English language only. The supporting documents and printed literature furnished by the Bidder with the Proposal may be in any other language provided that they are accompanied by a true and correct official translation into English and duly certified. In the event of a foreign Bidder, the same shall be legalized by the Indian Embassy in the respective country of the Bidder. Supporting materials that are not translated into English will not be considered for evaluation of the Proposal. For the purpose of interpretation and evaluation of the Proposal, the English language translation shall prevail.

## 2.10 Currency

The currency for the purpose of the Proposal shall be the Indian Rupee (INR).

## 2.11 Clarifications by Bidders

2.11.1 Bidders requiring any clarification on the RFP Document may notify the SCTL in writing by e-mail/ facsimile/ post/ courier within such date as specified in the Schedule of Bidding Process set out in **Appendix 1: Schedule of Bidding Process**.

2.11.2 All correspondence / enquiries/ request for clarifications should be submitted in the format as specified in **Appendix 12: Format of Pre-Proposal Queries** to the following in writing by e-mail / fax / post / courier:

ATTN. OF	Chief Executive Officer
SUBJECT:	Queries/Request for Additional Information: RFP for _____
ADDRESS:	Smart City Thiruvananthapuram Limited 4th Floor, Annexe Building, Municipal Corporation of TVPM, Vikas Bhavan P.O, Thiruvananthapuram, Kerala - 695 033, India
TEL/FAX	Tel. : +91-471-2339944
E-MAIL	<a href="mailto:smartcitytvm@gmail.com">smartcitytvm@gmail.com</a> ; <a href="mailto:tenders.sctl@gmail.com">tenders.sctl@gmail.com</a>

2.11.3 SCTL shall endeavour to respond to the queries raised or clarifications sought by the Bidders. However, SCTL reserves the right not to respond to any query or provide any clarification, in its sole discretion, and nothing in this clause shall be construed, taken or read as compelling or requiring SCTL to respond to any query or to provide any clarification.

2.11.4 SCTL may, also on its own, if necessary, issue interpretations and clarifications to all Bidders. All clarifications and interpretations issued in writing by SCTL shall be deemed to be part of the RFP Documents. Verbal clarifications and information given by the SCTL or their employees, advisors or representatives shall not in any way or manner be binding on the SCTL.

## 2.12 Pre – Proposal Meeting

2.12.1 To clarify and discuss issues with respect to the Project and the RFP Document, a Pre-Proposal meeting (“**Pre-Proposal Meeting**”) will be held as per the details provided in Appendix 1.

2.12.2 Prior to the Pre-Proposal meeting, the Bidders may submit a list of queries and proposed suggestions, if any, to the Project requirements and/or the draft Contract Agreement. Bidders must formulate their queries and forward the same to the SCTL prior to the Pre-Proposal meeting in terms of schedule as set out in **Appendix 1: Schedule of Bidding Process**.

2.12.3 Bidders may note that SCTL will not entertain any deviations to the RFP Document at the time of submission of the Proposal or thereafter. The Proposal to be submitted by the Bidders will be unconditional and unqualified and the Bidders would be deemed

to have accepted the terms and conditions of the RFP Document with all its contents including the terms and conditions of the draft Contract Agreement. Any conditional Proposal shall be regarded as non-responsive and would be liable for rejection.

- 2.12.4 Bidders' representatives attending the Proposal opening shall bring an authorisation letter from the Bidder and sign a register to evidence their presence.
- 2.12.5 In case of any change in the schedule of Pre-Proposal Meeting, the same will be communicated to Bidders through email and/or by posting on the web sites <https://etenders.kerala.gov.in/nicgep/app> / <https://smartcityvm.in/sctl/>
- 2.12.6 Attendance of the Bidders at the Pre-Proposal Meeting is not mandatory. SCTL will endeavour to respond to all queries from all Bidders, irrespective of attendance of the Bidder in the Pre-Proposal Meeting.
- 2.12.7 No interpretation, revision, or other communication from the SCTL regarding this solicitation is valid unless in writing. SCTL may choose to send to all Bidders whose Proposals are under consideration, in writing or by any standard electronic means such as email or by uploading on website(s) of responses, including a description of the enquiry but without identifying its source to all the Bidders.

## 2.13 Amendment of RFP Document

- 2.13.1 At any time prior to the Proposal Due Date, SCTL may, for any reason, whether at its own initiative or in response to clarifications requested by Bidder(s), modify the RFP Document by way of issue of Addenda.
- Any Addendum thus issued will be sent to the Bidders who have participated in the RFP stage and have intimated their willingness to participate in the RFP stage to SCTL.
- The Addendum may be issued by SCTL in writing or by any standard electronic means such as email or by uploading on website(s). Bidders are advised to visit the website(s) (<https://etenders.kerala.gov.in/nicgep/app> / <https://smartcityvm.in/sctl/>) regularly to keep themselves updated. Any Addendum thus issued will be binding upon them. Bidders shall promptly acknowledge receipt of any Addendum issued to them.
- 2.13.2 In case in the opinion of a Bidder there is any inconsistency or discrepancy in provisions / specifications / requirements between any parts / sections of the RFP Document, the Bidder shall bring the same to the attention of SCTL before or during the Pre-proposal Meeting. The decision of SCTL in this regard shall be final and binding.
- 2.13.3 In order to afford the Bidders reasonable time in which to take an Addendum into account, or for any other reason, SCTL may, at its own discretion, extend the Proposal Due Date.

2.13.4 SCTL, may in its sole discretion and without assigning any reason, modify, alter or amend all or any part of the Schedule of Bidding Process by issue of addendum to the RFP Document.

## 2.14 Miscellaneous - Other Provisions

2.14.1 The Bidding Process shall be governed by, and construed in accordance with, the laws of India and the Courts at Thiruvananthapuram alone shall have jurisdiction over all disputes arising under, pursuant to and/ or in connection with the Bidding Process.

2.14.2 The SCTL, in its sole discretion and without incurring any obligation or liability, reserve the right to:

- (a) suspend and/or cancel the Bidding Process and/or amend and/or supplement the Bidding Process or modify the dates or other terms and conditions relating thereto;
- (b) to consult with any Bidder in order to receive clarification or further information;
- (c) retain any information and/or evidence submitted to the SCTL by, on behalf of, and/ or in relation to any Bidder; and
- (d) independently verify, disqualify, reject and/ or accept any and all submissions or other information and/or evidence submitted by or on behalf of any Bidder.

2.14.3 It shall be deemed that by submitting the Proposal, the Bidder agrees and releases the SCTL, their employees, agents and advisers, irrevocably, unconditionally, fully and finally from any and all liability for claims, losses, damages, costs, expenses or liabilities in any way related to or arising from the exercise of any rights and/or performance of any obligations hereunder, pursuant hereto and/or in connection herewith and waives any and all rights and/or claims it may have in this respect, whether actual or contingent, whether present or future.

2.14.4 Bidders may carry out project related visits/ inspections at their cost. The SCTL shall facilitate access to the project site(s) upon receiving prior requests for the same. It is desirable that each Bidder submits its Proposal after visiting the relevant site(s) and ascertaining for itself the location, surroundings, or any other matter considered relevant by it.

## 2.15 Disqualification

2.15.1 Even if the Bidder meets the guidelines as set forth in this RFP Document, the SCTL, at its discretion, may disqualify any Bidder if:

- (a) the Bidder (or any of the member in case of a Consortium) has been blacklisted by the SCTL / any other entity of GOI or GOK or any state government or central government / department / agency in India; or
- (b) the Bidder has made misleading or false representation in the forms, statements and attachments submitted; or
- (c) the Bidder has a record of poor performance during the last three (3) years such as consistent history of litigation / arbitration award against the Bidder / any of its constituents or financial failure due to bankruptcy, etc.

#### 2.15.2 Conflict of Interest:

A Bidder shall not have a conflict of interest (the “**Conflict of Interest**”) that affects the Bidding Process. Any Bidder found to have a Conflict of Interest shall be disqualified. In the event of disqualification, the SCTL shall forfeit and appropriate the Bid Security or Performance Guarantee, as the case may be, without prejudice to any other right or remedy that may be available to the SCTL, hereunder or otherwise. Without limiting the generality of the foregoing, a Bidder shall be considered to have a Conflict of Interest that affects the Bidding Process, if:

- (a) such Bidder, or any constituent thereof, and any other Bidder or any constituent thereof have common controlling shareholders or other common ownership interest by any third party, whether direct or indirect, or such Bidder or any constituent thereof is holding paid up capital, directly or indirectly, in other Bidder or any constituent thereof. Provided that, this disqualification shall not apply (i) in case of common controlling shareholding or other common ownership interest by any third party, if such shareholding or ownership interest in one of the Bidders is less than 25% of its paid up and subscribed capital, or (ii) in case of the direct or indirect shareholding in a Bidder by the other Bidder on any constituent thereof if such shareholding is less than 25% of that other Bidder’s paid up and subscribed capital;
- (b) a constituent of such Bidder is also a constituent of another Bidder;
- (c) such Bidder receives or has received any direct or indirect subsidy from any other Bidder, or has provided any such subsidy to any other Bidder; or
- (d) such Bidder has the same legal representative for purposes of the Proposals as any other Bidder; or
- (e) such Bidder has a relationship with another Bidder, directly or through common third parties, that puts them in a position to have access to each other’s information about, or to influence the Proposal of either or each of the other Bidder; or

- (f) such Bidder has participated as a consultant to the SCTL in the preparation of any documents, design or technical specifications for the Project; or
- (g) If any legal, financial or technical adviser of the SCTL in relation to the Project is engaged by the Bidder in any manner for matters related or incidental to the said Project during the Bidding Process or subsequent to the (i) issue of the LOA or (ii) execution of the Contract Agreement. In the event any such adviser is engaged by the Successful Bidder or Contractor, as the case may be, after issue of the LOA or execution of the Contract Agreement, then notwithstanding anything to the contrary contained herein or in the LOA or the Contract Agreement and without prejudice to any other right or remedy of the SCTL, including the forfeiture and appropriation of the Bid Security or Performance Guarantee, as the case may be, which the SCTL may have under the LOA or the Contract Agreement, as the case may be, shall be liable to be terminated without the SCTL being liable in any manner whatsoever to the Successful Bidder or the Contractor, as the case may be, for the same.

### 2.15.3 Corrupt Practice:

- (a) The Bidders and their respective officers, employees, agents and advisers shall observe the highest standard of ethics during the Bidding Process and subsequent to the issue of the LOA and during the subsistence of the Contract Agreement. Notwithstanding anything to the contrary contained herein or in the LOA or the Contract Agreement, the SCTL shall reject a Proposal, withdraw the LOA, or terminate the Contract Agreement, as the case may be, without being liable in any manner whatsoever to the Bidder or the Contractor, as the case may be, if it determines that the Bidder or Contractor, as the case may be, has directly or indirectly or through an agent, engaged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice in the Bidding Process. In such an event, the SCTL shall forfeit and appropriate the Bid Security or Performance Guarantee, without prejudice to any other right or remedy that may be available to the SCTL hereunder or otherwise;
- (b) Without prejudice to the rights of the SCTL hereinabove and the rights and remedies which the SCTL may have under the LOA or the Contract Agreement, if a Bidder/ Contractor, as the case may be, is found by the SCTL to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice during the Bidding Process, or after the issue of the LOA or the execution of the Contract Agreement, such Bidder/ Vendor shall not be eligible to participate in any tender or RFP Document issued by the SCTL during a

period of five years from the date such Bidder/ Vendor, as the case may be, is found by the SCTL to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practices, as the case may be.

(c) For the purposes of Clauses above, the following terms shall have the meaning hereinafter respectively assigned to them:

- i. **“corrupt practice”** means (i) the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the actions of any person connected with the Bidding Process (for avoidance of doubt, offering of employment to or employing or engaging in any manner whatsoever, directly or indirectly, any official of the SCTL who is or has been associated in any manner, directly or indirectly with the Bidding Process or the LOA or has dealt with matters concerning the Contract Agreement or arising therefrom, before or after the execution thereof, at any time prior to the expiry of one year from the date such official resigns or retires from or otherwise ceases to be in the service of the SCTL, shall be deemed to constitute influencing the actions of a person connected with the Bidding Process; or (ii) engaging in any manner whatsoever, whether during the Bidding Process or after the issue of the LOA or after the execution of the Contract Agreement, as the case may be, any person in respect of any matter relating to the Project or the LOA or the Contract Agreement, who at any time has been or is a legal, financial or technical adviser of the SCTL in relation to any matter concerning the tender;
- ii. **“fraudulent practice”** means a misrepresentation or omission of facts or suppression of facts or disclosure of incomplete facts, in order to influence the Bidding Process;
- iii. **“coercive practice”** means impairing or harming, or threatening to impair or harm, directly or indirectly, any person or property to influence any person’s participation or action in the Bidding Process;
- iv. **“undesirable practice”** means establishing contact with any person connected with or employed or engaged by the SCTL with the objective of canvassing, lobbying or in any manner influencing or attempting to influence the Bidding Process.

## 2.16 Bid Security

- 2.16.1 The Proposal shall be accompanied by a Bid Security for an amount of Rupees Five lakhs only (INR 5,00,000/-). No relaxation of any kind in Bid Security shall be given to any Bidder except as applicable for MSME enterprises as per Kerala Government or Government of India rules.
- 2.16.2 The Bid Security shall remain valid for a period of Sixty (60) days beyond the Proposal Validity Period of Proposals as provided in Clause 2.17.1, and would need to be extended, if so required by the SCTL, for any extension in the Proposal Validity Period.
- 2.16.3 The Bid Security shall be in the form of an irrevocable Bank Guarantee issued by any Indian Nationalized Bank or a Scheduled Bank authorized to handle transactions of Government of India/ Government of Kerala, in favour of the SCTL, as per the format set out in **Appendix 6: Format of Bid Security**.
- 2.16.4 In case the Bid Security is issued by any bank outside Thiruvananthapuram, the same shall be routed through their branch in Thiruvananthapuram and enforceable at Thiruvananthapuram.
- 2.16.5 For the avoidance of any doubt, 'Scheduled Bank' shall mean a Bank as defined under Section 2(e) of the Reserve Bank of India Act, 1934.
- 2.16.6 The Bid Security shall be returned to unsuccessful Bidders on the signing of Contract Agreement by the Successful Bidder for the Project. The Bid Security, submitted by the Successful Bidder, shall be released:
- (a) upon Successful Bidder furnishing the Performance Guarantee; and
  - (b) upon signing of the Contract Agreement.
- 2.16.7 The Bid Security shall be liable to be forfeited, in the following cases:
- (a) If the Bidder withdraws its Proposal except as provided in Clause 2.23.1; or
  - (b) If the Bidder modifies or withdraws its Proposal during the interval between the Proposal Due Date and expiration of the Proposal Validity Period; or
  - (c) If the Preferred Bidder fails to accept the LOA within the stipulated time period; or
  - (d) In case of the Successful Bidder, if it fails to furnish the Performance Guarantee within the specified time limit prescribed therefor in the Contract Agreement; or
  - (e) If any information or document furnished by the Successful Bidder turns out to be misleading or untrue in any material respect; or

- (f) If a Bidder engages in a corrupt, fraudulent, coercive, undesirable or restrictive practice as specified in Clauses 2.15.3 of this RFP Document; or
- (g) If a Bidder has a Conflict of Interest which affects the Bidding Process.

## 2.17 Validity of Proposal

- 2.17.1 The Proposal shall indicate that it would remain valid for a period not less than One Hundred and Eighty (180) days from the Proposal Due Date (the “**Proposal Validity Period**”). The SCTL reserves the right to reject any Proposal that does not meet this requirement.
- 2.17.2 Prior to expiry of the Proposal Validity Period, the SCTL may request the Bidders to extend the period of validity for a specified additional period. A Bidder may refuse the request without forfeiting its Bid Security. A Bidder agreeing to the request will not be allowed to modify its Proposal, but would be required to extend the validity of its Proposal for the period of extension and for extension of Bid Security comply with Clause 2.16.2 of this document in all respects. A Bidder refusing the request shall not be eligible to participate further in the Bidding process.
- 2.17.3 The Successful Bidder shall extend the Proposal Validity Period till the date of signing of the Contract Agreement.

## 2.18 Bidders Responsibility

- 2.18.1 The Bidder is expected to examine carefully the contents of all the documents provided. Failure to comply with the requirements of RFP Document will be at the Bidder’s own risk.
- 2.18.2 It would be deemed that prior to the submission of Proposal, the Bidder has:
- (a) made a complete and careful examination of the various aspects of the Project including but not limited to:
    - (i) requirements, and other information set forth in this RFP Document;
    - (ii) all other matters that might affect the Bidder’s performance under the terms of this RFP Document;
    - (iii) a diligent scrutiny and conformity with the terms and conditions of the draft Contract Agreement;
    - (iv) applicable laws and regulations in force in India and those applicable to the Project.
  - (b) received all such relevant information as it has requested from the SCTL; and

2.18.3 The SCTL and / or their consultants shall not be liable for any omission or mistake or error or neglect by the Bidder in respect of the above.

## 2.19 Format and Signing of Proposal

2.19.1 Bidders shall provide all the information as per this RFP Document and in the specified formats. The SCTL reserves the right to reject any Proposal that is not in the specified formats.

2.19.2 **The Proposal shall be submitted in two parts:**

**Part I : Technical Proposal (To be submitted in a separate envelope)**, which shall include:

- (a) Covering Letter cum Project Undertaking as per Appendix 3 stating the Proposal Validity Period.
- (b) Power of Attorney for signing of the Proposal as in Appendix 4.
- (c) Power of Attorney for Lead Member of the Joint Venture \_\_\_\_.
- (d) Affidavit Certifying that Business Entity/Promoter(s)/ Director(s) of Business Entity are not blacklisted/banned as in Appendix 5.
- (e) Bid Security as per Appendix 6.
- (f) Affidavit as per Appendix 7.
- (g) Non-Collusion Certificate as per Appendix 8.
- (h) The Bidder shall submit Copy of PAN, GSTIN and TAN certificates of bidding company.
- (i) Empanelment Letter from MNRE/ ANERT.
- (j) Shareholding certificate signed by the Company Secretary of the Bidding company and shareholding certificate signed by the Company Secretary of the Parent company (if parent company credentials are used).
- (k) Certificates of incorporation of Bidding company and Parent company (if parent company credentials are used).
- (l) Certificates of incorporation of Bidding consortium (not more than 3 members), if consortium is envisaged in the Bid submitted by Bidder.
- (m) If credentials of Parent company are being used by the Bidding Company/Lead member of the Bidding consortium then details as per format of the RFP shall be furnished.

- (n) Undertakings from the Financially Evaluated Entity or its Parent Company/Ultimate Parent Company as per the format.
- (o) Board Resolution of the Parent Company/Ultimate Parent Company of the Bidding Company duly certified by the Company Secretary to provide the Performance Bank Guarantee (PBG) in the event of failure of the Bidding Company to do so.
- (p) Signed and stamped Copy of RFP Documents including amendments & clarifications by Authorized signatory on each page.
- (q) Check – List dully filled in as per the format provided in Appendix 11.

The Technical Proposal shall consist of the information as per Appendix 9 and Appendix 9 A.

**Part III: Price Proposal (To be submitted in a separate envelope):**

The Price Proposal shall be submitted in accordance with the requirements prescribed in this RFP as per Appendix 10, Appendix 10A and Appendix 10B.

An indicative Check List has been included at Appendix 11 of this RFP document. This has been designed to help the Bidders in submitting their Proposal complete in all respects. The Bidders must fill this checklist and submit along with their Proposal. Any other documents required as per any other clause of the RFP Document have to be submitted along with the Proposal even if not indicated in the aforesaid checklist.

2.19.3 The Bidder shall submit following documents in original physically as per schedule mentioned in NIT:

- (a) Bid Security in the form of bank guarantee.
- (b) Power of Attorney for signing of the Proposal as in Appendix 4.
- (c) Power of Attorney for Lead Member of the Joint Venture as in Appendix \_\_\_\_.
- (d) Payment receipt / acknowledgement document/details towards cost of Bid of Rs. 7,500 (Rupees Seven Thousand and Five Hundred only) along with applicable GST in favour of "Smart City Thiruvananthapuram Limited," payable at Thiruvananthapuram through online mode only and e-procurement Portal; and
- (e) Any other documents in original as required under the RFP.

2.19.4 The Proposal and its copy shall be typed or printed in indelible ink and the Bidder's Authorised Representative shall sign each page in blue ink. All the alterations,

omissions, additions, or any other amendments made to the Proposal shall be initialled by the person signing the Proposal. All pages of the Proposal must be serially numbered.

## 2.20 Sealing and Marking of Proposal

2.20.1 The Bidder shall seal the original and one copy of Technical Proposal; and the original of the Price Proposal, in separate envelopes, duly marking the envelopes as **“TECHNICAL PROPOSAL”** and **“PRICE PROPOSAL”** respectively as per procedure mentioned in the e-procurement website.

2.20.2 Each envelope shall indicate the name and address of the Bidder (in case of a Consortium the name and address of the Lead Member).

2.20.3 All the envelopes shall clearly bear the following identification:

**“RFP for Selection of Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram”**

**[Name of Submission as part of Proposal]**

**“To be opened by Tender Opening Committee only”**

and

**“Submitted by**

**- Name, Address and Contact Phone No. of the Bidder”**

2.20.4 The envelope shall be addressed to:

Attn. Of:	Chief Executive Officer
Address:	Smart City Thiruvananthapuram Limited 4th Floor, Annexe Building, Municipal Corporation of TVPM, Vikas Bhavan P.O, Thiruvananthapuram, Kerala - 695 033, India
Telephone:	+91-471-2339944

2.20.5 If the envelopes are not sealed and marked as instructed above and as per requirements of the e-procurement portal, the Proposal may be deemed to be non-responsive and would be liable for rejection. The SCTL assume no responsibility for the misplacement or premature opening of such Proposal.

## 2.21 Proposal Due Date

- 2.21.1 Proposals should be submitted on or before the Proposal Due Date mentioned in the Schedule of Bidding Process, set forth in Appendix 1 at the address provided in Clause 2.20.4 in the manner and form as detailed in this RFP Document. Proposals submitted by facsimile transmission or telex or email or any other such mode shall not be acceptable.
- 2.21.2 The SCTL may extend the Proposal Due Date by issuing an Addendum in accordance with Clause 2.13.3 and Clause 2.13.4.

## 2.22 Late Proposals

- 2.22.1 Proposals received by the SCTL after the Proposal Due Date will be summarily rejected and returned unopened to the Bidder.

## 2.23 Modification and Withdrawal of Proposals

- 2.23.1 The Bidder may modify or withdraw its Proposal after submission, provided that written notice of the modification or withdrawal is received by SCTL before the Proposal Due Date. No Proposal shall be modified or withdrawn by the Bidder after the Proposal Due Date.
- 2.23.2 The Bidder's modification or withdrawal notice shall be prepared, sealed, marked and delivered in accordance with the provisions of e-procurement portal as appropriate.
- 2.23.3 Notwithstanding anything to the contrary contained in this RFP Document, any modification or withdrawal of the Proposal during the interval between the Proposal Due Date and expiration of the Proposal Validity Period would result in forfeiture of the Bid Security, in accordance with Clause 2.16.7 of this RFP Document.

## 2.24 Confidentiality

Information relating to the examination, clarification, evaluation and recommendation for the Bidders shall not be disclosed to any person who is not officially concerned with the process or is not a retained professional advisor advising the SCTL in relation to, or matters arising out of, or concerning the Bidding Process. The SCTL will treat all information, submitted as part of the Bid, in confidence and will require all those who have access to such material to treat the same in confidence. The SCTL may not divulge any such information unless it is directed to do so by any statutory entity that has the power under law to require its disclosure or is to enforce or assert any right or privilege of the statutory entity and/ or the SCTL or as may be required by law or in connection with any legal process.

## 2.25 Clarifications Sought by SCTL

To assist in the process of evaluation of Proposals, the SCTL may, at its sole discretion, ask any Bidder for any clarification with respect to its Proposal. The request for clarification and the response shall be communicated by letter/ fax/ email/e-procurement website. The Bidder in such cases would need to provide the requested clarification / documents promptly and within such timeframe as specified by the SCTL. No change in the substance of the Proposal would be permitted by way of such clarifications.

## 2.26 Consultant(s) or Advisor(s)

- 2.26.1 To assist in the examination, evaluation, and comparison of Proposals, the SCTL may utilise the services of consultant(s) or advisor(s).
- 2.26.2 The SCTL shall not be bound by the opinion or advice given by any consultant or advisor referred to in Clause 2.26.1. The final determination as regards the Proposal during the Bidding Process shall vest with SCTL.

## 3. Evaluation Methodology

### 3.1 Opening of Proposal

3.1.1 The SCTL shall open the envelope labelled “**TECHNICAL PROPOSAL**” on the Proposal Opening Date and time as mentioned in Appendix 1, or at an appropriate time on the extended date for opening of Proposals as may be notified, at the venue specified below:

**Smart City Thiruvananthapuram Limited**  
**4<sup>th</sup> Floor, Annexe Building,**  
**Municipal Corporation of TVPM, Vikas Bhawan,**  
**Kerala – 695033**

3.1.2 The above envelopes shall be opened in the presence of Bidders’ representatives, who choose to attend. Bidders’ representatives attending the Proposal opening shall bring an authorisation letter from the Bidder and sign a register to evidence their presence.

3.1.3 The following information shall be announced at the Proposal Opening Date:

- (a) Bidders’ names; and
- (b) Particulars of the Bid Security.

3.1.4 The SCTL shall intimate Bidders vide Email/Fax/by posting on mentioned web site(s) in case of any change in the date or venue of opening of Technical Proposal (Part I).

3.1.5 The Bid Security must form part of the Technical Proposal (Part I). Any Proposal not accompanied with valid Bid Security in the acceptable form will be summarily rejected by SCTL as being non-responsive.

3.1.6 The SCTL will subsequently examine and evaluate the Proposals in accordance with the provisions set out in this Section 3.

3.1.7 To facilitate evaluation of Proposals, the SCTL may, at its sole discretion, seek clarifications in writing from any Bidder regarding its Proposal.

3.1.8 Proposals marked “WITHDRAWAL” shall not be opened and shall be returned to the Bidder. No withdrawal notice shall be considered unless such notice contains a valid authorisation to request the withdrawal of Proposal. In case of Proposals marked “MODIFICATION”, the corresponding Envelopes marked “MODIFICATION” shall be opened and read with the corresponding Proposal. No Proposal modification shall be permitted unless the corresponding modification notice contains a valid authorization to request the modification and is read out at Proposal opening. Only envelopes that

are opened and read out at Proposal opening shall be considered further in the Bidding Process.

## 3.2 Test of Responsiveness

3.2.1 Prior to evaluation of Proposals, SCTL will determine whether each Proposal is responsive to the requirements of the RFP Document. A Proposal shall be considered responsive if it satisfies all the criteria stated below:

- (a) It is received by the Proposal Due Date.
- (b) It is signed, sealed, and marked as stipulated.
- (c) It contains the information and documents as requested in the RFP Document.
- (d) It mentions the Proposal Validity Period as set out in Clause 2.17.1.
- (e) It is accompanied by the Bid Security as set out in Clause 2.16.1.
- (f) It provides the information in reasonable detail. (“Reasonable Detail” means that, but for minor deviations, the information can be reviewed and evaluated by the SCTL without communication with the Bidder). The SCTL reserves the right to determine whether the information has been provided in reasonable detail.
- (g) There are no inconsistencies between the Proposal and the supporting documents.
- (h) Does not affect in any substantial way the scope, obligations, quality, specifications, standards, rules, controls and performance of the Project.
- (i) It does not contain any condition or qualification.

3.2.2 Bidders are expected to submit a complete Proposal in all respect. All the required documents and details must be included. In the absence of the same, leading to material deviation or reservation, the Proposal is liable to be rejected.

3.2.3 A Proposal that is substantially responsive is one that conforms to the preceding requirements without material deviation or reservation. A material deviation or reservation is one:

- (a) which affects in any substantial way, the scope, quality, or performance of the Project, or
- (b) which limits in any substantial way, inconsistent with the RFP Document, SCTL’s rights or the Bidder’s obligations under the Contract Agreement, or
- (c) which would affect unfairly the competitive position of other Bidders presenting substantially responsive bids.

- 3.2.4 SCTL reserves the right to reject any Proposal which in its opinion is not responsive and no request for modification or withdrawal shall be entertained by SCTL in respect of such Proposals.

### 3.3 Evaluation of Proposal

- 3.3.1 In step I of Proposal Evaluation, the Technical Proposal submitted by the Bidders shall be checked for responsiveness with the requirements of the RFP Document.
- 3.3.2 The SCTL reserves the right to reject the Proposal of a Bidder without opening/evaluating the Technical Proposal if the contents of Technical Proposal are not substantially responsive with the requirements of this RFP Document.
- 3.3.3 The Technical Proposal of the Bidder would be evaluated as per the criteria set out in the RFP Document
- 3.3.4 The evaluation of Price Proposal of a Bidder shall be taken up only for those Bidders who have meets technical eligibility. (the “**Technically Qualified Bidders**”).

### 3.4 Opening of Technical Proposal

- 3.4.1 The Technical Proposal of only such Bidders shall be opened and considered for evaluation whose submission meets test of responsiveness of the Technical Proposal.

### 3.5 Eligibility Criteria

- 3.5.1 The Bidder as shall be either a body incorporated in India under the Companies Act, 1956 or 2013 including any amendment thereto and shall have the activity of setting up & operation of Solar Power projects as one of its object of business as per its Memorandum & Articles of Association. Limited Liability partnership (LLP) shall be allowed for bidding. A copy of certificate of incorporation shall be furnished along with the bid in support of above.
- 3.5.2 The Bidders shall be approved Channel Partner of MNRE or ANERT as per the latest list of such partners published by the respective organizations.
- 3.5.3 The Bidder or its promoter/ group company should have designed, supplied, installed & commissioned Grid connected/ Non-grid connected Solar PV Power Project having a cumulative capacity of 1000 - 2000 kWp or more in last five years Or alternately the Bidder or its promoter/ group company should have designed, supplied, installed & commissioned Grid connected Solar PV Power Project having a capacity of 1MWp scale in last five years. Bidder shall submit a scanned copy of the Commissioning certificate and Work order / Contract / Agreement / from the Client / Owner in its own name or its promoter/ group company to support of this Clause.

3.5.4 The Bidder or its promoter/ group company should have Operation and Maintenance of at least one year in Grid connected/ Non grid connected solar PV power projects of cumulative capacity of at least 1000 - 2000 kWp or more Or Alternately the Bidder or its promoter/ group company should have designed, supplied, installed & commissioned Grid connected Solar PV Power Project having a capacity of 1MWp scale in last five years.

3.5.5 The Bidder should have an Average Annual Turnover and Net worth as indicated below:

- (a) The average annual turnover of Rs. 5.00 Crores (Rupees Five Crores only) in last three (3) financial years preceding the Bid Submission date.
- (b) The Net worth over the period of last 3 financial years shall be equal to or greater than Rs. 2.00 Crore (Rupees Two Crore only). The Computation of Net worth shall be based on unconsolidated audited annual accounts of the last financial year immediately preceding the Bid Deadline. Share premium can be included in the Net-worth calculation in case of listed companies in India only.

The formula of calculation of net-worth shall be as follows:

Net-worth = (Paid up share capital) + {(Free reserves - Share premium) + Share premium of listed companies} - (Revaluation of reserves) - (Intangible assets) - (Miscellaneous expenditure to the extent not written off and carry forward losses).

For the purposes of meeting financial requirements, only unconsolidated audited annual accounts shall be used. However, audited consolidated annual accounts of the Bidder may be used for the purpose of financial requirements provided the Bidder has at least twenty six percent (26%) equity in each company whose accounts are merged in the audited consolidated accounts and provided further that the financial capability of such companies (of which accounts are being merged in the consolidated accounts) shall not be considered again for the purpose of evaluation of the Bid.

- (c) The Bidder or each member of Consortium should have positive net profit in the last financial year including two previous financial years before the last financial year i.e. 2017-18.
- (d) The Bidder/ each of Consortium members should be an operating entity in India for last 3 financial years i.e. FY 2015-16 through FY 2018-19.
- (e) The Bidder/ each member of Consortium should submit letter of comfort from its bankers regarding availability of loan and / or working capital requirements in case it is needed and the solvency certificate from banks should also be produced.

- (f) The Bidder / each of Consortium members should not have been blacklisted or barred by any government entity in India. The Bidder to provide an undertaking.
- (g) Bidders shall furnish documentary evidence as per the given format, duly certified by Authorized Signatory and the Statutory Auditor / Practicing Chartered Accountant of the Bidding Company in support of their financial capability.

3.5.6 Further in case where the bidding company has used the financial eligibility criteria of its parent company then it needs to be ensured that any change in the controlling equity of the Bidding Company requires prior approval of SMART CITY THIRUVANANTHAPURAM LIMITED.

3.5.7 Bidder can however use the technical and financial strength of its Parent Company / Affiliate's or Associate to fulfill the Technical and / or Financial Eligibility criteria mentioned below. In such case, Bidders shall submit an Undertaking from the Parent / Affiliate Company as per format given in this RFP and also furnish a certificate of relationship of Parent Company or Affiliate with the Bidding Company as per format given in this RFP, Company Secretary certificate towards shareholding pattern of the Parent Company and the Bidding Company along with a Board resolution from the Parent Company.

### 3.6 Evaluation Methodology for Technical Proposal

- 3.6.1 The evaluation of Technical Proposal of the Bidders will be carried out on the parameters in RFP.
- 3.6.2 SCTL may conduct Bidder-specific meeting(s) with individual Bidders to clarify aspects of the Bidder's Technical Proposal that require explanation in the opinion of SCTL.
- 3.6.3 Only those Bidders who have met eligibility criteria shall be considered for evaluation of their Price Proposal.

### 3.7 Evaluation Methodology for Price Proposal

- 3.7.1 The Price Proposals of the Technically Shortlisted Bidders will be opened in the presence of such Bidders' representatives who choose to attend.
- 3.7.2 Bidders' representatives attending the Financial Proposal opening shall bring an authorisation letter from the Bidder and sign a register to evidence their presence.
- 3.7.3 The Price Proposal shall be evaluated on the basis of the Composite Monthly Charges, as per Appendix 10A.

- 3.7.4 The Bidder who has quoted the least price (as mentioned in the RFP) shall be given a Financial Score of 100 marks and be marked as L1. The Financial Scores of Bidders shall be computed as follows:

**Financial Score and Ranking of Bidders = 100 x [lowest Price quoted (in INR) / Lowest Price quoted by the Bidder (in INR)]**

The marks secured based on evaluation of the Financial Bid as per the above shall be the Financial Score of the Bidder (“**Financial Score**”).

### 3.8 Final Evaluation

- 3.8.1 The Bidder who has secured the highest Ranking or L1 shall be considered by SCTL to be the Preferred Bidder.
- 3.8.2 SCTL may either choose to accept the Proposal of the Preferred Bidder or invite him for negotiations.
- 3.8.3 Upon acceptance of the Proposal of the Preferred Bidder with or without negotiations, SCTL shall declare the Preferred Bidder as the Successful Bidder.

### 3.9 Notification

- 3.9.1 SCTL will notify the Successful Bidder by a letter of acceptance (“**Letter of Acceptance**” or “**LOA**”) that its Proposal has been accepted.

### 3.10 SCTL’s Right to Accept or Reject Proposal

- 3.10.1 SCTL reserves the right to accept any Proposal or reject any or all of the Proposals without assigning any reason therefore and to take any measure as it may deem fit, including annulment of the bidding process, at any time prior to award of work, without incurring any liability or any obligation for such acceptance, rejection or annulment.
- 3.10.2 SCTL, in its sole discretion, reserves the right, at any stage, to invite fresh Proposals from the Bidders either on the same terms and conditions as contained in the RFP Document or any amendment thereof, as may be deemed appropriate, without assigning any reason therefor and without being liable to any of the Bidders under any circumstance whatsoever.
- 3.10.3 SCTL reserves the right to reject any Proposal if:
- (a) the Bidder does not respond promptly and thoroughly to the requests for supplemental information required for evaluation of its Proposal; or

- (b) one or more of the conditions have not been met by the Bidder; or
- (c) the Bidder has made a material misrepresentation or such material misrepresentation is uncovered; or
- (d) the Bidder engages in a corrupt, fraudulent, coercive, undesirable or restrictive practice.

3.10.4 If such disqualification / rejection occurs after the Price Proposals have been opened and the Bidder securing the highest Composite Score gets disqualified / rejected, then SCTL reserves the right to:

- (a) invite the Bidder with next highest Composite Score, for negotiations; or
- (b) take any such measure as may be deemed fit in the sole discretion of SCTL, including annulment of the bidding process.

3.10.5 Proposals shall be deemed to be under consideration immediately after they are opened until such time the SCTL makes an official intimation of award of the work or rejection of the Proposal to the concerned Bidders. While the Proposals are under consideration, Bidders and/or their representatives or other interested parties are advised to refrain from contacting by any means the SCTL and/or their employees/ representatives on matters relating to the Proposals under consideration.

3.10.6 In case it is found after the issue of the Letter of Acceptance (“LOA”) or signing of the Contract Agreement or during the subsistence thereof, that :

- (a) one or more of the conditions have not been met by the Bidder; or
- (b) the Bidder has made a material misrepresentation or such material misrepresentation is uncovered; or
- (c) the Bidder engages or has engaged in a corrupt, fraudulent, coercive, undesirable or restrictive practice,

then the LOA or the Contract Agreement, as the case may be, shall notwithstanding anything to the contrary contained therein or in this RFP Document, be liable to be revoked / terminated by a communication in writing by the SCTL to the Successful Bidder without the SCTL being liable in any manner whatsoever to the Successful Bidder or Vendor, as the case may be. In such event, the SCTL shall forfeit and appropriate the Bid Security or Performance Guarantee, as the case may be, without prejudice to any other right or remedy that may be available to the SCTL.

### 3.11 Acknowledgment of Letter of Acceptance (LOA) and Execution of Contract Agreement

- 3.11.1 Within seven (7) days from the date of issue of the LOA, the Successful Bidder shall accept the LOA and submit to SCTL the acknowledgement letter in respect thereof.
- 3.11.2 The Successful Bidder shall execute the Contract Agreement within thirty (30) days of the date of issue of LOA or within such other period as may be communicated by SCTL.
- 3.11.3 SCTL may notify other Bidders that their Proposals have been unsuccessful, and their Bid Security will be released as promptly as possible upon signing of the Contract Agreement with the Successful Bidder and furnishing of Performance Guarantee and Success Fee by the Successful Bidder.

### 3.12 Performance Guarantee

- 3.12.1 The Successful Bidder shall be required to furnish and maintain a Performance Guarantee equal to ten percent (10%) of the Contract Price, in accordance with the provisions given in Part III, prior to the signing and currency of the Contract Agreement.
- 3.12.2 Failure of the Successful Bidder to comply with the requirements of Clause 3.11.2 or Clause 3.12.1 shall constitute sufficient grounds for the annulment of the LOA, and forfeiture of its Bid Security. In such an event, the SCTL reserves the right to,
- (a) invite the next highest-ranking bidder or L2 and negotiate upon the following scenario, or
  - (b) take any such measure as may be deemed fit in the sole discretion of SCTL, including annulment of the Bidding Process.



RFP For Selection of Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram

## Appendix 1: Schedule of Bidding Process

SCTL would endeavour to adhere to the schedule as given in NIT.

## Appendix 2: Format of Acknowledgement of RFP Document and Notification of Intent to Submit Proposal

[On the Letter head of the Bidder (Lead Member in case of Consortium)]

Date: \_\_\_\_\_

To

The Chief Executive Officer ,  
SMART CITY THIRUVANANTHAPURAM LTD. (SCTL)  
4th Floor, Annexe Building,  
Municipal Corporation of TVPM,  
Vikas Bhavan  
Kerala – 695 033, India  
Tel:+91-471 -2339944  
E-mail: [smartcityvm@gmail.com](mailto:smartcityvm@gmail.com) , [tenders.sctl@gmail.com](mailto:tenders.sctl@gmail.com)  
Website: <https://smartcityvm.in/sctl/>

Dear Sir,

**Re: Proposal for Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram**

The undersigned hereby acknowledges and confirms receipt of all the Parts (Part I, Part II and Part III) of the Request for Proposal (RFP) Document for the captioned project from SCTL and conveys its intention to submit a Proposal for the Project.

.....  
Name of the Bidder

.....  
Signature of the Authorised Signatory

.....  
Name of the Authorised Signatory

Note:

- *On the Letterhead of the Sole Bidder or the Lead Member of Consortium.*
- *To be signed by the Lead Member in case of a Consortium.*
- *The acknowledgement should be sent within one (1) week of receipt of the RFP Document*

## Appendix 3: Format for Covering Letter cum Project Undertaking

Date: \_\_\_\_\_

To

The Chief Executive Officer ,  
SMART CITY THIRUVANANTHAPURAM LTD. (SCTL)  
4th Floor, Annexe Building,  
Municipal Corporation of TVPM,  
Vikas Bhavan  
Kerala – 695 033, India  
Tel:+91-471 -2339944  
E-mail: [smartcityvm@gmail.com](mailto:smartcityvm@gmail.com) , [tenders.sctl@gmail.com](mailto:tenders.sctl@gmail.com)  
Website: <https://smartcityvm.in/sctl/>

Dear Sir,

**Re: Proposal for Proposal for Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram**

We have read and understood the Request for Proposal (RFP) Document in respect of the Project provided to us by SCTL We hereby submit our Proposal for the captioned Project.

1. We are enclosing and submitting herewith our Proposal in one (1) original and one (1) copy, with the details as per the requirements of the RFP Document, for your evaluation and consideration.
2. The Proposal is unconditional.
3. All information provided in the Proposal and in the Appendices is true and correct.
4. We shall make available to the SCTL any additional information it may find necessary or require to clarify, supplement or authenticate the Proposal.

5. We acknowledge the right of the SCTL to reject our Proposal without assigning any reason or otherwise and hereby waive our right to challenge the same on any account whatsoever.
6. We certify that in the last three years, we/ any of the Consortium Members have neither failed to perform on any contract, as evidenced by imposition of a penalty or a judicial pronouncement or arbitration award, nor been expelled from any project or contract nor have had any contract terminated for breach on our / their part.
7. We declare that:
  - (a) We have examined and have no reservations to the RFP Documents, including the Addendum issued by SCTL.
  - (b) We have not directly or indirectly or through an agent engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice, as defined in Clause (c) of the RFP Document, in respect of any tender or request for proposal issued by or any agreement entered into with the SCTL or any other public sector enterprise or any government, Central or State.
8. We hereby certify that we have taken steps to ensure conformity with the provisions of Clauses 2.15.2 of the RFP Document.
9. We understand that you may cancel the Bidding Process at any time and that you are neither bound to accept any Proposal that you may receive nor to invite the Bidders to submit Proposals for the Project, without incurring any liability to the Bidders, in accordance with Clause 2.13.2 of the RFP Document.
10. We declare that we satisfy and meet the requirements as specified in the RFP Document and eligible to submit a Proposal in accordance with the terms of this RFP Document.
11. We declare that we/ any Member of our Consortium are/ is not a member of any other Consortium submitting a Proposal for the Project.
12. We certify that we have not been convicted by a Court of Law or indicted or adverse orders passed by a regulatory authority in any matter which could cast a doubt on our ability to undertake the Project or which relates to a grave offence that outrages the moral sense of the community.
13. We further certify that in regard to matters relating to security and integrity of the India, we have not been charge-sheeted by any agency of the Government or convicted by a Court of Law for any offence committed by us.

14. We certify that no investigation by a regulatory authority is pending either against us or against our CEO or any of our Directors or any shareholder holding not less than 10% of our issued and subscribe equity share capital.
15. We undertake that in case due to any change in facts or circumstances during the Bidding Process, we are attracted by the provisions of disqualification; we shall intimate SCTL of the same immediately.
16. We hereby irrevocably waive any right which we may have at any stage at law or howsoever otherwise arising or accruing to challenge or question any decision taken by SCTL in connection with the selection of the Bidder, or in connection with the Bidding Process itself, in respect of the above mentioned Project and the terms and implementation thereof.
17. In the event of our being declared as the Successful Bidder, we agree to enter into a Contract Agreement in accordance with the draft that has been provided to us as part of the RFP Document (including any amendments issued thereto) prior to submission of Proposal. We agree not to seek any changes in the aforesaid draft and agree to abide by the same.
18. We have studied all the RFP Documents carefully and also surveyed the Project requirements and other matters pertaining thereto. We understand that except to the extent as expressly set forth in the Contract Agreement, we shall have no claim, right or title arising out of any documents or information provided to us by the SCTL or in respect of any matter arising out of or concerning or relating to the Bidding Process including the award of Contract.
19. Our Price Proposal has been quoted by us after taking into consideration all the terms and conditions stated in the RFP Document, draft Contract Agreement, our own estimates of costs and after a careful assessment of the Project and all the conditions that may affect the Proposal.
20. We confirm our having submitted the Bid Security of Rupees One Lakh only (INR 1,00,000/-) to the SCTL in accordance with the RFP Document.
21. We agree and understand that the Proposal is subject to the provisions of the RFP Documents. In no case, we shall have any claim or right of whatsoever nature if the Project / Contract is not awarded to us or our Proposal is not opened.
22. We agree and undertake to abide by all the terms and conditions of the RFP Document.
23. We agree to keep and confirm that our Proposal is valid upto \_\_\_\_\_ (minimum One Hundred and Eighty (180) days from Proposal Due Date).



RFP For Selection of Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram

Dated this .....Day of ....., 2019.

Signature of the Authorised Signatory.....

Name of the Authorised Signatory.....

Note:

- *On the Letterhead of the Bidder or Lead Member of Consortium.*
- *To be signed by the lead member, in case of a Consortium.*

## Appendix 4: Format for Power of Attorney for Signing of Proposal

(On Non – judicial stamp paper of Rs 100/- or such equivalent document as applicable for Kerala State duly attested by notary public)

### Power of Attorney

Know all men by these presents, We, ..... (name of the firm and address of the registered office) do hereby irrevocably constitute, nominate, appoint and authorise Mr. /Ms (Name), son / daughter / wife of ..... and presently residing at ....., who is presently employed with us / the Lead Member of our Consortium and holding the position of ....., as our true and lawful attorney (hereinafter referred to as the **“Attorney”**) to do in our name and on our behalf, all such acts, deeds and things as are necessary or required in connection with or incidental to submission of our Proposal for the **“Selection of Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram”** in response to RFP issued on behalf of the SMART CITY THIRUVANANTHAPURAM LTD. (the **“SCTL”**) of all applications, bids and other documents and writings, participate in bidders’ and other conferences and providing information / responses to the SCTL, representing us in all matters before the SCTL, signing and execution of all contracts including the Contract Agreement and undertakings consequent to acceptance of our Proposal, and generally dealing with the SCTL in all matters in connection with or relating to or arising out of our bid for the said Project and/or upon award thereof to us and/or till the entering into of the Contract Agreement.

AND we hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us.

IN WITNESS WHEREOF WE, ....., THE ABOVE NAMED PRINCIPAL HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS ..... DAY OF ..... 20.....

For.....

(Signature, name, designation and address)

Witnesses:

- 1.
- 2.

Accepted

Notarised

(Signature, name, designation and address of the Attorney)

Notes:

1. The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure.
2. Wherever required, the Bidder should submit for verification the extract of the charter documents and documents such as a board or shareholders resolution/ power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Bidder.
3. For a Power of Attorney executed and issued overseas, the document will also have to be legalised by the Indian Embassy and notarised in the jurisdiction where the Power of Attorney is being issued. However, the Power of Attorney provided by Bidders from countries that have signed the Hague Legislation Convention, 1961 are not required to be legalised by the Indian Embassy if it carries a conforming Appostille certificate.
4. In case the Proposal is signed by an authorised Director of the Bidder (Lead Member, in case of a Consortium), a certified copy of the appropriate resolution/ document conveying such authority may be enclosed in lieu of the Power of Attorney.

## Appendix 5: Format for Affidavit Certifying no Blacklisting

(On Non – judicial stamp paper of Rs 100/- or

such equivalent document as applicable for the state of Kerala duly attested by notary public)

*Affidavit*

I, M/s. .... (Sole Bidder / Lead Member/ Other Member /s), (the names and addresses of the registered office) hereby certify and confirm that we or any of our promoters/directors are not barred by SCTL or blacklisted by any state government or central government / department / agency in India from participating in projects, either individually or as member of a Consortium as on the .....(*seven days prior to Proposal Due Date*).

We undertake that, in the event of us or any of our promoters/directors being blacklisted / barred at any time post the date of this affidavit, we shall intimate SCTL of such blacklisting.

We further confirm that we are aware that as per Clause 2.15 of the RFP for Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram, our Proposal for the captioned Project would be liable for rejection in case any material misrepresentation is made or discovered with regard to the requirements of the RFP Document at any stage of the Bidding Process or thereafter the Contract Agreement will be liable for termination.

Dated this .....Day of ....., 2019.

Name of the Bidder

.....

Signature of the Authorised Signatory

.....

Name of the Authorised Signatory

Note:

- *To be executed separately by all the Members in case of Consortium*

## Appendix 6: Format of Bid Security

To,

The Chief Executive Officer ,  
 SMART CITY THIRUVANANTHAPURAM LTD. (SCTL)  
 4th Floor, Annexe Building,  
 Municipal Corporation of TVPM,  
 Vikas Bhavan  
 Kerala – 695 033, India  
 Tel:+91-471 -2339944  
 E-mail: [smartcitytvm@gmail.com](mailto:smartcitytvm@gmail.com) , [tenders.sctl@gmail.com](mailto:tenders.sctl@gmail.com)  
 Website: <https://smartcitytvm.in/sctl/>

RFP No. \_\_\_\_\_

Date : \_\_\_\_\_

KNOW ALL MEN by these present that we ..... of .....  
 ..... (Name and address of Bank) having our registered office at .....  
 (hereinafter called “the bank”) are bound unto the Chief Executive Officer, SCTL (hereinafter called “the Owner”) in the sum of Rupees .....  
 (INR..... only) for which payment truly to be made to the said Owner, the Bank hereby binds itself, its successors and assigns by these present.

Whereas ..... (NAME OF BIDDER) has submitted its bid dated..... (date of submission of bid) for Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram in terms of the Owner’s RFP No. \_\_\_\_\_ Due on ..... issued by the SCTL for and on behalf of SCTL (hereinafter called “**the Proposal**”).

**AND WHEREAS** the Bidder is required to furnish a Bank Guarantee for the sum of Rupees ..... (INR..... only).

**AND WHEREAS** \_\_\_\_\_ (Name of Bank) have, at the request of the Bidder, agreed to give this guarantee as hereinafter contained without demur.

1. We further agree as follows:

- (a) That the Owner may without affecting this guarantee grant time of or other indulgence to or negotiate further with the Bidder in regard to the conditions contained in the said bid and thereby modify these conditions or add thereto any further conditions as may be mutually agreed upon between the Owner and the Bidder.
- (b) That the guarantee hereinbefore contained shall not be affected by any change in the constitution of our Bank or in the constitution of the Bidder.
- (c) That any account settled between the Owner and the Bidder shall be conclusive evidence against us of the amount due hereunder and shall not be questioned by us.
- (d) That this guarantee commences from the date hereof and shall remain in force till:
  - (i) the Bidder, in case his bid is accepted by the Owner, executes a Contract Agreement after furnishing the Performance Guarantee as per the provisions of the RFP; or
  - (ii) Sixty Days (60) days beyond the Proposal Validity Period.
- (e) That the expression 'the Bidder' and 'the Bank' herein used shall, unless such an interpretation is repugnant to the subject or context, include their respective successor and assigns.

2. The Conditions on this obligation are:

- (a) If any information or document furnished by the Bidder turns out to be misleading or untrue in any material respect; and/ or
- (b) If a Bidder engages in a corrupt, fraudulent, coercive, undesirable or restrictive practice as specified in the RFP Document; and/ or
- (c) If a Bidder has a Conflict of Interest which affects the Bidding Process, as specified in the RFP; and/or
- (d) if the Bidder withdraws his Proposal during the period of Proposal validity specified in the RFP, and/ or
- (e) If the Bidder fails to accept the Letter of Acceptance within the stipulated time period; and/ or



- (f) if the Bidder does not accept the correction/s of its bid price in terms of the RFP, or
- (g) if the Bidder having been notified of the acceptance of its Proposal by the Owner during the period of Proposal validity:
  - (i) fails or refuses to furnish the Performance Guarantee in accordance with the RFP and/or
  - (ii) fails or refuses to furnish the Success Fee in accordance with the RFP and/or
  - (iii) fails or refuses to enter into a Contract Agreement within the time limit specified in the RFP.

We undertake to immediately pay to the Owner in THIRUVANANTHAPURAM the above amount upon receipt of his first written demand, without the Owner having to substantiate his demand provided that in his demand the Owner will note that the amount claimed by him is due to him owing to the occurrence of any one or more of the conditions mentioned in Sl. 2 above, specifying the occurred condition or conditions.

SIGNATURE OF \_\_\_\_\_

AUTHORISED OFFICIAL OF THE BANK

SIGNATURE OF THE WITNESS

NAME OF OFFICIAL \_\_\_\_\_

\_\_\_\_\_

DESIGNATION \_\_\_\_\_

NAME OF THE WITNESS

\_\_\_\_\_

ADDRESS OF THE WITNESS

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

STAMP/SEAL OF THE BANK

## Appendix 7: Format of Affidavit

**(On a Stamp Paper of relevant value by Bidder/ Each Consortium Member)**

I, \_\_\_\_\_ son of \_\_\_\_\_ resident of \_\_\_\_\_ having been duly authorized on behalf of the Bidder, do hereby solemnly affirm and declare as under:

That whereas, I have submitted the Proposal for Selection of Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid - Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram (the “**Project**”)

Now, therefore, I, the undersigned, do hereby certify that all the information supplied as accurate, true and correct.

The undersigned also authorize(s) and request(s) any bank, person or firm to furnish any information requested by SCTL to verify any pertinent information deemed necessary and for otherwise inquiring about our reputation.

The undersigned also understands and agrees to supply any further information as may be required by SCTL.

The undersigned also understands that furnishing of false information could result in disqualification of his company (the Consortium, in case Bidder is a Consortium) for the Project, and if so awarded, SCTL may withdraw the LOA or terminate the Contract Agreement, as the case may be, without being liable in any manner.

**Dated this .....Day of ....., 2019**

.....Name of the Bidder

.....Signature of the Authorised Signatory

.....Name of the Authorised Signatory

Note:

- *To be executed by Bidder or separately by all the Members in case of Consortium.*

## Appendix 8: Format of Non-Collusion Certificate

### Non - Collusion Certificate

(on the Letter Head of Bidder/ Each Consortium Member)

We hereby certify and confirm that in the preparation and submission of this Proposal, we have not acted in concert or in collusion with any other Bidder/s and also not done any act, deed or thing which is or could be regarded as anti-competitive.

We further confirm that we have not offered nor shall we offer any illegal gratification in cash or kind to any person or agency in connection with the instant Proposal.

Dated this .....Day of ....., 2019

.....

Signature of the Authorised Signatory

.....

Name of the Authorised Signatory

*Note:*

- *To be executed by all the Members in case of Consortium.*



RFP For Selection of Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram

## Appendix 9: Technical Proposal

[On the Letter head of the Bidder (Lead Member in case of Consortium)]

Date: \_\_\_\_\_

To

The Chief Executive Officer,  
SMART CITY THIRUVANANTHAPURAM LTD. (SCTL)  
4th Floor, Annexe Building,  
Municipal Corporation of TVPM,  
Vikas Bhavan  
Kerala – 695 033, India  
Tel:+91-471 -2339944  
E-mail: [smartcitytvm@gmail.com](mailto:smartcitytvm@gmail.com) , [tenders.sctl@gmail.com](mailto:tenders.sctl@gmail.com)  
Website: <https://smartcitytvm.in/sctl/>

Dear Sir,

**Sub: Technical Proposal for Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram**

We \_\_\_\_\_ herewith submit our Technical Proposal as further detailed in Appendix 9A for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram.

**Signature of Bidder / the Lead Member in case of Consortium**

**Name of the Authorised Signatory**

**(With Stamp of the Bidder / the Lead Member in case of Consortium)**

Place: \_\_\_\_\_

Date: \_\_\_\_\_

## Appendix 9A: Description of Approach, Methodology and Work Plan for Implementing Project

- The Bidder will submit clause by clause compliance and details for all requirements/ specifications listed in RFP Part II, in the format given below:

Clause Reference	Description of the Bidder's Solution vis-a-vis the RFP requirement	Whether complied fully with RFP requirement (Write Yes or No)	If not fully complied, state the nature of non-compliance and how Bidder's solution will meet the functional requirements

- The Bidder must provide detailed write-ups alongwith supporting documents, case studies, product brochures, testimonials, etc. for each of the Evaluation Parameters listed below. The information should be sufficiently detailed, for SCTL to evaluate the Technical Proposal. The Bidder shall provide complete reference details for its implementations, the features of which it is providing as part of its Technical Proposal.

## Appendix 10: Format of Price Proposal Letter

To be submitted in physical copy in sealed envelope along with Appendix 10B  
**[On the Letter head of the Bidder (Lead Member in case of Consortium)]**

Date: \_\_\_\_\_

To

The Chief Executive Officer ,  
SMART CITY THIRUVANANTHAPURAM LTD. (SCTL)  
4th Floor, Annexe Building,  
Municipal Corporation of TVPM,  
Vikas Bhavan  
Kerala – 695 033, India  
Tel:+91-471 -2339944  
E-mail: [smartcityvm@gmail.com](mailto:smartcityvm@gmail.com) , [tenders.sctl@gmail.com](mailto:tenders.sctl@gmail.com)  
Website: <https://smartcityvm.in/sctl/>

Dear Sir,

**Sub: Price Proposal for Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram**

We \_\_\_\_\_ herewith submit our Price Proposal as detailed in Appendix 10A for \_\_\_\_\_

The supporting details in respect of the Price Proposal are furnished in Appendix 10B.

**Signature of Bidder / the Lead Member in case of Consortium**

**Name of the Authorised Signatory**

**(With Stamp of the Bidder / the Lead Member in case of Consortium)**

Place: \_\_\_\_\_

Date: \_\_\_\_\_



RFP For Selection of Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram

## Appendix 10A: Contents and Format of Price Proposal

As per Price BoQ

1. Good and Service Tax will be paid extra, at actual. All other taxes, duties and levies should be included in the quoted prices.

## Appendix 10B: Detailed Breakup of Price Proposal

To be submitted in physical copy in sealed envelope along with Appendix 10

### 1. Break-up of Price Proposal

The Bidder is required to give detailed break up of charges quoted for each of the Items of Work in Appendix 10A.

Such break up should contain complete computation details including various assumptions relating to capital costs, maintenance costs and operating costs for each of the Items of Work, arriving at the quoted charges. Such break up should contain details for each item comprising capital costs, maintenance costs and operating costs.

### 2. Price for various equipment, accessories, peripherals, spares, etc.

The Bidder is required to give prices for supply of all equipment, accessories, peripherals, spares, mounting kits, installation kits, etc.

The Bidder should give break-up of the prices in terms of base price, custom duties, CVD, excise duty, GST and any other taxes/duties, as applicable.

### 3. Manpower Cost

The Bidder is required to quote rates for different categories of manpower that may be required for undertaking additional work/changes in respect of one or more Items of Work. The rates shall be quoted in terms of man-hour, exclusive of GST.

S. No.	Category/ Position	Typical Qualification/ Experience	Typical Role	Unit Man-hour Rate (in INR)
1				
2				
3				
4				
5				
6				
7				
8				



**RFP For Selection of Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram**

**Notes:**

- (a) In case of insufficient details, Bidder shall promptly provide further details, as may be required by SCTL.

## Appendix 11: Checklist

1. The following Check List is intended to help the Bidders in submitting Proposals which are complete. Incomplete Proposals are liable to be rejected. Bidders are advised to go through the list carefully and submit Proposals complete in all respect.
2. Bidders are also required to submit the Check List, duly marked, along with their Proposal.
3. Any other documents required as per any other clause of the RFP Documents have to be submitted along with the Proposal even if not indicated in the aforesaid checklist.
4. Proposal Check List:

S. No.	Clause / Section / Appendix Ref. No.	Description	Checking Remarks
<b>Outer Envelope</b>			
1.	Appendix 11	Check – List duly filled in as per the format provided in Appendix 11.	Yes/No
2.	Appendix 2	Acknowledgement of RFP Document and Notification of Intent to Submit Proposal.	Yes/No
3.	Appendix 3	Covering Letter cum Project Undertaking stating the Proposal Validity Period.	Yes/No
4.	Clause 2.13	Bid Documents and amendments/ clarifications are submitted duly signed and sealed on all pages.	Yes/No
5.	Clause 2.16 / Appendix 6	Bid Security for Rupees Five Lakhs only (INR 1, 00,000/-) in required format.	Yes/No
6.	-	Envelope A.	Yes/No
7.	-	Envelope B.	Yes/No
<b>General Proposal (Envelope A)</b>			
1.	Appendix 4	Power of Attorney for signing of the Proposal.	Yes/No

S. No.	Clause / Section / Appendix Ref. No.	Description	Checking Remarks
2.	Appendix 5	Affidavit Certifying that Business Entity/ Promoter(s)/ Director(s) of Business Entity are not Blacklisted.	Yes/No
3.	Appendix 7	Affidavit.	Yes/No
4.	Appendix 8	Non-Collusion Certificate.	Yes/No
<b>Technical Proposal (Envelope B)</b>			
1.	Appendix 9 and Appendix 9 A	Contents of Technical Proposal.	Yes/No
<b>Price Proposal (Envelope C)</b>			
1.	Appendix 10: Format of Price Proposal Letter	<ul style="list-style-type: none"> <li>• Price Proposal Letter (Appendix 10)</li> <li>• Contents and Format of Price Proposal (Appendix 10A)</li> <li>• Detailed Breakup of Cost (Appendix 10B)</li> </ul>	Yes/No

## Appendix 12: Format of Pre-Proposal Queries

To

General Manager

SMART CITY THIRUVANANTHAPURAM LTD. (SCTL)

4th Floor, Annexe Building,

Municipal Corporation of TVPM,

Vikas Bhavan

Kerala – 695 033, India

Tel:+91-471 -2339944

E-mail: [smartcityvm@gmail.com](mailto:smartcityvm@gmail.com) , [tenders.sctl@gmail.com](mailto:tenders.sctl@gmail.com)

Website: <https://smartcityvm.in/sctl/>

**Subject:** RFP for Selection of Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram

Dear Sir,

Following are the Clarifications and Comments from the Terms and Conditions and Scope of Work against the RFP issued on \_\_\_\_\_ for Selection of Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid - Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram.

These Clarifications are exhaustive.

S. No.	Part No.	Clause No.	Page No.	Statement of Clarifications	Remarks
1					
2					
3					

Signature of the Authorized Signatory:

Name of the Authorized Signatory:

Name of the Bidder:

Date:



# **Smart City Thiruvananthapuram Limited National Competitive Bidding**

**Request for Proposal (RFP)**

**For**

**Selection of Contractor for Providing  
Design, Supply, Installation, Erection, Testing &  
Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted  
Solar PV Power Plant on Various Buildings  
in Thiruvananthapuram**

**Volume II: Scope of Work**

**Issued: 10<sup>th</sup> June, 2019**

**By**

**Chief Executive Officer  
SMART CITY THIRUVANANTHAPURAM LIMITED**

4th Floor, Annexe Building,  
Municipal Corporation of TVPM, Vikas Bhavan,  
Kerala – 695 033, India  
Tel:+91-471 -2339944

E-mail: [smartcitytvm@gmail.com](mailto:smartcitytvm@gmail.com)

Website: <https://smartcitytvm.in/sctl/>

Abbreviation	Full Form
ACB	Air Circuit Breaker
ACDB	Alternating Current Distribution Board
BIS	Specifications of Bureau of Indian Standards (BIS)
Capacity Utilization Factor (CUF)	Ratio of the annual output of the plant in kWh versus installed plant capacity for number of days. CUF = plant output in kWh / (installed plant capacity in kWp (DC side) * 365X24).
CEA	Central Electricity Authority
Commissioning	Successful operation of the Project / Works by the Contractor, for the purpose of carrying out Performance Test(s) as defined in RFS
Company	body incorporated in India under the Companies Act, 1956 or Companies Act,2013 including any amendment thereto
DC	Direct Current
DIN	German institute for standardisation
DSR	Diffused Solar Radiation
FAT	Factory Acceptance test
FF	Fill Factor
FRLS	Flame Retardant Low Smoke
FRLSOH	Flame Retardant Low smoke zero halogen
GSR	Global Solar Radiation
IEC	specifications of International Electro-technical commission
IEEE	Institute of Electrical and Electronics Engineers
IP67	Ingress Protection Standard
IR	Infra red
ISO	International Organisation for Standards
I-V Curve	Current - Voltage Characteristic Curve
kWh	Kilo-Watt-hour
kWp	Kilo-Watt Peak
LT Power	Low Tension Power
MCCB	Moulded Case Circuit Breaker
MNRE	Ministry of New and Renewable Energy, Government of India
MPPT	Maximum Power Point Tracker
MV Panel	Medium Voltage Panel
NABL	National Accreditation Board for Testing and Calibration Laboratories
O&M	Operation & Comprehensive Maintenance of Rooftop Solar PV system
PC	Personal Computer
PCU	Power Conditioning Unit / Grid tied Invertor
Performance Ratio (PR)	Ratio of plant output versus installed plant capacity at any instance with respect to the radiation measured. PR= (Measured output in kW /Installed Plant capacity in kW * (1000 W/m2/Measured radiation intensity in W/m2).
PID	Proportional integral derivative
Project	constitute all the roof top Solar PV Plants to be installed by the developer for a specific period and at a fixed cost for SCTL
Project capacity	Capacity in kWp specified by SCTL for each site consisting of single or multiple roof tops. The project capacity specified is on "DC" output Side only
PV	Photo Voltaic

Abbreviation	Full Form
RFID	Radio frequency identification
SCADA	Supervisory Control and Data Acquisition
SCTL	Smart City Thiruvananthapuram Limited
SECI	Solar Energy Corporation of India, New Delhi (A Govt. of India Enterprise) under MNRE
SNA	State Nodal Agency
SPV	Grid Tied Solar Rooftop Photo Voltaic
SS 304	Stainless Steel 304
STC	Standard Test Condition(Measured at standard test conditions of solar radiation at 1000W per sq meter at 25 deg. Celsius, spectrum AM 1.5)
UG Cables	Underground cable
UV	Ultra Violet
Vmp	Opt. Operating Voltage at Maximum Power
W	Wattage
Wp	Watt Peak
kA	kilo Amps
kV	kilovolts
MCB	Miniature Circuit Breaker
EPDM	ethylene propylene diene monomer rubber
XLPE	Cross-linked polyethylene
ISI	Indian Standards Institute
CE	European Conformity
TUV	Technical Inspection Association
RoHS	Restriction of Hazardous Substances
MOV	metal oxide arrestors
SPD	surge protection devices
GS	Galvanised Steel
DCDB	Direct Current Distribution Board
LCD	liquid crystal display
KWH	kilowatt hour
MD	Maximum demand
KW	kilowatt
CT	Current Transformer
PT	Voltage Transformer
KSEBL	Kerala State Electricity Board Limited
TOD	Time of Day
DLMS	Device Language Message Specification
AMR	Automatic meter reading

## **SCOPE OF WORK**

Design, engineering , supply, installation, testing and commissioning and grid connection of Grid tie Rooftop Solar Power plant (inclusive of Electrical, Civil, Electronic and Mechanical features) along with Solar PV panels, Power Conditioning Units (PCUs)/ Inverters, MPPTs, DCDB, AC Isolator, ACDB, DC Cables, AC Cables, AC Panels, Surge Protector at DCDB & ACDB, Smart Solar energy meter, Net Meter with CT/PT arrangement, Lightning protection system, Solar PV panel earthing, DCDB earthing, ACDB earthing, Electrical panel earthing, Remote data monitoring, all Civil works and electrical works, Transportation and insurance, Liasoning, Feasibility Report from KSEBL/EI/any other agencies, as required and specified as per MNRE/ ANERT standard with minimum annual average power generation of 1350 units per kWp, Operation, Maintenance, Remote Data monitoring, Servicing, Repairing & Generation for 5 years as per the SCTL directions with a performance ratio above 77%

- Detailed design of the proposed solar power plant for solar power generation.
- Design, Engineering, Supply, Installation, Testing and Commissioning of Solar Power Plant Project on Rooftop of specified buildings as per technical specifications given by MNRE/ ANERT, GOI Specifications/ appropriate IS standards.
- The scope shall include supply, installation & commissioning of Solar PV modules, module mounting structure, inverters, surge protectors for AC & DC, DC cables, LT AC Cables, Cable trays, junction boxes, connectors/combiners, perforated cable trays, ACDB, Earthing & Lightning Protection System, solar meters, check meters, Data Logging & Monitoring System, fire & safety equipment. The plant shall be in complete in all respects with the above equipment/items listed out but not limited to the same.
- Supply and installation of Module mounting structure/ super structure on identified locations SPV Panel structure with Hot dipped galvanised steel and cement concrete (CC) footing suitable for site condition. Design of SPV structure shall be certified /vetted by a reputed structural consultant and submitted for approval before taking up the structure works.
- Generation of Solar Energy based, conversion of the same to AC power with a guaranteed annual generation of 1350 units per kWp per annum during the first five years of operation at KSEBL grid synchronization point
- Supply, installation, testing and commissioning of three phase Power Conditioning Units (PCU)/ inverter plus local grid synchronizing system), distribution panels, electrical switchgears, inverters, metering and connecting the system to the switch gear (MCB/Distribution Board) provided in the substation for load and connecting up the system to the electrical grid surge protection units etc. as required. Enclosed indoor space for locating PC, control monitoring, data loggers, PCU/solar inverter etc.
- Supply and laying of all power and control cables on prefabricated GI perforated cable trays including supply of cable trays, their installation, hangers, supports, cable terminations and all fixing accessories.

- Testing and commissioning of the entire system including synchronizing with power grid and operation as required. The installation shall include the electrical switchgears, cabling, terminations, cable trays, inverters, metering and connecting the system to the electrical grid.
- The PV modules shall be installed with the necessary tilt with the most effective orientation.
- All related & required civil works will be the responsibility of the execution agency.
- Supply of the recommended spare parts along with the main equipment's to avoid downtime during Guaranty/Warranty and defect liability period should be maintained.
- Inspection of the complete installation at least once every year during guarantee period by the respective equipment manufacturer's specialist Engineer(s).
- The metering of electricity shall be carried out as per the regulations stipulated by KSEBL, Kerala Electricity Regulatory Commission and/or Central Electricity Authority.
- All Inclusive Upkeep & Maintenance during warranty period
- Provision of necessary switchgear in the LT distribution panel for connecting the solar energy based AC power to Bank's Power grid. However, the termination of cable to the switchgear shall be in the scope of the successful tenderer.
- All aspects of quality assurance, including procurement & testing of materials and other components of the work, as specified or as directed;
- Clearing of site and handing over of all the Works, as directed;
- Maintenance of the completed Work during the maintenance period
- Submission of completion (i.e. 'as-built') drawings and other related documents as specified
- Any other requirement to commission the solar panel supporting system in all respects in accordance with the provisions of the Contract and/or to ensure the structural stability and safety during and after construction
- The Contractor shall carry out adequate site visit and perform shadow analysis of site and design the plant accordingly. The Contractor shall submit complete design, details and drawings for approval to SCTL before progressing with the installation work.
- Arranging, obtaining and maintaining all permits, licenses, approvals, no objection certificates, clearances from all authorities concerned in the name of itself or / and SCTL or its designated assignee (as the case may be), to enable unhindered smooth progress of all works during construction up to power generation and injection to Grid including operation of the Plant.
- Procurement of all equipment required for setting up of the rated capacity of the plant, power evacuation and transmission requirements at specified voltage
- Providing solar radiation and weather monitoring system within plant for information and control of required parameters such as voltage, current, output power, power factor, DC input voltage, DC input current, active time of power generation, time idle, time disabled, total power produced, temperature shall be logged in the system.

- Providing suitable grid compliant reactive power management system & facilitation of net metering and certification of net-metering system.
- Providing all necessary protection devices to protect the plant from lightening, sudden surges in voltage and current and to ensure safety of the grid to which the plant is connected to ensure protection of life and property likely to be endangered due to the installed solar power plant.
- Contractor shall adhere to safety standards, reliability, operability & maintainability aspects, metering arrangement as per the standards, norms and regulations specified/notified by KSEBL/Electrical Inspectorate/KSERC during erection as well and operation & Maintenance.
- Compliance with all legal requirements of State/ Nation where the Project is located.
- Commissioning the power plant to its full capacity
- Operation and Maintenance of the Solar Power Plant for a concession period of 5 years from the commissioning for demonstration of agreed performance level and handover the entire plant to SCTL or its designated assignee.
- Any other activity deemed fit and necessary for execution and operation of the Project as per prudent utility practices.
- The successful Contractor shall have to prepare and submit 'As Built Drawings' depicting the exact construction carried out on site, in soft and hard copy format.
- Statutory and other charges for getting various required approvals for operation shall be in scope of Successful Contractor.
- Danger boards, information boards, fire safety equipments, first aid kits, operation and maintenance spares, tools and tackles as required shall be provided.

#### **SCOPE OF SERVICE**

- The solar PV array must be installed on the structure top in such a way that there is sufficient space on the structure top for maintenance, etc.
- Proper and safe ladder must be provided to ensure easy access to the structure top mainly for the purpose of maintenance and inspection.
- There should not be any damage what so ever to the structure due to installation of the solar power plant. The structure shall have decorative cladding around it and care should be taken to ensure that no damage occurs to the same during construction or O&M stage.
- The Contractor shall agree to provide installation details of the PV modules and the support structures with appropriate diagrams and drawings.
- An Operation, Instruction and Maintenance Manual, in English and Malayalam, should be provided with the system.
- A Factory Test Report (FTR) shall be supplied with the unit after all tests. The FTR shall include detailed description of all parameters tested.
- Factory testing of the Inverter/ Inverters may be carried out. SCTL representative may be allowed to witness it at the manufacturer's premises, if so required.

- All the electrical installation shall be certified by a competent licensee of the Electrical Inspectorate and approval has to be obtained from the authority designated for the same.
- An Energy Audit of the power plants shall be conducted at the time of commissioning. Similar Energy Audit shall be performed after every 3 years and report shall be submitted to SCTL. The performance guarantees specified in the RFP shall be reviewed and the Contractor will have to ensure that the same are met by adopting appropriate corrective measures.

### **SCTL OBLIGATIONS**

- SCTL shall not provide subsidy of any kind to the vendor for meeting the cost of setting up solar system.
- SCTL shall periodically evaluate the performance of the Contractor

### **CONTRACTOR'S OBLIGATION**

- Site survey, technical feasibility, financing, regulatory & policy assessment
- Securing all planning permits and approvals, from all local authorities as applicable;
- Providing all necessary labour, material, services, tools, plant and equipment for the works;
- The Contractor must guarantee the complete equipment delivery, implementation, integration and commissioning within 6 month duration
- The physical security of the equipment and relevant accessories will be the responsibility of the operator.
- Offer a range of viable project delivery options, including by but not limited to
- Design, construct, operate, maintain, provide supply to the Grid for a contract duration of 5 years;
- Design, construct, operate, maintain, provide solar power supply to grid and ensure power generation & plant availability as per contract requirements;
- Assist SCTL to enter into a Power Purchase Agreement for supply of power to the Grid if required
- Ensure cleanliness & safety during execution of work.

### **SIZE OF THE PROJECT**

The size of each project shall be in the range of 4kWp to 400 kWp for identified locations. One project may however comprise of several rooftop units. Each roof top unit can separately connect with the grid and may have separate meters.

Building name	Government College for Women	Kerala University Library	State Central Library	Government Central High School	Kerala Legislative Assembly	Total
Client Connection Type	HT	HT	HT	LT	HT	
Project location (Latitude, Longitude)	8°29'58.14"N, 76°57'22.19"E	8°30'12.23"N, 76°56'56.67"E	8°30'23.11"N, 76°57'7.98"E	8°28'54.58"N, 76°56'51.98"E	8°30'24.49"N, 76°56'57.39"E	
Type of array mountings	Fixed Tilt 8.5° towards south	Fixed Tilt 8.5° towards south	Fixed Tilt 8.5° towards south	Fixed Tilt 8.5° towards south	Fixed Tilt 8.5° towards south	
Roof type	RCC Tiled	RCC Tiled	RCC Tiled	RCC	RCC Tiled	
Mounting	Removable concrete ballast	Removable concrete ballast	Removable concrete ballast	Removable concrete ballast	Removable concrete ballast with elevated or roof mounting	
Rooftop Area sqmtr	959	1549	509	235	12528	
Solar Plant Capacity suggested kWp(indicative only)	82.875	85.475	39.650	3.900	395.625	<b>607.525</b>

## TECHNICAL SPECIFICATION

### TECHNOLOGY

Any Solar PV power generation Technology viz High efficiency Poly/Multi or Mono crystalline silicon Solar Cell Modules manufactured in India of reputed make. Under this bid, it is proposed to promote only established and operational technologies to minimize the technology risk and to achieve the commissioning of the projects in state. The Contractor shall however submit the technology selected for its Project.

A Grid Tied Solar Rooftop Photo Voltaic (SPV) power plant consists of SPV array, Module Mounting Structure, Power Conditioning Unit (PCU)/ Inverter consisting of Maximum Power Point Tracker (MPPT), Inverter, and Controls & Protections, interconnect cables and switches. PV Array is mounted on a suitable structure. Grid tied SPV system is without battery and should be designed with necessary features to supplement the grid power during day time. Components

and parts used in the SPV power plants including the PV modules, metallic structures, cables, junction box, switches, PCUs/ Inverters etc., should conform to the BIS or IEC or international specifications, as specified herein or otherwise wherever such specifications are available and applicable. All the equipment associated with solar plant installation like solar PV panels, inverters, MPPT, cables, junction boxes etc. shall be brand new and as per latest specified Indian/IEC standards.

Rooftop Solar PV system shall consist of following equipment /components

- Solar PV modules consisting of required number of crystalline PV modules
- Grid interactive Power Conditioning Unit with Remote Monitoring System
- Mounting structures
- Junction Boxes
- Earthing and lightning protections
- IR/UV protected FRLS/FRLSOH (for underground) Cables, pipes and accessories
- Metering & associated equipment
- Circuit breakers & control gears for step-up, UG Cables etc.
- Life-line safety systems

#### **TYPE AND QUALITY OF MATERIALS AND WORKMANSHIP**

The design, engineering, manufacturing, supply, installation, testing and performance of the equipment shall be in accordance with latest appropriate IEC/Indian Standards as detailed. Where appropriate Indian Standards and Codes are not available, other suitable standards and codes as approved by the MNRE/ ANERT shall be used. The specifications of the components should meet the technical specifications mentioned

Any supplies which have not been specifically mentioned in this Contract but which are necessary for the design, engineering, manufacturing, supply & performance or completeness of the project shall be provided by the Contractor without any extra cost and within the time schedule for efficient and smooth operation and maintenance of the SPV plant

#### **GENERAL QUALITY REQUIREMENTS OF SPV PLANT**

1. SPV modules of adequate capacity, Inverters, Junction boxes, etc. to ensure generation of power as per design estimates. This is to be done by applying liberal de-rating factors for the array and recognizing the efficiency parameters of Inverters etc. The output at Inverter(s) will be checked. The meter reading will be considered for verifying the Performance Ratio.
2. Use of equipment and systems with proven design and performance that have a high availability track record under similar service conditions.

3. Selection of the equipment and adoption of a plant layout to ensure ease of maintenance.
4. Strict compliance with the approved and proven quality assurance norms and procedures during the different phases of the project.
5. Proper monitoring in the synchronizations which ensures the availability of power to the grid.
6. The injection of AC power if not in the range in to Grid shall be avoided by using suitable rated isolation transformer etc at output of/ in the inverter if separate power evacuation transformer is not used.
7. Ripple content must not exceed 3% on DC side
8. Limits for harmonics as per CEA technical standard on Grid connectivity to be follow. Individual voltage harmonics distortion shall be as per IEEE 519-2014
9. The power plant has to operate in parallel with the grid system which is infinite electrical system. So, the Solar Power Plant design should be equipped with requisite protective measures/ relays / breakers so as to protect equipment in solar power plant against any of possible fault or other disturbances from the grid.
10. The Solar plant shall be equipped with necessary protection systems including physical isolation to ensure isolation of the solar power plant from the grid at the time of any fault or/and any additional suitable protection.
11. Very fast microprocessor based Directional and Reverse power flow protection should be provided to ensure isolation of the solar power plant from the grid at the time of any fault or/and any additional suitable protection.
12. The alarm contact shall be provided for hardware failures, failures of internal and external auxiliary supplies etc. The alarm signals should be via system fault relay (voltage free contact).

The detailed design of the complete solar generating system by using their software to optimize the string sizing considering the specific location, isolation, nature of load etc.

The equipment and materials for the Rooftop Grid tie Solar PV Power Plant with associated system (Typical) shall include but not be limited to the Supply, Erection, and Testing & Commissioning of the following:

1. Solar PV modules, of suitable rating in each array.
2. Solar PV modules in array to generate as per given kWp including mounting frames, structures, array foundation and module inter connection.
3. Array Junction boxes/SMU, distribution boxes, fuse boxes, MCBs, Surge Arrestors etc.
4. Inverters with Data compatibility, LT Power Interfacing Panel, common AC power evacuation

panel with bus bars and MCCBs/ Load Break switch suitable for remote operation, Plant Monitoring Desk and any other equipment required for the smooth and satisfactory operation of the Solar PV Plant.

5. Metering and protection
6. LT Power and Control Cables including end terminations and other required accessories, if any, for both AC & DC power
7. Data acquisition system with remote monitoring and communicating facilities.
8. Lightning arrestors, Lightning conductors, Lightning protection system etc.
9. Tool kit
10. Control equipment related to solar system
11. Testing, maintenance and Condition monitoring equipment.
12. Mandatory spares for 5 years
13. Any other equipment / material required to complete the Solar Power Plant Receipt, unloading, storage, erection, testing and commissioning of all supplied material.
14. One Solar Observatory including testing facilities to be provided at site with higher capacity plant. The Solar Observatory with associate system shall include minimum of but not be limited to the items like Pyranometer, Modified Shade Disk Kit. Sunshine Duration Recorder, Ultrasonic Anemometer. Temperature & Relative Humidity Meter.
15. Design of Rooftop Mounted Grid tie Solar Power Plant and its associated electrical & mechanical auxiliary systems which includes preparation of single line diagrams and installation drawings, electrical lay outs, erection key diagrams, electrical and physical clearance diagrams etc. design memorandum and other relevant drawings and documents required for engineering of all facilities within the demarcated area under this contract, are covered
16. The measurement of the Solar Radiation and other climatic conditions is necessary to study Solar Level and Guaranteed Performance of the Solar Power Plant. The satellite based analysis is to be combined with direct rooftop based measurement equipment in order to achieve the necessary accuracy in the assessment of solar levels and climatic conditions. The major categories of site-specific assessment required are Global Solar Radiation (“GSR”), Diffused Solar Radiation (“DSR”), Sunshine Duration, Atmospheric Turbidity, Temperature & Humidity, Wind Speed
17. Power evacuation from Grid connected roof top mounted SPV shall be made available at the substation main panel interconnection point of Grid.

## **PLANT SPECIFICATION**

PLANT SPECIFICATION	
Power Generation	Average 1350 units per kWp per annum
Plant Life	>25 Years
System Warranty	5 Years
O&M	5 Years
Module Performance Warranty	>90% at the end of 10 years and >80% at the end of 25 years
Quality requirements of SPV Plant	<ul style="list-style-type: none"> <li>• Selection of the equipment and adoption of a plant layout to ensure ease of maintenance</li> <li>• Ripple content must not exceed 3% on DC side</li> <li>• Solar Power Plant design should be equipped with requisite protective measures/ relays / breakers so as to protect equipment in solar power plant against any of possible fault or other disturbances from the grid</li> <li>• Solar plant shall be equipped with necessary protection systems including physical isolation to ensure isolation of the solar power plant from the grid at the time of any fault or/and any additional suitable protection</li> <li>• Very fast microprocessor based Directional and Reverse power flow</li> <li>• Protection should be provided to ensure isolation of the solar power plant from the grid at the time of any fault or/and any additional suitable protection</li> <li>• Data acquisition system with remote monitoring and communicating facilities is a requirement</li> </ul>
Other features	<ul style="list-style-type: none"> <li>• Performance Ratio should be above 77%</li> <li>• Fill factor of the Solar PV module <math>\geq 80\%</math></li> </ul>

### PV MODULE QUALIFICATION

The PV module must conform to the latest edition of the following IEC/ equivalent BIS standards for PV module design qualification and type approval.

Sl.No	Standard	Description
1	IEC: 61215	Crystalline silicon terrestrial photovoltaic modules - Design qualification and type approval.
2	IEC: 61730 – I: 2007	Photovoltaic module safety qualification-Requirement for construction
3	IEC: 61730 – II: 2007	Photovoltaic module safety qualification-Requirement for testing
4	IEC 61701	Salt mist corrosion test of the module
5	IEC 61853	Photovoltaic (PV) module performance testing and energy rating

The Solar PV Module should be of power rating 325Wp or above, manufactured in India in a plant certified under ISO 9001: 2008 & ISO 14001 or equivalent BIS standard and must have test certificate issued from accredited test laboratories of MNRE/ ANERT Govt. of India or abroad .

The Solar PV Module should be made of mono or poly / multi crystalline Silicon Solar Cell connected in series/parallel. The supplied modules should be PID free; a certificate should be submitted with the bid document.

Module efficiency shall be more than 17% at STC (Measured at standard test conditions of solar radiation at 1000W per sq meter at 25 deg. Celsius, spectrum AM 1.5). If required Inspection of testing of PV array will be conducted by the Authority including identification of panels ready for dispatch to be confirmed with details provided in RFID tag using RFID reader at site during FAT. The RFID details of each module shall be issued to the SCTL during FAT.

The single module with highest wattage shall be given preference provided all other criteria are equal.

<b>SOLAR PHOTOVOLTAIC MODULES SPECIFICATION</b>	
Module capacity	≥325 Wp
Module Efficiency	≥ 17 %
Tolerance	+ /-1%
Fill factor	≥80%
Maximum system voltage	1000/1500 V
Cell Type	Mono or Poly/Multi Crystalline Silicon
Opt. Operating Voltage (Vmp)	≥37.4 V
Degradation Warranty	Panel Output (Wp) capacity to be ≥90% of designed nominal power after 10 years and ≥80% of design nominal power after 25 years.
Product warranty on materials and workmanship	10 years
Operating Temperature	-40°C to +85°C
PID	PID Free/resistance certificate is required
Application Classification	Class A
Frame Material	Anodized aluminium alloy Non corrosive and electrolytically compatible with the mounting structure material
J-Box	IP67, 3 diodes
Make	Module manufactured in India
Average relative efficiency	≥97 %
Termination Box	Thermo plastic, IP 65, UV resistant
Blocking diodes	Schottky Type
Other features	<ul style="list-style-type: none"> <li>• PV modules must be tested and approved by one of the IEC authorized test centers</li> <li>• Protective devices against surges at the PV module shall be</li> </ul>

## SOLAR PHOTOVOLTAIC MODULES SPECIFICATION

	<p>provided. Low voltage drop bypass diodes shall be provided</p> <ul style="list-style-type: none"> <li>• PV modules to be used in a highly corrosive atmosphere throughout their lifetime, they must qualify to IEC 61701/IS 61701</li> <li>• Solar cell shall have surface anti-reflective coating to help to absorb more light in all weather conditions.</li> <li>• Solar module shall be laminated using lamination technology using established polymer (EVA) and Pedlar/ Polyester laminate</li> <li>• The module frame shall be made of Anodized Aluminium alloy/ corrosion resistant material, which shall be electrically compatible with the structural material.</li> <li>• Fuses of adequate rating shall also be provided in each solar array module to protect them against short circuit. The fuse shall have DIN rail mountable fuse holders and shall be housed in thermoplastic IP 65 enclosures with transparent covers</li> <li>• A suitable number of Solar PV modules shall be connected in a series string. A suitable number of series strings shall be connected in parallel to formulate a series parallel array. The PV strings and array shall be designed to match the inverter input specifications</li> <li>• The peak-power point voltage and the peak-power point current of any supplied module and/or any module string (series connected modules) shall not vary by more than 2 (two) per cent from the respective arithmetic means for all modules and/or for all module strings, as the case may be</li> <li>• The module shall be provided with a junction box with either provision of external screw terminal connection or sealed type and with arrangement for provision of by-pass diode. The box shall have hinged, weather proof lid with captive screws and cable gland entry points or may be of sealed type and IP-65 rated.</li> </ul>
<p><b>Identification and Traceability</b></p>	<p>Each PV module used in any solar power project must use a RF identification tag. RFID shall be mandatorily placed inside the module laminate and it must be able to withstand harsh environmental conditions.</p> <p>The following information must be mentioned in the RFID used on each module.</p> <ol style="list-style-type: none"> <li>1. Name of the manufacturer of PV module</li> <li>2. Name of the Manufacturer of Solar Cells</li> <li>3. Month and year of the manufacturer (separately for solar cells and modules)</li> </ol>

### SOLAR PHOTOVOLTAIC MODULES SPECIFICATION

	<p>4. Country of origin (separately for solar cells and module)            5. I-V Curve for the module            6. Wattage, Im, Vm and FF of the module            7. Unique serial no. and Model no. of the module            8. Date and year of obtaining IEC PV module qualification certification            9. Name of the test lab issuing IEC certificate            10. Other relevant information on traceability of solar cells and module as per ISO 9000.</p> <p>The successful Contractor shall provide an RFID Reader from the manufacturer with supporting software to show/ transfer the RFID details of the modules transported to sites to the PC/ Laptop of system of site Engineer in charge and the data may be transferred to the SCTL up to their satisfaction, which is mandatory for the site acceptance tests.</p>
<b>Authorized Test</b>	<p>The PV modules must qualify (enclose test reports/certificate from IEC/NABL accredited laboratory) as per relevant IEC standard. Additionally the performance of PV modules at STC must be tested and approved by one of the IEC/NABL accredited test centers including Solar Energy Centre.</p>

### MECHANICAL CHARACTERISTICS

- I. Each module shall have low iron tempered glass front for strength and superior light transmission (4 mm tempered for SSI-M6-270 & SSI-3M6-270, 3.2 mm for others).
- II. It shall have back sheet for environment protection against moisture and high voltage electrical insulation.
- III. The V-I curve of each PV module with Sl. Nos. should be submitted along with Modules meeting the required specifications.
- IV. Solar cell shall have surface anti-reflective coating to help to absorb more light in all weather conditions.
- V. Output Cables shall be Polarized Weather Proof DC rated multi-contact connector of relevant international/national standards
- VI. The module frame shall be made of Anodized Aluminium alloy/ corrosion resistant material, which shall be electrically compatible with the structural material.
- VII. Fuses of adequate rating shall also be provided in each solar array module to protect them against short circuit. The fuse shall have DIN rail mountable fuse holders and shall be housed in thermoplastic IP 65 enclosures with transparent covers.

- VIII. Shading Losses as per the relevant Industry Standard & Practice should be taken while designing the proposed power plant and the same shall be specifically indicated.
- IX. A suitable number of Solar PV modules shall be connected in a series string. A suitable number of series strings shall be connected in parallel to formulate a series parallel array. The PV strings and array shall be designed to match the inverter input specifications.

The Contractor shall provide data sheet for Solar PV modules along with their offer

### **MODULE MOUNTING STRUCTURE**

Photovoltaic arrays must be mounted on a stable, durable structure (with due consideration of aesthetic beauty of the project location) that can support the array and withstand wind, rain, hail and other adverse conditions. The mechanical structure shall be made up of hot-dip galvanized steel or aluminium and designed to withstand gusts of wind/ cyclonic wind up to 150 km/h from back side of the panel. Stationary structures shall support SPV modules at a given orientation, absorb and transfer the mechanical loads to the rooftop properly.

The modules will be fixed on rooftop mounted structures with arrangement of manual tilting. Array support structure shall be fabricated using corrosion resistant hot dipped galvanized GI metal sections or 100% aluminium electrically compatible with the structural material. Array support structure welded joints and fasteners shall be adequately treated to resist corrosion.

The mounting steel structure shall be as per latest BIS 2062 (amended up to date) and galvanisation of mounting structure shall be in compliance of BIS 4759 (amended up to date).

The array will be installed on steel racking structures that are anchored in the rooftop. Racks will be laid out in parallel matrices allowing for individuals to access the area between the racks for cleaning and other maintenance needs. The minimum clearance between lower edge of PV panel and rooftop level shall not be less than 0.6 m. In between the row of solar panels sufficient gap need to be provided to avoid falling of shadow of previous row on the next row. Seismic factors for the site will be considered while making the design of the foundation.

The manufacturer shall specify installation details of the PV modules and the support structures with appropriate diagram and drawings. The detailed structure design drawings should be submitted along with the bid. The material selected and their standards shall be submitted to SCTL for approval before starting the execution work. The work will be carried out as per design approved by SCTL

Design foundation (RCC and PCC) and structure considering the wind loads and structural load bearing capacity of the building. The contractor must ensure proper water proofing in case of any modifications to the roof.

<b>MOUNTING STRUCTURE SPECIFICATION – GI 2.5 meter elevated mounting</b>	
Material	MS Galvanized
Coating	Hot dipped (galvanized)

<b>MOUNTING STRUCTURE SPECIFICATION – GI 2.5 meter elevated mounting</b>	
Wind Withstand velocity	150kM /hr
Panel Tilt angle	Fixed angle type Suitable to site-North South Orientation with a fixed tilt angle of 9 -13 degrees (depending on location) facing true South
Foundation Mounting arrangement for flat roofs	Removable concrete ballast made of pre-fabricated PCC (1:2:4),M15 Preferable with Adhesive and required counterweight to withstand wind speed of 150kM/hr
Fixing type	SS 304 fasteners, Clamps, Bolts
Installation	The structures shall be designed for simple mechanical on-site installation. There shall be no requirement of welding or complex machinery at the installation site
Access for panel cleaning and maintenance	All solar panels must be accessible from the top for cleaning and from the bottom for access to the module junction box.
Other features	<ul style="list-style-type: none"> <li>• The mounting structure steel shall be as per latest IS 2062: 1992 and galvanization of the mounting structure shall be in compliance of latest IS 4759</li> <li>• Structural material shall be corrosion resistant and electrolytically compatible with the materials used in the module frame, its fasteners, nuts and bolts</li> <li>• The total load of the structure (when installed with PV modules) on the terrace should be less than 60 kg/m<sup>2</sup></li> <li>• Regarding civil structures the Contractor need to take care of the load bearing capacity of the roof and need arrange suitable structures based on the quality of roof</li> <li>• The minimum clearance of the structure from the roof level should be 300 mm</li> <li>• Hot dip galvanised steel (min 120 microns thick)</li> <li>• The mounting steel structure shall be as per latest BIS 2062 and galvanisation of mounting structure shall be in compliance of BIS 4759</li> </ul>
Minimum distance between roof level and lower edge of PV panel	0.3 meter for base mounting 2.5 meter for elevated mounting

<b>MOUNTING STRUCTURE SPECIFICATION – ALUMINIUM 0.3 meter base mounting</b>	
Material	Aluminium
Material Grade	6063 Alloy
Wind Withstand velocity	150kM /hr
Panel Tilt angle	Fixed angle type Suitable to site-North South Orientation with a fixed tilt angle of 9 -13 degrees (depending on location) facing true South

<b>MOUNTING STRUCTURE SPECIFICATION – ALUMINIUM 0.3 meter base mounting</b>	
Foundation Mounting arrangement for flat roofs	Removable concrete ballast made of pre-fabricated PCC (1:2:4),M15 Preferable with Adhesive and required counterweight to withstand wind speed of 150kM/hr
Fixing type	SS 304 fasteners, Clamps, Bolts
Installation	The structures shall be designed for simple mechanical on-site installation. There shall be no requirement of welding or complex machinery at the installation site
Access for panel cleaning and maintenance	All solar panels must be accessible from the top for cleaning and from the bottom for access to the module junction box.
Other features	<ul style="list-style-type: none"> <li>• Structural material shall be corrosion resistant and electrolytically compatible with the materials used in the module frame, its fasteners, nuts and bolts</li> <li>• The total load of the structure (when installed with PV modules) on the terrace should be less than 40 kg/m<sup>2</sup></li> <li>• Regarding civil structures the Contractor need to take care of the load bearing capacity of the roof and need arrange suitable structures based on the quality of roof</li> <li>• The minimum clearance of the structure from the roof level should be 300 mm</li> <li>• Anti-Corrosive Property against harsh environment</li> </ul>
Minimum distance between roof level and lower edge of PV panel	0.3 meter for base mounting 2.5 meter for elevated mounting

### **STRING COMBINER BOX OR ARRAY JUNCTION BOXES**

1. The string combiner box/ junction box shall be dust, vermin, and waterproof and made of FRP/ABS Plastic. The terminal will be connected to copper bus-bar arrangement of proper size to be provided. The junction boxes shall have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cables. Suitable markings shall be provided on the bus- bars for easy identification and cable ferrules will be fitted at the cable termination points for identification.
2. The string combiner box/ junction box shall conform to IEC 60529 and shall be with protection class IP 65 for mounting outside in open weather condition.
3. Each string combiner box/ junction box will have suitable Reverse Blocking Diodes of maximum DC blocking voltage of 600/ 1000V with suitable arrangement for its connecting.
4. The string combiner box/ Array junction Box will also have suitable surge protection device. The Surge Protective Device shall be of Type 2 as per IEC 60364-5-53

5. The junction Boxes shall have suitable arrangement for the followings (typical):-
  - a. Combine groups of modules into independent charging sub-arrays that will be wired into the controller.
  - b. Provide arrangement for disconnection for each of the groups.
  - c. Provide a test point for each sub-group for quick fault location.
6. The current carrying ratings of the string combiner box/ junction box shall be suitable with adequate safety factor, to inter connect the Solar PV array.

## **INVERTER**

The Inverter houses the inverter circuitry which converts DC power supply into AC power supply, the synchronization circuitry actualizes the tie-up of solar PV source to the grid source and control circuitry. A number of Inverters are connected in parallel to build up the required AC power and combiners permit AC output power at 3 Phase 50 Hz. The inverter output shall always confirm to the grid in terms of Voltage and frequency. The Inverters should be designed to be completely compatible with the SPV array voltage and Grid supply voltage. The 3 phase Inverters shall be from reputed firms, which will incorporate latest Technological advance to provide highly reliable and efficient energy conversion from DC to AC. The inverter shall be efficient based on PWM MPPT with IGBT power based design.

Inverter output should be compatible with the grid frequency. Inverter shall be capable to synchronize independently & automatically with KSEBL grid power line frequency to attain synchronization and export power generated by solar plant to grid. The Inverter shall be capable of complete automatic operation, including wake-up, synchronization & shut down.

The combined kW rating of all Inverters shall meet the location specific requirements. The efficiency of the Inverter shall be equal to or more than 97 % at 75% load as per IEC 61683 or equivalent standard.

The inverters should comply with applicable IEC/ equivalent BIS standard for efficiency measurements and environmental tests as per standard codes IEC 61683 and IEC 60068 2(1,2,14,30).

Maximum Power Point Tracker (MPPT) shall be integrated in inverter to maximize energy drawn from the Solar PV array. The MPPT should be microprocessor based to minimize power losses.

The details of working mechanism of MPPT shall be mentioned by the contractor in his offer.

The junction boxes/ enclosures should be IP 65(for outdoor)/ IP 21 (indoor) and as per IEC 62208 specifications.

The inverters should be tested from the MNRE/ ANERT/ NABL/ BIS approved test centers or accredited testing or calibration laboratories. If required Inspection of testing of Inverter will be conducted by the Tendering Authority. In case of imported Inverters, these should be approved

by international test houses.

The Inverter shall be able to withstand an unbalanced load conforming to IEC standard and relevant Indian electricity condition. The Inverter shall include appropriate self- protective and self-diagnostic features to protect itself and the PV array from damage in the event of Inverter component failure or from parameters beyond the Inverters safe operating range due to internal or external causes. The self-protective features shall not allow signals from the Inverter front panel to cause the Inverter to be operated in a manner which may be unsafe or damaging. Faults due to malfunctioning within the inverters, including commutation failure, shall be cleared by the inverter protective devices.

PV systems shall be provided with adequate rating fuses, fuses on inverter input side (DC) as well as output side (AC) for overload and short circuit protection and disconnecting switches to isolate the DC and AC system for maintenances as needed.

Inverters should qualify Electrical Safety standard IEC 62109-1&2. Inverter shall be protected against earth leakage faults.

Inverter shall be provided with protection against islanding of Grid as per IEEE 1547/UL1741/62116 to isolate it from the grid in case of no supply, under voltage and over voltage conditions so that in no case there is any chance of accident.

<b>INVERTER SPECIFICATION</b>	
Control	Microprocessor /DSP
Capacity kW	5, 10, 15, 20, 25, 30, 40, 50 ( or as per requirement)
Nominal AC output voltage and Frequency	415V, 3 Phase, 50 Hz Grid type (In case single phase inverters are offered, suitable arrangement for balancing the phases must be made.)
Max. input voltage	1000 V
Grid Frequency range	±2.5 Hz
Operating Temperature	-40°C to +60°C
Relative Humidity	100% non-condensing
Degree of protection	IP-65 Outdoor mounting(as per IEC 60529) Protection of Enclosure
Grid Voltage tolerance	±10%
No-load power	Less than 2.5Watt
Inverter efficiency	>98%
THD	<2%
PF	>0.99
No of independent MPPT, String per MPPT	2, 3
DC Injection voltage	<0.5%
Switching devices	IGBT/MOSFET
Voltage ripple	<3%
Noise	<25 dBA
Cooling Method	Natural or Temperature dependent forced convection cooling

INVERTER SPECIFICATION	
Earthing Provisions:	AC bypassing to earth on inverter and DC inputs Enclosure environment rating: IP-65(Min) for outdoor.
Interface	RS485, Modbus
Guarantee	10 Years
Rain guard	To be provided
PCU(Inverter)/Array Size Ratio	<ul style="list-style-type: none"> <li>• The combined wattage of all inverters should not be less than rated capacity of power plant under STC (Standard test conditions).</li> <li>• Maximum power point tracker shall be integrated in the PCU/inverter to maximize energy drawn from the array.</li> </ul>
Internal Protection System	Inverter continuous overload protection Over/under grid frequency protection DC-side disconnection Ground fault monitoring Grid monitoring DC reverse polarity protection AC short-circuit current capability All-pole sensitive residual-current monitoring unit AC and DC short circuit and over current protection AC and DC over voltage and temperature protection Anti-islanding protection Ground fault detection Over load capacity (for 10 sec) should be 150% of continuous rating.
Other feature	<ul style="list-style-type: none"> <li>• Inverter location is at the short distance from all SPVs and should be near to mounting structure</li> <li>• All Inverters must be having rain guard and other dust proof arrangement</li> <li>• The string combiner box/ junction box shall be with protection class IP 65 for mounting outside in Open weather condition</li> <li>• The current carrying ratings of the string combiner box/ junction box shall be suitable with adequate safety factor, to inter connect the Solar PV array.</li> <li>• The Junction boxes / string combiner boxes shall conform to IEC 60529 (Degrees of Protection provided by Enclosures (IP Code)).</li> </ul>
LED/LCD with membrane keypad display for programming and view on line parameters	Inverter per phase voltage, current, kW, kVA and frequency Grid voltage and frequency Inverter (grid) on line status PV panel voltage Solar charge current and ambient temperature, Individual power stage heat sink and cabinet temperature Inverter import & export kWh summation Solar kWh summation Inverter on, Grid on

### INVERTER SPECIFICATION

	System set points and event logs Cumulative hours of operation
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The inverter shall have internal protection arrangement against any sustained fault in the feeder line and against lightning in the feeder line. MOV type surge arresters shall be provided on AC and DC terminals for over voltage protection from lightning-induced surges.

An alarm contact shall be provided for hardware failures, failures of internal and external auxiliary supplies etc. The alarm Signals should be via system fault relay (voltage free contact)

Inverter AC output side shall be provided with an electrically operated draw out (EDO) type breaker with microprocessor based protection.

Detailed technical description of the complete unit of offered inverter should be furnished with bid document. The Contractor shall provide data sheet for Inverter along with their offer

#### **PROTECTIVE RELAYS**

The Solar PV system and associated power evacuation system shall be protected as per relevant Indian Standards. Over current relays, reverse power relays and earth fault relays have to be essentially provided. All relays should be Numerical type & should be remote operating.

Operational Requirements for Numerical Relays and Auxiliary Relays

- a. All protection relays to be supplied shall be Numerical type.
- b. All numerical relays, auxiliary relays and devices shall be of latest version, reputed make and types proven for the application, satisfying requirement covered elsewhere. Relays and timers shall have appropriate setting ranges, accuracy, resetting ratio, transient overreach and other characteristics to provide required sensitivity to the satisfaction of the Owner.
- c. Numerical relays shall be suitable for efficient and reliable operation of the protection scheme. Necessary auxiliary relays, timers, trip relays, etc. required for complete scheme, interlocking, alarm, logging, etc. shall be provided. No control relay, which shall trip the circuit breaker when relay is de-energized, shall be employed in the circuits.

#### **AC DISTRIBUTION BOARD (ACDB)**

An ACDB panel shall be provided in between Inverter and MV Panel. It shall have MCCB or circuit breaker of suitable rating for connection and disconnection of Inverter from grid. It should be protected with adequate protection relays, fuses, annunciation etc.

The connection between ACDB and MV Panels shall be XLPE cable. It shall have provision to measure bus voltage, current, power, energy etc

The bus bar shall be of electrolytic grade copper of adequate size. The bus bar/ cable shall be adequately supported by hygroscopic, non-combustible track resistant and high strength type

polyester fiber glass moulded insulators.

The ACDB incomer shall be four pole MCCB with thermal over current and earth fault releases. The incomer shall be selected at required rating. The ACDB enclosure shall be IP 54 and suitable for mounting on wall.

The Contractor shall provide data sheet for ACDB and its accessories along with their offer

AC DISTRIBUTION PANEL BOARD SPECIFICATION	
Variation in supply frequency	+/- 2.5 Hz
Variation in supply voltage	+/- 10 %
Solar smart meter	Solar meter should be provided for the incomer of the ACDB panel with data communication facility
Enclosure	All indoor panels will have protection of IP54 or better. All outdoor panels will have protection of IP65 or better.
Other features	<ul style="list-style-type: none"> <li>• AC Distribution Panel Board shall control the AC power from PCU/ inverter, and should have necessary surge arrestors. Interconnection from ACDB to mains at LT Bus bar while in grid tied mode.</li> <li>• All switches and the circuit breakers, connectors should conform to IEC 60947, part I, II and III/ IS60947 part I, II and III.</li> <li>• The changeover switches, cabling work should be undertaken by the Contractor as part of the project.</li> <li>• All the Panels shall be metal clad, totally enclosed, rigid, floor mounted, air - insulated, cubical type suitable for operation on three phase, 415 volts, 50 Hz</li> <li>• The panels shall be designed for minimum expected ambient temperature of 45 degree Celsius, 80 percent humidity and dusty weather.</li> <li>• All the 415 AC or 230 volts devices / equipment like bus support insulators, circuit breakers, SPDs etc., mounted inside the switchgear shall be suitable for continuous operation and satisfactory performance</li> <li>• A manual disconnect 4pole isolation switch beside automatic disconnection to grid would have to be provided at utility end to isolate the grid connection by the utility personnel to carry out any maintenance</li> <li>• Internal surge protection device in all incomers of the panel with MCCB</li> <li>• The changeover switches, cabling work should be undertaken by the Contractor as part of the project</li> <li>• Cable alley design needs to be compatible to allow easy access</li> </ul>

### AC DISTRIBUTION PANEL BOARD SPECIFICATION

	<p>depending upon the number of AC Cables into the panel. Minimum width of cable alley shall be 300 mm. Location of bus bars should be such so as to avoid any overlapping/looping of cables in the panels.</p> <ul style="list-style-type: none"> <li>• Bare/exposed portion of terminal/cables should be covered with appropriate sleeves instead of wrapping insulating tape</li> <li>• Should conform to Indian Electricity Act and rules (till last amendment).</li> </ul>
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### SURGE PROTECTION SPECIFICATION - AC

Type	Type 2 AC
Maximum discharge current	40kA/ 80kA
Protection level	1.25kV
Voltage	415V AC
Other features	<p>Removable cartridges for easy maintenance with no need to isolate the line</p> <p>The protection against induced high voltages shall be provided by the use of surge protection devices (SPDs) and the earthing terminal of the SPD shall be connected to the earth through the earthing system.</p> <p>Surge protection shall be provided on the AC side of the solar system.</p> <p>The AC surge protection devices shall be In the AC distribution box</p>

### DC DISTRIBUTION BOARD

DC generated by the solar modules is transmitted through the appropriate cables from Array to Inverter. DC bus & panel should be provided for the incoming DC supply from array. The panel should be of adequate size.

DC bus / cable which can handle the current and the voltage of Solar PV array output safely with necessary surge arrestor as per the relevant IS standards.

DC panel should be equipped with an adequate capacity indoor DC circuit breaker along with control circuit, protection relays, fuses, annunciations and remote operating and controlling facility from the main control facility.

The Contractor shall provide data sheet for DCDB and its accessories along with their offer

### DC DISTRIBUTION BOARD SPECIFICATION

Design voltage	1000V
No of string	6 string/inverter
Input fuse protection	Both Positive and Negative
Input and output cable	Single core
DC MCB	As per Requirement and standard
SPD	40 kA Type 2
Input cable size	4 Sqmm or as per requirement
Enclosure	IP 65
Other features	<p>DC DBs shall be fabricated and have sheet from enclosure of dust &amp; vermin proof conform to IP 65 protection.</p> <p>Bus bars are made of copper of desired size</p> <p>Suitable capacity MCBs shall be provided for controlling the DC power output to the Inverter</p> <p>Internal DC surge protection device in all DC Inputs</p> <p>Copper bus bars / terminal blocks housed in the junction box with suitable termination threads Conforming to IP65 standard and IEC 62208 Hinged door with EPDM rubber gasket to prevent water entry. Single / double compression cable glands. Provision of earthing. It should be placed at 5 feet height or above for ease of accessibility</p> <p>DC panel should be equipped with an adequate capacity indoor DC circuit breaker along with control circuit, protection relays, fuses</p>

### SURGE PROTECTION SPECIFICATION - DC

Type	Type 2
Maximum discharge current	40kA/ 80kA
Protection level	1.25kV
Voltage	1000V DC
Other features	<p>Removable cartridges for easy maintenance with no need to isolate the line</p> <p>The protection against induced high voltages shall be provided by the use of surge protection devices (SPDs) and the earthing terminal of the SPD shall be connected to the earth through the earthing system.</p> <p>Surge protection shall be provided on the DC side of the solar system.</p> <p>The DC surge protection device shall be installed in the DC distribution box adjacent to the solar grid inverter.</p>

### POWER AND CONTROL CABLES

Irrespective of utilization voltage and current rating all type of power cables shall be minimum of 1100 V grade XLPE insulated conforming to IS: 1554 / IS 694. The control and power cable has to be laid separately. All LT XLPE cables shall conform to IS: 7098 Part I & II. All wires used on the LT

side shall conform to IS and should be of appropriate voltage grade. Only copper conductor wires of reputed make shall be used.

Cable inside the control facility/ switch yard shall be tagged and laid galvanized cable trays or mounted on mild steel supports duly painted. For Substation buildings, the Cables laid through the existing constructed trenches, shall be marked separately and the work shall be executed without damaging the existing infrastructure under authorization of operator on Duty. For laying/termination of cables latest BIS/IEC Codes/ standards shall be followed.

The cables shall be adequately insulated and UV protected for the voltage required and shall be suitably color coded for the required services. Bending radii for cables shall be as per manufactures recommendations and IS: 1255. Cables shall also confirm to IEC 60189 for test and measuring methods.

- For the DC cabling, XLPE or XLPO insulated and sheathed, UV stabilized single core flexible copper cables shall be used; Multi-core cables shall not be used.
- For the AC cabling, XLPE insulated and PVC sheathed single or, multi- core flexible copper cables shall be used, Outdoor AC cables shall have a UV - stabilized outer sheath
- The total voltage drop on the cable segments from the solar PV modules to the solar grid inverter shall not exceed 2.0%
- The total voltage drop on the cable segments from the solar grid inverter to the AC distribution board shall not exceed 2.0%
- The DC cables from the SPV module array shall run through a UV-stabilized PVC conduit pipe of adequate diameter with a minimum wall thickness of 1.5mm
- Cables and wires used for the interconnection of solar PV modules shall be provided with solar PV connectors (MC4) and couplers
- All cables and conduit pipes shall be properly laid on the ground/ locations as per requirement; the minimum DC cables size shall be 4.0mm<sup>2</sup> copper. In three phase systems, the size of the neutral wire size shall be equal to the size of the phase wire.
- The following color code shall be used for cable wires
  - DC positive: red (the outer PVC sheath can be black with a red line marking DC negative: black
  - AC single phase: Phase: red; Neutral: black
  - AC three phase: phases: red, yellow, blue; Neutral: black Earth wires: green
- Cables and conduits that have to pass through walls or ceilings shall be taken through PVC pipe sleeve.
- Cable conductors shall be terminated with tinned copper end ferrules to prevent fraying and

breaking of individual wire strands. The termination of the DC and AC cables at the Solar Grid Inverter shall be done as per instructions of the manufacturer, which in most cases will include the use of special connectors.

- Bending radii for cables shall be as per manufactures recommendations and IS: 1255. Cables shall also conform to IEC 60189 for test and measuring methods.
- For laying/termination of cables latest BIS/IEC Codes/ standards shall be followed.

<b>AC CABLE SPECIFICATION</b>	
Certification	ISI, 1.1kV grade
No of core	4 core
Cable size	As per requirement
Type of cable	XLPE
Temp. Range	- 400°C to 1000°C
Voltage rating	1000V
Other features	Excellent resistance to heat, cold, water, oil, abrasion, UV radiation, ozone & weathering, Halogen-free, flame retardant low smoke (FRLS), low smoke, low toxicity, Flame retardant, Flexible, Fulfills IEC 60228 class 5, Certification/Approvals: CE/TUV/RoHS

#### **DC CABLES**

- Should have Multi Strand Annealed high conductivity copper conductors.
- For working voltage less than 150 V, control cable shall be of min. 500V grade.
- The cables shall be adequately insulated and UV protected for the voltage required and shall be suitably color coded for the required services and confirm to IEC 69947.

<b>DC CABLE SPECIFICATION</b>	
Type of material	Copper
certification	ISI, 1.1kV grade
No of core	Single core
Cable size	Rating as per requirement
Temp. Range	- 400°C to 1000°C
Voltage rating	1000V
Other features	Excellent resistance to heat, cold, water, oil, abrasion, UV radiation, ozone & weathering, Halogen-free, flame retardant low smoke (FRLS), low smoke, low toxicity, Flame retardant, Flexible, Fulfills IEC 60228 class 5, Certification/Approvals: CE/TUV/RoHS Cable Routing/ Marking: All cable/wires are to be routed in a GI cable tray and suitably tagged and marked with proper manner by good quality ferule or by other means so that the cable easily identified. In addition, cable drum no. / Batch no. to be embossed/ printed at every one meter All cables and conduit pipes shall be properly laid on the cable tray;

### DC CABLE SPECIFICATION

The minimum DC cables size shall be 4.0mm<sup>2</sup> copper

### LIGHTNING PROTECTION

The SPV power plants shall be provided with lightning & overvoltage protection. The main aim in this protection shall be to reduce the over voltage to a tolerable value before it reaches the PV or other sub system components. The source of over voltage can be lightning, atmosphere disturbances etc. The entire space occupying the SPV array shall be suitably protected against Lightning by deploying required number of Lightning Arrestors, Lightning conductors etc.. Lightning protection should be provided as per IEC 62305 standards. The protection against induced high-voltages shall be provided by the use of metal oxide arrestors (MOVs) and suitable earthing such that induced transients find an alternate route to earth. The lightning conductors shall be made as per applicable Indian Standards in order to protect the entire array yard from lightning stroke.

#### LIGHTNING PROTECTION SYSTEM SPECIFICATION

Radius	40m or the area covered by Solar PV modules
Maximum Lightning Current	150kA
Conductor material	Lightning protection air termination and down conductors for buildings shall be Galvanised Steel (GS Flat)
Other features	Each down conductor shall be connected to separate earth pit through a rod electrode, through test links. Bitumen paint shall be applied at all joints Conductors of lightning protection system shall not be connected with conductors of safety earthing system above ground level The entire space occupying the SPV array shall be suitably protected against Lightning by deploying required number of Lightning Arrestors, Lightning conductors etc. Lightning protection should be provided as per IEC62305 standard

### EARTHING SYSTEM

- Earthing System shall connect all non –current carrying metal receptacles, electrical boxes, appliance frames, chassis and PV module mounting structures in one long run. The earth strips should not be bolted. Earthing GI strips shall be interconnected by proper welding.
- The complete earthing system shall be electrically connected to provide return to earth from all equipment independent of mechanical connection.
- The equipment grounding wire shall be connected to earth strip by proper fixing arrangement. The each strip shall be continued up to at least 500mm from the equipments.
- Earthing system design should be as per the standard practices and should conform to the

1987 edition of IS 3043.

- Masonry enclosure with the earth pit of size not less than 400mm X 400mm (depth) complete with cemented brick work (1:6) of minimum 150mm width duly plastered with cement mortar (inside) shall be provided. Hinged inspection covers of size not less than 300mm X 300mm with locking arrangement shall be provided. Suitable handle shall be provided on the cover by means of welding a rod on top of the cover for future maintenance.
- Minimum 02 numbers of interconnected earth pit needs to be provided. Minimum required gap shall be provided in between earth pits as per relevant standard .Body earthing shall be provided in inverter, each panel, module mounting structure, kiosk and in any other item as required. Earthing also to be provided for lightning protection system, DCDBs, Solar PV module mounting structure, ACDBs to be done separately
- Earthing system must be interconnected through GI strip to arrive equipotential bonding. The size of the GI earth strip must be minimum 25mm X 6mm.

All metal casing / shielding of the plant shall be thoroughly grounded in accordance with Indian electricity act / IE Rules. The earthing for array and LT power system shall be as required as per provisions of IS.

The complete earthing system shall be mechanically and electrically connected to provide independent return to earth. All three phase equipment shall have two distinct earth connections. An earth bus shall be provided inside the control facility. For each earth pit, necessary test point shall have to be provided.

In compliance to Rule 33 and 61 of Indian Electricity Rules, 1956 (as amended up to date), all non-current carrying metal parts shall be earthed with two separate and distinct earth continuity conductors to an efficient earth electrode.

The Earthing System should be based on use of Copper Bonded Earth Rods (for corrosion resistance) and Ground Enhancement Material (to reduce Soil Resistivity). It should be capable of providing ohmic value of less than 2ohm, by inter-connection of ground rods to form a grid.

The system shall be totally maintenance free and require no periodic or scheduled maintenance for a period of at least 30 years. There shall be no requirement to add water or any other chemical any time after initial installation. The system shall provide constant low ohmic value for entire life cycle without any consideration for moisture or temperature conditions. The manufacturer shall be a company of international repute engaged in the field of Electrical Protection work.

Ground Enhancement Material/ Backfill / Grounding compound shall be permanent and maintenance free. (No re- charging with salts or any other chemicals) and shall maintain its earth resistance with time and confirm IEEE 80-2000 Clause No.14.5 (d).

Ground Enhancement Material/ Backfill / Grounding compound in its set form shall have a resistivity of not more than 0.12 ohm-m and comply the requirements and all applicable tests as

per technical specification.

The Ground Enhancement Material/ Backfill / Grounding compound shall not depend on the continuous presence of water to maintain its conductivity. The material shall be carbon based conductive concrete and shall not contain bentonite in any form. Same shall be applicable for conductive material used for filling in case of P-I-P and Flat-In-Pipe type earth electrodes.

The earth enhancement compound increases the earth's conductivity by enhancing the charge carrying ions, the effectiveness of earthing can be improved. The earthing compound shall have the qualities like Good conductivity, Good moisture absorption and retaining capacity for long period, Continuous resistance against corrosion

The Ground Enhancement Material/ Backfill / Grounding compound shall not contain any hazardous chemicals which harm the environment and provide quality earthing solutions, minimizing the seasonal variations.

Each Earth Rod/Pipe/PIP must be provided with a suitable Cu plated clamp or exothermic welding of Cu plated plate to facilitate Interconnection of rods and connection to Equipment Earth Bar using appropriate copper coated MS strip.

The earthing shall be guaranteed for trouble free operation for a period of 30 years from date of commission or arrival at site whichever is later. Any defect discovered during this period shall be rectified free of charge.

<b>EARTHING SPECIFICATION</b>	
Type	Plate earthing
MATERIALS	Plate shall be Grey Cast Iron made from Foundry grade pig iron Grade-4 and free from all defects as per IS13502/1992. & latest amendment if any
size	600mm x 600mm x 6mm
Earth resistance	<2 ohm
Distance of Earth From Building	1.5m
Other features	Each array structure of the PV yard should be grounded/ earthed properly as per IS: 3043-1987. The lighting arrester should also be earthed inside the array field. Earth Resistance shall be tested in presence of the representatives as and when required after earthing by calibrated earth tester. PCU/Inverter, ACDB and DCDB should also be earthed properly. It shall be ensured that all the earthing points are bonded together to make them at the same potential

### **ENERGY METER CONFIGURATION**

As per KSERC Grid Interactive Distributed Solar Energy Systems Regulation, 2014 net metering system is to be provided. Net metering means a system consisting of a solar meter and net meter

with their associated equipment. Solar meter means a unidirectional meter to be installed at the delivery point of the solar energy system to measure the solar electricity generated. Net meter means the bidirectional energy meter to be installed at the interconnection point of the distribution licensee. A solar meter and an import export energy meter suitable for the installed solar plant shall be supplied and installed by the contractor after obtaining testing and sealing from respective TMR Divisions. Meter must be provided with the necessary data cables if required.

Energy meters shall be installed and maintained in accordance with the provisions of The Central Electricity Authority Installation and Operation of Meters Regulations, 2006 as amended from time to time. The Contractor shall maintain the Metering System as per metering code and CEA guidelines. The defective meter shall be immediately tested and calibrated.

The accuracy class of the energy meters and current and potential transformers will be selected and agreed upon so that all levels of energy produced or taken by the Solar Power Plant will be measured accurately, and this equipment has applicable accuracy class.(3x240 volt (P-N)/(-/5A Cl.0.2S) . The solar meter shall be of accuracy class .5S or better and the net meter shall be of accuracy class .2S.

Meters shall be microprocessor based conforming IEC 60687 / IEC 6205211 / IEC 62053- 22 / IS 14697.

Meters shall measure active energy (both import and export) and reactive energy (import) by 3 phase, 4 wire principle suitable for balanced / unbalanced 3 phase load. Tri- vector based energy meter shall have an accuracy class of energy measurement of at least Class 0.2 for active energy and at least 0.5 Class for reactive energy according to IEC 60687 and shall be connected to Class 0.2S CT cores and Class 0.2 VT windings.

Display parameters required are LCD test, KWH import, KWH export, MD in KW export, MD in KW import, Date & Time, AC current and voltages and power factor (Cumulative KWH will be indicated continuously by default & other parameters through push-button).

The metering system for rooftop solar system, under net-metering arrangement should be applicable till such time the Central Electricity Authority notifies the standards in this matter.

Bidirectional energy meter with CTs and PT, if required, having the feature of recording both the import and export of energy, besides other parameters shall be as per CEA metering regulations or KSERC code as applicable and of the make & specifications as approved by KSEBL shall be installed at the point where interconnection is made between Consumer system and KSEBL system. All the Net meter should be of TOD type

**DETAILS OF ENERGY METERS**

SR NO	METER DESCRIPTION	ACCURACY	LOAD	VOLTAGE
1	Single Phase 10-60 A, whole current	Class-1	Up to 7 kW	Single Phase LT 230V
2	3 Phase four wire, LT whole current, bi directional, accuracy class 1S, 10-60A, static tri vector meter with TOD facility, DLMS compliant and AMR compatible with optical port and RS 232.	Class-1S	More than 7kW & up to 25 kW	Three Phase LT 400V
3	3 Phase four wire, CT operated 0.5S, -/5A, bi directional, static tri vector meter with TOD facility, DLMS compliant and AMR compatible with optical port and RS 232.	Class- 0.5S	More than 25 kW & up to 100 KW	Three Phase LT 400V
4	3 phase four wire HT CT/PT operated bidirectional accuracy class 0.2 S, - /5A static tri vector meter with TOD facility, DLMS compliant and AMR compatible with optical port and RS 232.	Class- 0.2S or better	More than 100 kW	Three Phase HT (11KV)

**SPV PLANT AND METERING**

Bidirectional energy meter with CTs and PT, if required, having the feature of recording both the import and export of energy, besides other parameters shall be as per CEA metering regulations or State Grid code as applicable and of the make & specifications as approved by KSEBL shall be installed at the cost of the SPV plant owner at the point where interconnection is made between Consumer system and KSEBL system.

The Plant owner has option to install the meter and metering equipment procured by KSEBL or can procure from vendors approved by KSEBL. If metering system is procured by Plant owner,

then the testing and installation of meters including CTs and PT shall be got carried out from KSEBL as per the latest departmental instructions and no meter rentals shall be charged. KSEBL shall seal the tested bidirectional energy meters as per prevailing practice of KSEBL

**METERING AND GRID CONNECTIVITY**

Net metering and grid connectivity of the roof top solar PV system under this scheme would be the responsibility of the Contractor in accordance with the prevailing guidelines of the SCTL and/or KSEBL and/or CEA and/or KSERC. SCTL could facilitate connectivity; however the entire responsibility lies with Contractor only. The regulations shall be complied as and when the revision as applicable is available throughout the life of the project

**DATA ACQUISITION SYSTEM / PLANT MONITORING**

- Web based monitoring system for the performance of the system should be provided and the link for access has to be provided to the building owner and SCTL. GSM Modem/ WiFi Modem in case GSM connectivity is used or Wireless Router + Modem in case Ethernet connection is being used for remote access must be provided.
- Data Acquisition System shall be provided for each of the solar PV plant above 3kWp capacity.
- Data Logging Provision for plant control and monitoring, time and date stamped system data logs for analysis with the high quality, suitable PC. Metering and Instrumentation for display of systems parameters and status indication to be provided. At least one set of Weather Monitoring Station (including 1 No. Computer, 1 No. Server, 1 No. Pyranometer and 1 No. Temperature sensor for ambient temperature measurement shall be supplied. The existing LAN and Internet facility available in the Building. This shall be done at the location of highest capacity plant
- The Contractors shall be obligated to push real-time plant monitoring data on a specified interval (say 15 minute) through open protocol at receiver location (cloud server) in XML/JSON format, preferably. The data acquisition can be done at ICC. Suitable provision in this regard will be intimated to the Contractors.

DATA ACQUISITION SYSTEM / PLANT MONITORING SPECIFICATION	
Solar Irradiance	<p>An integrating Pyranometer / Solar cell based irradiation sensor (along with calibration certificate) provided, with the sensor mounted in the plane of the array. Readout integrated with data logging system</p> <p>One Solar Observatory including testing facilities. The Solar Observatory with associate system shall include minimum of but not be limited to the</p>

## DATA ACQUISITION SYSTEM / PLANT MONITORING SPECIFICATION

	<p>following</p> <ul style="list-style-type: none"> <li>i) Pyranometer</li> <li>ii) Modified Shade Disk Kit.</li> <li>iii) Sunshine Duration Recorder</li> <li>iv) Ultrasonic Anemometer.</li> <li>v) Temperature &amp; Relative Humidity Meter</li> </ul>
Temperature	<p>Temperature probes for recording the Solar panel temperature and/or ambient temperature to be provided complete with readouts integrated with the data logging system</p>
Data acquisition & logging	<p>RS232/RS485. MOD Bus/Telephone Modem/WiFi</p>
Data Logging Parameters	<p>AC Voltage, AC Output current, Output Power, Power factor, DC Input Voltage, DC Input Current, Time Active, Time disabled, Time Idle, Power produced, Protective function limits (Viz-AC Over voltage, AC Under voltage, Over frequency, Under frequency ground fault, PV starting voltage, PV stopping voltage.</p>
Other features	<p>Data Logging Provision for plant control and monitoring, time and date stamped system data logs for analysis with the high quality, suitable PC. Metering and Instrumentation for display of systems parameters and status indication to be provided.</p> <p>All major parameters available on the digital bus and logging facility for energy auditing through the internal microprocessor and read on the digital front panel at any time) and logging facility (the current values, previous values for up to a month and the average values) should be made available for energy auditing through the internal microprocessor and should be read on the digital front panel.</p> <p>Digital Energy Meters to log the actual value of AC/ DC voltage, Current &amp; Energy generated by the PV system provided. Energy meter along with CT/PT should be of 0.5 accuracy class.</p> <p>Computerized DC String/ Array monitoring and AC</p>

## DATA ACQUISITION SYSTEM / PLANT MONITORING SPECIFICATION

output monitoring shall be provided as part of the inverter and/or string/array combiner box or separately.

String and array DC Voltage, Current and Power, Inverter AC output voltage and current (All 3 phases and lines), AC power (Active, Reactive and Apparent), Power Factor and AC energy (All 3 phases and cumulative) and frequency shall be monitored.

Computerized AC energy monitoring shall be in addition to the digital AC energy meter.

The data shall be recorded in a common work sheet chronologically date wise.

The data file shall be MS Excel compatible. The data shall be represented in both tabular and graphical form.

All instantaneous data shall be shown on the computer screen.

Software shall be provided for USB download and analysis of DC and AC parametric data for individual plant.

Provision for Internet monitoring and download of data shall be also incorporated.

Remote Server and Software for centralized Internet monitoring system shall be also provided for download and analysis of cumulative data of all the plants and the data of the solar radiation and temperature monitoring system

Ambient /Solar PV module back surface temperature shall be also monitored on continuous basis.

Simultaneous monitoring of DC and AC electrical voltage, current, power, energy and other data of the plant for correlation with solar and environment data shall be provided.

Remote Monitoring and data acquisition through Remote Monitoring System software with latest software/ hardware configuration and service connectivity for online/ real time data

## DATA ACQUISITION SYSTEM / PLANT MONITORING SPECIFICATION

	monitoring/control complete to be supplied and operation and maintenance/ control. Provision for interfacing these data on server and portal in future
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### POWER QUALITY REQUIREMENTS & HARMONICS STANDARD

As per the standard of IEEE 519, the permissible individual harmonics level shall be less than 3% (for both voltage and current harmonics) and Total Harmonics Distortion (THD) for both voltage and current harmonics of the system shall be less than 3%.

DC Injection into the grid is proposed to limit within 1% of the rated current of the inverter as per IEC 61727.

The limits for Harmonics on AC side shall be as per following standards

- a. Total Voltage harmonic Distortion as per IEEE-519 2014
- b. Individual Voltage harmonics Distortion as per IEEE-519 2014
- c. Total Current harmonic Distortion as per IEEE-519 2014
- d. Output frequency = 50Hz +/- 0.5Hz

<b>TECHNICAL AND INTERCONNECTION REQUIREMENTS</b>		
<b>Overall conditions of Service</b>	Distribution Supply Code	
<b>Overall Grid Standards</b>	Central Electricity Authority (Grid Standard) Regulations 2010	
<b>Equipment</b>	BIS / IEC / IEEE	
<b>Meters</b>	Central Electricity authority (Installation & operation of meters) Regulation 2006 as amended time to time	
<b>Safety and supply</b>	Central Electricity Authority(measures of safety and electricity supply) Regulations, 2010	
<b>Harmonic requirements Harmonic Current</b>	IEEE 519 CEA (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations 2013	
<b>Synchronization Frequency</b>	IEEE 519 CEA (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations 2013	Photovoltaic system must be equipped with a grid frequency synchronization device. Every time the generating station is synchronized to the electricity system. It shall not cause voltage fluctuation greater than +/- 5% at point of connection.

<b>TECHNICAL AND INTERCONNECTION REQUIREMENTS</b>		
<b>Overall conditions of Service</b>	Distribution Supply Code	
<b>Synchronization Voltage</b>	IEEE 519 CEA (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations 2013	The voltage-operating window should minimize nuisance tripping and should be under operating range of 80% to 110% of the nominal connected voltage. Beyond a clearing time of 2 second, the photovoltaic system must isolate itself from the grid.
<b>Flicker</b>	IEEE 519 CEA (Technical standards for connectivity of the Distributed Generation Resources) Regulations 2013	Operation of Photovoltaic system should not cause voltage flicker in excess of the limits stated in IEC 61000 standards or other equivalent Indian standards, if any
<b>Frequency</b>	IEEE 519 CEA (Technical standards for connectivity of the Distributed Generation Resources) Regulations 2013	When the Distribution system frequency deviates outside the specified conditions (50.5 Hz on upper side and 47.5 Hz on lower side), There should be over and under frequency trip functions with a clearing time of 0.2 seconds.
<b>DC injection</b>	IEEE 519 CEA (Technical standards for connectivity of the Distributed Generation Resources) Regulations 2013	Photovoltaic system should not inject DC power more than 0.5% of full rated output at the interconnection point or 1% of rated inverter output current into output current into distribution system under any operating conditions.
<b>Power Factor</b>	IEEE 519 CEA (Technical standards for connectivity of the Distributed Generation Resources) Regulations 2013	While the output of the inverter is greater than 50%, a lagging power factor of greater than 0.9 should operate.
<b>Islanding and Disconnection</b>	IEEE 519 CEA (Technical standards for connectivity of the Distributed Generation Resources) Regulations 2013	The photovoltaic system in the event of fault, voltage or frequency variations must island/disconnect itself within IEC standard
<b>Overload and Overheat</b>	IEEE 519 CEA (Technical standards for connectivity of the Distributed Generation Resources) Regulations	The inverter should have the facility to automatically switch off in case of overload or overheating

<b>TECHNICAL AND INTERCONNECTION REQUIREMENTS</b>		
<b>Overall conditions of Service</b>	Distribution Supply Code	
	2013	and should restart when normal conditions are restored.
<b>Paralleling Device</b>	IEEE 519 CEA (Technical standards for connectivity of the Distributed Generation Resources) Regulations 2013	Paralleling device of photovoltaic system shall be capable of withstanding 220% of the normal voltage at the Inter-connection point.

### **DANGER BOARDS AND SIGNAGES**

Danger boards should be provided as and where necessary as per IE Act. /IE Rules as amended up to date. Solar array area and main entry in to the area. Text of the signages may be finalized in consultation with SCTL

### **FIRE EXTINGUISHERS**

The firefighting system for the power plant for fire protection shall be consisting of Portable fire extinguishers in the ACDB locations, DCDB/Inverter locations etc. for fire caused by electrical short circuits. The installation of Fire Extinguishers should confirm to TAC regulations and BIS standards. The fire extinguishers shall be provided as well as on the Roof or site where the PV arrays have been installed.

Two gas type CO2 fire extinguisher and a liquefied CO2 fire extinguisher upright type of capacity 10 kg having IS: 2171 -7, IS: 10658 marked shall be supplied. The fire extinguishers shall be suitable for fighting fire of oils, solvents, gasses, paints, varnishes, electrical wiring, live machinery fires and all flammable liquid & gas.

Adequate firefighting equipment and extinguishing agents of sufficient capacity and quantity must always be available at site and kept ready for immediate use.

One liquefied CO2 fire extinguisher upright type of capacity 10 kg having IS: 2171 -7, IS: 10658 marked per installation of 15kW shall be supplied by the Contractor and kept near the Inverter accommodation and shall also be responsible for periodic renewal during the maintenance period. The fire extinguisher shall be suitable for fighting fire of oils, solvents, gases, paints, varnishes, electrical wiring, live machinery fires and all flammable liquid & gas.

### **SAFETY MEASURES**

The Contractor shall take entire responsibility for electrical safety of the installation(s) including connectivity with the grid and follow all the safety rules & regulations applicable as per Electricity Act, 2003 and CEA guidelines etc.

### **WATER FOR CLEANING**

Permanent arrangement for module washing in the SPV Plant can be done. The source of water for the proposed Solar PV plant would be the existing pipeline in the Solar PV power plant site. An overhead tank is readily available at all the site for water storage. Some plumbing works required for the water supply arrangement to the site. Pipe line is required for the water supply arrangement to the site. Adequate size network of CPVC pipe in each row of SPV panels shall also be provided for the supply of water for cleaning the solar PV modules on a periodic base. Opening from the CPVC pipe with manual isolating valves with nozzles should be provided at regular interval in each row of SPV panels.

### **ERECTION, TESTING & COMMISSIONING**

1. The contractor shall provide necessary drawings and documents required by statutory authorities and obtain the approval before taking up erection.
2. Any modification in the equipment or installation that may be demanded by the inspecting authorities shall be carried out at no additional cost
3. In accordance with the specific installation instruction as per the manufacturers drawings or as shall unload, assemble, erect, install test, commission and hand over all electrical equipments included in this contract after O&M of 5 years.
4. Erection materials including all consumables, tools, testing instruments or any other equipment required for successful commissioning shall be arranged by the successful Contractor in a timely manner.
5. All equipment and instruments, indoor and outdoor, shall be marked with No. and provided with danger boards before commissioning.
6. All Power equipments shall be handled and erected as per the relevant codes of practice and manufacturer's drawings and instruction manuals.
7. The Contractor shall obtain the temporary Electrical connection for construction purposes and the same has to be dismantled off the premises after completion of erection of plant.

### **INTEGRATION OF PV POWER WITH GRID**

The output power from SPV would be fed to the inverters which converts DC produced by SPV array to AC and feeds it into the main electricity grid after synchronization. In case of grid failure, or low or high voltage, solar PV system shall be out of synchronization and shall be disconnected from the grid. Once the DG set comes into service, PV system shall again be synchronized with DG supply and load requirement would be met to the extent of availability of power.

4 pole isolation of inverter output with respect to the grid power connection need to be provided. The rooftop projects/systems for purpose of grid integration may adhere to voltage level regulations as per KSEBL latest commercial circulars and also to the latest KSERC orders. In addition to bi-directional meter specifications clause no 8 of annexure I of the net

## **CONNECTIVITY AND PROTECTION**

Solar Photo Voltaic rooftop systems shall be allowed in house auto synchronization or de synchronization facility with distribution system of the KSEBL at generation voltage level. It will utilize the same service line for excess power injection into the Grid which is currently being used by the consumer for drawl of power from utility network and shall operate in synchronization with KSEBL system provided that such injection of power from the rooftop solar PV system shall not be more than 100% of the total consumption from the KSEBL supply by the consumer in a Settlement Period. It shall be mandatory for the solar rooftop generator to provide an appropriate protection system on their incoming side or consumer premises with the feature of “Islanding the SPV generator”, so as to achieve isolation of consumer power-system from utility power-system during grid failure including protection from voltage / lightning surges. The Power Conditioning Unit of the SPV plant shall have features to filter out harmonics and other distortions before injecting the energy into KSEBL system

## **TESTING**

The international standard IEC 62446 Grid Connected PV Systems – Minimum Requirements for System Documentation, Commissioning Tests, and Inspection defines minimum documentation, commissioning tests and inspection criteria for grid-connected PV systems. Information derived from this standard is intended to verify the safe and proper operation of PV systems, and to serve as a guide for designers, installers and service personnel.

This IEC standard covers specific requirements for testing and commissioning PV systems not addressed by the NEC and other electrical installation codes, such as IEC 60364: Electrical Installations for Buildings. Section 712 of IEC 60364 addresses specific requirements for solar photovoltaic (PV) power supply systems.

Conducting electrical testing on any PV system should be performed by qualified individuals having knowledge and experience with electrical systems measurements, the test equipment used, the equipment or systems being tested, and an awareness of the hazards involved. Working with PV systems involves exposure to energized circuits with high voltages and potentially lethal currents, presenting electrical shock hazards. Higher voltage installations can also present electrical burn and arc flash hazards.

When these electrical hazards are combined other hazards such as working at heights and in difficult locations exposed to the elements, it is imperative for those installing and servicing PV systems to follow all applicable safety standards and guidelines.

All PV installations should have adequate documentation providing details of the system design and all components and materials used in its construction. The documentation should also

include safety information, and procedures for operating and maintaining the system. Proper system documentation helps ensure safe and reliable system operations and is generally required for the following purposes.

### **PROGRESS REPORT**

The Contractor shall submit the progress report weekly to SCTL in prescribed format. SCTL will have the right to depute their representatives to ascertain the progress of contract at the premises of works of the Contractor.

### **PROJECT COMPLETION REPORT**

The Contractor shall submit the Project Completion Report in (soft copy and signed copy) after commissioning of the project as per the Scope of RFP to SCTL. Non submission of the report shall be considered as “Breach of Contract” and shall attract punitive actions as per the relevant provisions of the Contract. However, the decision of SCTL shall be final in this regard.

### **O&M REPORT**

The Contractor shall submit the Monthly O&M Report mandatorily to SCTL as per the Format. Non submission of the report shall be considered as “Breach of Contract” and shall attract punitive actions as per the relevant provisions of the Contract. However, the decision of SCTL shall be final in this regard.

### **DOCUMENTATION**

- A single line diagram depicting the overall system design, including the types of modules, total number of modules, modules per string and total number of strings; the types and number of inverters; and any other major components. For larger projects, complete as-built electrical and mechanical drawings are usually required at project close out.
- The types, sizes and ratings for all balance- of-system components annotated on the single line diagram, or noted and provided in a separate table, including specifications for all conductors, raceways, junction boxes, source circuit combiner boxes, disconnects, overcurrent protection devices, and grounding equipment, as applicable.
- Data sheets and specifications for PV modules, inverters and other major components, including module mounting systems. For most inverters, installation and user/operator manuals are available and provide important information regarding the safe operation and maintenance of the equipment.
- Operation and maintenance information including procedures for verifying proper system operation and performance, and how to determine if there is a problem and what to do. Procedures for isolating/disconnecting equipment and emergency shutdown.

### **OPERATION MANUAL**

An Operation, Instruction and Maintenance Manual, in English and Malayalam should be provided with the system. The following minimum details must be provided in the manual

- a) About solar power plant – its components and expected performance.
- b) About PV module
- c) About electronics
- d) DO's and DON'T's
- e) Clear instructions on regular maintenance and trouble shooting of solar power plant
- f) Name and address of the contract person in case of non-functionality of the solar power plant.

### **COMMISSIONING PV SYSTEMS**

Commissioning of PV systems involves visual observations as well as tests and measurements to verify the safe and proper operation of the system. Commissioning is performed immediately after PV installations are completed, prior to being operated and put into service for the first time. A thorough commissioning process helps improve safety and quality control, provides verification of the installation matches, the plans and code requirements, and is performing as expected. Some of the tests conducted during commissioning may be repeated during periodic routine maintenance to help ensure that the system remains in a satisfactory operating condition over its lifetime.

### **KEY STEPS OF A PV SYSTEM COMMISSIONING PROCEDURE**

- Completing final installation details.
- Thermography inspection of all PV modules and connected electrics
- Completing visual inspections.
- Verifying compliance with specification requirements.
- Conducting electrical verification tests.
- Vo/c, Is/c, insulation resistance, polarity.
- Verifying system functionality including start-up, operations, shut-down and emergency procedures.
- Verifying system power output and energy production meet performance expectations.
- Completing system documentation, including changes for as-built drawings.
- Conducting user orientation and training on system operations and safety.
- Earth resistance tests, Harmonic & power quality tests

### **FINAL INSTALLATION CHECKOUT**

A final checkout confirms that the installation is complete before conducting any testing and beginning operations. Typically, the installation contractor will perform the final checkout, prior to formal inspections by building officials. With the exception of the PV array, all circuits should be de-energized wherever possible in preparation for system testing. A punch list can be used to help check off items as they are completed, and typically includes the following items:

- Verifying that all structural and electrical components are properly installed and secured.
- Verifying that all components are installed in a neat and workmanlike manner, including wire management practices.
- Verifying proper connections and terminations, including terminal torque specifications.
- Verifying that all required system and equipment labels, marking and placards are correct and in the proper locations.
- Verify that any calibrations or adjustments for inverters, charge controllers or other equipment are properly set or programmed.
- Verifying that all disconnects are open, fuses are removed and lockout/tag out procedures are in place.
- Identifying and completing any unresolved items.
- Completing site clean-up and restoring site to original conditions.

## **VISUAL INSPECTION**

Visual inspections of PV systems should be performed as part of commissioning and routinely over the system lifetime to verify and ensure that the system remains in a safe and properly functioning condition. There are many areas to evaluate with visual inspections, with the frequency and level of detail depending on the type and size of the system involved. Visual inspections are supplemented with other observations, test measurements and performance data to fully evaluate the safety and condition of PV systems.

Initial inspections are primarily used to identify unfinished installation details and verify compliance with the applicable code requirements. Visual inspections conducted after installation during periodic routine maintenance tend to look for physical damage or degradation of equipment from temperature extremes, moisture or other environmental conditions.

Prior to initial operation, all PV systems should be inspected for full compliance with the specification.

## **REQUIREMENTS FOR ELECTRICAL INSTALLATIONS**

- All equipment shall be properly listed, identified and labelled, suitable for the conditions of use, and be installed according to the listed product instructions.

- All equipment shall be installed in a neat and workmanlike manner, consistent with quality craftsmanship standards in the electrical construction industry.
- All equipment shall be mechanically secured and provided with adequate ventilation or cooling as required
- All electrical terminations and connections shall be made using approved products and installation methods. This includes consideration of conductor and terminal materials, temperature ratings, and use of specially approved terminals for use with fine stranded conductors or more than a single conductor. Pressure connectors using a set screw have required tightening torques, and these values should be recorded and verified at commissioning.
- All electrical equipment shall be marked with the manufacturer's identification and applicable specifications and ratings.
- Sufficient working spaces shall be provided about any electrical equipment that is likely to be serviced or maintained while energized. Clear spaces and dedicated spaces are also required about certain electrical equipment, such as panel boards or switchgear.

#### **LABELS AND MARKINGS**

Numerous markings, labels and signs are required to identify PV systems and their components, and to warn operators, service personnel or emergency responders of hazardous conditions. Manufacturer markings and labels identify the size, type, specifications and ratings for PV modules, inverters, controllers, combiner boxes, conductors, raceways, overcurrent devices, switchgear and all other electrical components. These markings are placed on the product at the time of manufacture and include listing marks from the approval agency.

#### **SYSTEM TESTING AND MEASUREMENTS**

PV systems should be thoroughly tested at the time of commissioning and periodically over their lifetime to ensure proper performance and safe operation. Baseline measurements at the time of system commissioning are compared to the system ratings and expectations for acceptance, and serve as a baseline for comparison with future measurements. Changes in test results over time are used to track system degradation, and identify problems that require attention or service for safety or performance reasons. Circuits or components that are modified or replaced should be retested accordingly.

There are several types of electrical tests conducted on PV systems that are used to verify NEC requirements and system performance. Many of these tests can be conducted with common electrical test equipment, while some measurements require special meters and instruments. In many cases, system performance information is measured, recorded and displayed by PV system inverters and can be used to verify system functions and proper operation.

The following summarizes common types of testing conducted on PV systems what information it provides:

- Continuity and resistance testing verifies the integrity of grounding and bonding systems, conductors, connections and other terminations.
- Polarity testing verifies the correct polarity for PV DC circuits, and proper terminations for DC utilization equipment.
- Voltage and current testing verifies that PV array and system operating parameters are within specifications.
- Insulation resistance testing verifies the integrity of wiring and equipment, and used to detect degradation and faults to wiring insulation.
- Performance testing verifies the system power and energy output are consistent with expectations. These tests also require measurements of array temperature and solar irradiance.

### **CONTINUITY TESTING**

Continuity testing is commonly used to verify grounding and bonding connections in electrical systems. These tests also verify the proper operation of disconnecting means and the function of overcurrent protection devices like fuses and circuit breakers. Measurements of resistance can also be used for estimating voltage drop in conductors, terminations and other connections and for evaluating windings in motors and transformers.

Proper grounding of PV systems reduces the risk of electrical shock to personnel and the effects of lightning and surges on equipment. The grounding requirements for PV systems can be quite complex to understand and installation practices and hardware are continually evolving and improving. There are two basic types of grounding. System grounding connects a current-carrying conductor in an electrical system to ground, or earth potential. Equipment grounding connects non-current carrying metal parts to ground, such as PV module frames, racks, enclosures, junction boxes, conduit and other metallic components.

### **POLARITY TESTING**

As for any dc circuits, the polarity of array wiring and dc equipment is a critical concern for PV installations.

### **VOLTAGE AND CURRENT TESTING**

Basic voltage and current tests are conducted on both dc and ac circuits in PV systems to verify these parameters are within acceptable limits prior to closing disconnects and beginning system operations. Detailed voltage and current tests may be conducted on PV source circuits and arrays for performance verification purposes. Testing for performance verification requires additional

measurements of solar irradiance and array temperatures, and translation of test results to a reference test condition.

Prior to operations, voltage should be verified for the following circuits and sources in PV systems

- Verify ac voltage and correct phasing at utility supply, inverter ac terminals and disconnects, and electrical generators as applicable.
- Verify dc voltage and correct polarity for PV array source and output circuits and at dc disconnects.

### **OPEN-CIRCUIT VOLTAGE TESTING**

Prior to closing the PV array dc disconnects, the open-circuit voltage ( $V_{oc}$ ) for each PV array source circuit should be tested and compared with expectations. This test can also be used to verify proper polarity. These tests simply verify correct installation, and are not intended to verify performance. Open-circuit voltage tests require a suitable voltmeter capable of reading AC and DC voltages of 600 V to 1000 V.

### **SHORT-CIRCUIT CURRENT TESTING**

Short-circuit current tests are conducted on PV string source circuits to verify proper readings and that the circuits are clear from major faults. Similar to the open-circuit voltage tests, these tests are only intended to verify proper system operation, not performance.

### **INSULATION RESISTANCE TESTING**

Insulation resistance tests are used to verify and demonstrate the integrity of electrical wiring systems and equipment.

### **SYSTEM FUNCTIONAL TESTING**

System functional testing verifies proper system operation, including start-up, shut-down and nominal operating conditions. These tests confirm that system operating parameters are within expected and nominal limits, but are not intended to verify system ratings in accordance with specifications or warranty provisions. Additional detailed testing, using additional measurements and normalizing data are required to verify performance with system ratings.

### **TEST REPORTS**

Measurements and test results for PV systems should be clearly summarized in a test report that includes the following information:

- System information.
- Visual inspection record and observations.
- Identification of circuits tested, tests performed, and record of measurements.
- Interpretation and summary of results, identifying special maintenance needs or corrective actions.

- Signatures of responsible person(s) and date(s) of tests.

Complete before conducting any testing and beginning operations. Typically, the installation contractor will perform the final checkout, prior to formal inspections by building officials. With the exception of the PV array, all circuits should be de-energized wherever possible in preparation for system testing. A punch list can be used to help check off items as they are completed, and typically includes the following items:

- Verifying that all structural and electrical components are properly installed and secured.
- Verifying that all components are installed in a neat and workmanlike manner, including wire management practices.
- Verifying proper connections and terminations, including terminal torque specifications.
- Verifying that all required system and equipment labels, marking and placards are correct and in the proper locations.
- Verify that any calibrations or adjustments for inverters, charge controllers or other equipment are properly set or programmed.
- Verifying that all disconnects are open, fuses are removed and lockout/tagout procedures are in place.
- Identifying and completing any unresolved items.
- Completing site clean-up and restoring site to original conditions.

## **VISUAL INSPECTION**

Visual inspections of PV systems should be performed as part of commissioning. A maintenance plan and intervals should be provided for all routine (scheduled) system maintenance, such as array cleaning as required. Operating and maintenance guidelines should differentiate what tasks can be performed by the owner or caretakers, from those that require professional service due to the complexity of the tasks, special equipment needs, or safety concerns.

Maintenance agreements, plans and recordkeeping forms or sheets should also be provided to document maintenance activities over time.

- Warranty details on major components indicating the terms and conditions, System warranties should also be addressed, including quality of workmanship, performance warranties as applicable.
- Copies of all commissioning test reports and verification data.

## **DATE OF COMMISSIONING**

After the Inspection and approval of the Electrical Inspectorate, date of Energisation to the Grid will be considered as the official Date of Commissioning (CoD) of the project to ensure PR, the Contractor will be allowed to erect additional number of solar modules without extra cost

addition.

### **DRAWINGS, DATA AND DOCUMENTS**

The Contractor shall furnish following documents/ information along with the offer.

- a. General description of equipment offered specifying the important features, make, technical parameters, materials of construction, etc. to enable the owner to have proper understanding of the equipment offered and its operation.
- b. Technical literature, catalogue and publications.
- c. Layout of Complete Power Plant Installation showing location of all major sub- systems.
- d. Single line diagram of the PV Power Plant
- e. Detailed Plot Plan for the Deployment of PV Array
- f. Schematic Diagram.
- g. Module Mounting Structure (Plan & Elevation).
- h. Typical general arrangement and foundation details.
- i. Technical particulars as listed in this specification.
- j. Type tests certificates of all equipment like switchgear, Inverters, Solar Modules etc.

### **OPERATION & MAINTENANCE OF THE PLANT**

Comprehensive Operation and maintenance of the Solar Power Plants installed in the premises of the plant for a period of 5 years from the date of commissioning of this solar project.

The operation of the solar Plant and shall provide for, at a minimum, the following services:

Performing routine and non-routine maintenance on the solar Plant for a period of 5 years from the date of commissioning of solar project;

- Operating the solar Plant;
- Providing all materials and services necessary for solar Plant maintenance;
- Performing all duties for the safe and efficient operation and maintenance as per the standards;
- Complying with all regulatory obligations;

Contractor shall impart basic training to the employer personnel with the concurrence of the Engineer in Charge and also conduct O & M Training at the designated Training center as required with participation of OEM Trainers.

The contractor shall supply manual for Operation and Maintenance, trouble shooting etc of all the system in English. Equivalent Malayalam copy also to be submitted

Contractor shall perform the Work and supply all required spare parts in a prudent and efficient

manner and in accordance with

- Manufacturers and systems designers' specifications, the Annual Operating Plan for the Plant and all operation and maintenance manuals,
- All Indian applicable laws including environmental protection, pollution, sanitary, employment and safety laws, ("Government Rules").
- Prudent Utility Practice.

Operator shall use all reasonable and practical efforts

- To maximize plant capacity utilization
- To minimize plant downtime
- Optimize useful life of all the equipments of the energy project. Contractor shall be responsible for all the required activities for the successful running, optimum energy generation & maintenance of all the Solar Photovoltaic Power Plants covering
  - a. Monitoring controlling, troubleshooting maintaining of records, registers.
  - b. Supply of all spares, consumables and fixing/application, inverters, indoor panels , cables terminals kits, Circuit Breakers, Isolators switch, and all other associated equipment of solar plant etc , for a period of 5 years. Cost of these items (including Cost of spares) shall be included in the price quoted.
  - c. Supply & use of consumables throughout the maintenance period as per recommendations of the equipment manufacturers.
  - d. Conducting periodical checking, testing, over hauling and preventive action.
  - e. Monthly General up keeping including cleaning of all equipment, PV Station, amenities, Solar Photovoltaic array area etc .
  - f. Submission of Monthly reports to the SCTL on the energy generation & operating conditions of the solar plant by 2nd day of every month
  - g. Taking care of the full security aspects of the Solar Power Plant.
  - h. Replacement of damaged modules if any, during the period of 5 years. Thermography Inspection report of all panels should be prepared, analysed and submitted every 3 years
  - i. Replacement of Inverter and any other equipments in solar plant time to time if required, during the period of 5 years. System Integrity report of all equipments should be prepared, analysed and submitted every 3 years
  - j. Insurance covering all risks (Fire & allied perils, earth quake, terrorists, and burglary.
  - k. Maintaining and replacement of Lightning Arrestors, Lightning protection system.
  - l. Continuous monitoring the performance of the Solar Power Plant and regular inspection

and maintenance of the whole system including Modules, Inverters, junction boxes, underground cables, outdoor/indoor Distribution Board and all associated equipment etc. necessary for extracting and maintaining the maximum energy output from the Solar Power Plant.

- m. Successful running of Solar Power Plant for the desired Performance ratio above 77%
- n. Contractor personnel shall arrange the Annual Calibration of Energy Meters shall be done by the NABL accredited labs. Meters with net metering mechanism should be provided by the contractor. It shall be the responsibility of the contractor to promptly rectify/ replace the defective meter so as to ensure that the errors in the energy meters are within specified limit. Cost of calibration and rectification/ replacement, if any shall be borne by the Contractor. Shortfall on the account of metering error to meet the Generation Guarantee shall only be the responsibility of the Contractor.
- o. Periodic Testing/ calibration of all measuring devices as per respective manufacturer's instruction/ guideline.
- p. Operation and Maintenance of the Solar Photovoltaic Power Plant is required for a period of 5 years from the date of commissioning of the project which shall be carried out at fixed cost. The period of Operation and Maintenance will be deemed to commence from the date of commissioning of solar Photovoltaic Power Plant.

## **MONITORING**

Operation part consists of deputing necessary manpower necessary to monitor the Solar Photovoltaic Power Plant at the optimum capacity. Operation procedures such as preparation to start, routine operations with safety precautions, monitoring of Solar Power Plant etc. shall be carried out as per the manufacturer's instructions to have trouble free operation of the complete system Performance evaluation shall be carried out annually in presence of the officials of SCTL.

Monthly work of the operators in the Solar Photovoltaic Power Plants involves:

- 1) Cleaning of Modules, logging the voltage, current, power factor, power and energy output of the solar Power Plant.
- 2) Note down failures, interruption in supply and tripping of different relays, reason for such tripping, duration of such interruption etc.
- 3) The operator shall record monthly energy output, down time, etc.

The contractor shall carry out the periodical/plant maintenance as given in the manufacturer's service manual and perform at least minimum requirement.

Preventive/Routine Maintenance shall be done by the Contractor at least once in a every three months and shall include activities such as, cleaning and checking the health of the SPV system, cleaning of module surface, tightening of all electrical connections, mounting structure, Inverter

operations and any other activity that may be required for proper functioning of the SPV system as a whole. The contractor shall ensure the generation data availability for proper monitoring of the system.

Regular periodic checks of the Modules, Inverters, shall be carried out as a part of routine preventive maintenance.

In order to meet the maintenance requirements stock of consumables are to be maintained as well as various spare as recommended by the manufacturer at least for 5 years to be kept for usage.

Particular care shall be taken for outdoor equipment to prevent corrosion. Cleaning of the junction boxes, cable joints, insulators etc shall also be carried out at every three month interval.

Resistance of the earthing system as well as individual earthing is to be measured and recorded every month. If the earth resistance is more than 2 ohm, suitable action is to be taken to bring down the same.

According to the recommendations stock of special tools and tackles shall be maintained for Modules, Inverter's and other major electrical equipment.

Solar modules surface shall be thoroughly cleaned twice every month to ensure maximum possible generation. Manufacturer's approved method of cleaning shall be adopted for the purpose.

A maintenance record is to be maintained by the contractor to record the regular maintenance work carried out as well as any breakdown maintenance along with the date of maintenance, reasons for the breakdowns, steps taken to attend the breakdown, duration of the breakdown etc.

The installation / Maintenance of the grid connected roof mounted solar PV plant during the non-office hours and holidays should be carried out only with the prior written approval of custodian of site.

The Contractor shall deploy enough manpower at Solar Photovoltaic Power Plant site to carryout work instructions and preventive maintenance schedules as specified.

The Contractor will attend to any breakdown jobs immediately for repair/replacement /adjustments and complete at the earliest working round the clock. The details of the emergency assistance personnel of the contractor shall be displayed in the location. During breakdowns (not attributable to normal wear and tear) at O&M period, the Contractor shall immediately report the accidents, if any, to the parties involved showing the circumstances under which it happened and the extent of damage and or injury caused.

The Contractor shall comply with the provision of all relevant acts of Central or State Governments including payment of Wages Act 1936, Minimum Wages Act 1948, Employer's Liability Act 1938, Workmen's Compensation Act 1923, Industrial Dispute Act 1947, Maturity

Benefit Act 1961, Mines Act 1952, Employees State Insurance Act 1948, Contract Labour (Regulations & Abolishment) Act 1970, Electricity Act 2003, Grid Code, Metering Code, MNRE/ANERT guide lines or any modification thereof or any other law relating whereto and rules made there under from time to time.

The contractor shall at his own expense provide all amenities to his workmen as per applicable laws and rules.

The Contractor shall ensure that all safety measures are taken at the site to avoid accidents to his Workmen.

If negligence / mal-operation of the contractor's operator results in failure of equipment such equipment should be repaired replaced by contractor at free of cost.

If any jobs covered in O&M Scope are not carried out by the contractor during the O&M period pro-rata deduction will be made based on the quantum of work from the O&M contract bills.

The solar plant shall comply with the relevant standards specified by the MNRE/ ANERT, BIS and CEA. The responsibility of operation and maintenance of the solar photo voltaic (SPV) plant including all accessories and apparatus lies with the consumer. The design and installation of the rooftop SPV should be equipped with appropriately rated protective devices to sense any abnormality in the system and carry out automatic isolation of the SPV from the grid. The inverters used should meet the necessary quality requirements and should be certified for their quality by appropriate authority; the protection logics should be tested before commissioning of the plant.

The automatic isolation or islanding protection of SPV should be ensured for, no grid supply and low or over voltage conditions and within the required response time. Adequate rated fuses and fast acting circuit breakers on input and output side of the inverters and disconnect/isolating switches to isolate DC and AC system for maintenance shall be provided. The consumer should provide for all internal safety and protective mechanism for earthing, surge, DC ground fault, transients etc.

To prevent back feeding and possible accidents when maintenance works are carried out by KSEBL personnel, Double pole/Triple pole with neutral isolating disconnect switches which can be locked by KSEBL personnel should be provided. This is in addition to automatic sensing and isolating on grid supply failure etc and in addition to internal disconnect switches. In the event of KSEBL LT/HT supply failure, the consumer has to ensure that there will not be any solar power being fed to the LT/HT grid of KSEBL. The consumer is solely responsible for any accident to human beings/animals whatsoever (fatal/non-fatal/departmental/non-departmental) that may occur due to back feeding from the SPV plant when the grid supply is off. KSEBL reserves the right to disconnect the installation at any time in the event of damage to its grid, meter, etc. or to prevent accident or damage.

The consumer shall abide by all the codes and regulations issued by the Commission to the extent applicable and in force from time to time. The consumer shall comply with KSERC/KSEBL/CEA requirements with respect to safe, secure and reliable function of the SPV plant and the grid. The power injected into the grid shall be of the required quality in respect of wave shape, frequency, absence of DC components etc.

The consumer shall restrict the harmonic generation within the limit specified in the agreement or specified by the Central Electricity Authority as and when such regulation is issued.

However, the features above shall be available so as to ensure islanding of the SPV system & prevent back feeding to Grid system of KSEBL.

The inverter standard shall be such that it should not allow solar power to extend to KSEBL's LT grid on failure of KSEBL's grid supply, irrespective of the LT connectivity options.

The required inverter standard for three phase and single phase solar power are furnished in the specification. The inverter should be a sine wave inverter. Harmonic standards shall be as per IEEE 519.

#### **TOOLS AND TACKLES**

The Contractor shall arrange for all the necessary tools and tackles for carrying out all the maintenance work covered under this contract.

The Contractor shall check growth of vegetation, accumulation of debris and water clogging and clear the site timely.

#### **PLANT PERFORMANCE EVALUATION**

The successful Contractor shall be required to meet minimum guaranteed generation with Performance Ratio (PR) at the time of commissioning and related Capacity Utilization Factor (CUF) as per the Global Horizontal Irradiance (GHI) levels of the location during the O&M period. Performance Ratio (PR) should be shown minimum of 77% at the time of inspection for initial commissioning acceptance. Minimum CUF of 17% should be maintained all through the Operation & Maintenance period of the project. The Contractor should send the periodic plant (fortnightly) output details to for ensuring the CUF. The PR will be measured at Inverter output level during peak radiation conditions.

#### **PERFORMANCE RATIO TEST**

The Plant should run minimum two weeks without any major equipment failure to start the PR test. Contractor shall submit two copies of O&M manual with soft copy before the start of PR Test. Depending on the requirement, capacity and suitability Pyranometer shall be installed at locations suggested by SCTL or else METEONORM data shall be considered for calculating PR.

The PR test shall be conducted at site by the Contractor in presence of the SCTL officials as per IEC 61724. The PR test procedure shall be submitted by the Contractor for review and approval.

Any special equipment, instrumentation tools and tackles required for the successful completion of the performance test shall be arranged by the Contractor at his own cost.

The procedure for PR demonstration test shall be as follows:

- Weather monitoring station installed in the plant shall be in working condition for minimum 2 weeks and all the parameters shall be available for analysis and verification. The test report for the calibration shall be submitted by the Contractor for approval.
- After the successful verification of the initial parameters by SCTL officials, PR test shall be conducted as per Tender Documents.

The factors excluded for calculation are Generation loss due to grid outage, Irradiance below 250 W/m<sup>2</sup>, the measured global solar radiation of the period of the outage of the power evacuation system

### PR CALCULATION

$$\text{Performance Ratio (Rp)} = \frac{\text{Final PV System Yield (Yf)}}{\text{Reference Yield (Yr) Rp}}$$

$$= \frac{Yf}{Yr}$$

$$Yf = \frac{\text{Plant AC Output (kWh)}}{\text{Plant Capacity (kWp at STC)}}$$

$$Yr = \frac{\text{Collector Plane Irradiance (kWh/m}^2\text{)}}{\text{Irr Ref}}$$

Irradiance Irr Ref = 1000W/m<sup>2</sup>

Performance Ratio of the solar plant for a period of time

$$= \frac{\text{Energy measured (kWh)}}{(\text{Irradiance(kWh/m}^2\text{) on the panel} \times \text{Active area of PV module} \times \text{PV module efficiency})}$$

Contractor shall demonstrate minimum PR of 77% (measured at the HT panel outgoing feeder level of the inverter room) in the initial PR test within 7 consecutive days. If the contractor fails to prove the desired performance ratio at the time of completion and during any of the consecutive years of defect liability period he will be given a second chance to demonstrate the PR within another 7 consecutive days. Still if it is not achieved, the same shall be demonstrated within another 7 consecutive days and still if it is not achieved, EPC contractor shall enhance the module capacity of solar plant/improve the quality of the plant by replacement of module/other components with all suitable modification requirements on balance of systems at his own cost to achieve the performance ratio. After obtaining energisation approval from Electrical Inspectorate and demonstration of minimum specified PR, the solar plant shall be commissioned which shall be the date of completion of the project.

## **HANDING OVER**

After the date of operation & maintenance of five years, the Contractor shall hand over the complete system to in the best working condition within 15 days to the SCTL. Any component found defective/inefficient/worn out shall be rectified/ replaced/ made good at contractor's cost before handing over the system to the SCTL. In order to ensure longevity & safety of the core equipment and optimum performance of the system the Contractor should use only genuine spares of high quality standards. Contractor has to operate & maintain the SPV plant till the end of the contract period of five years after commissioning.

## **WARRANTY**

The mechanical structures, electrical works and overall workman ship of the grid solar power plants must ensure longevity. PV modules used in grid power plants must be warranted for output wattage, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years. Manufacturer's warranty certificate shall be obtained in this regard.

The Solar power projects shall be warranted for five years after the date of commissioning of the project. For replacement in case of any manufacturing, operation failure, nonperformance as per design standards.

It is to ensure that 10 years replacement warranty is given by the module manufacturers if it is established that higher degradation is due to manufacturing defects. In addition to maintenance during warranty period of 5 years, it is proposed that SCTL opt for complete Operation & Maintenance contract for 5 years or 10 years post completion/ commission of the roof top projects.

The PV module(s) shall be warranted for a minimum period of 25 years from the date of commissioning of the project. The PV modules must be warranted for their output peak watt capacity, which should not be less than 90% at the end of Ten (10) years and 80% at the end of twenty-five (25) years.

In the first 10 years, replacement warranty is to be given by the module manufacturer if it is established that higher degradation is due to manufacturing defects.

The Warranty Card to be supplied with the system must contain the details of the system.

In addition to maintenance during warranty period of 5 years, after completion of 5 years' warranty period. Additional 10 years O&M contract with the Contractor to be given

## **MATERIAL WARRANTY**

- Material Warranty is defined as: The manufacturer should warrant the Solar Module(s) to be free from the defects and/or failures specified below for a period not less than five (05) years from the date of sale to the original customer ("Customer")
- Defects and/or failures due to manufacturing

- Defects and/or failures due to quality of materials
- Non conformity to specifications due to faulty manufacturing and/or inspection processes. If the solar Module(s) fails to conform to this warranty, the manufacturer will repair or replace the solar module(s), at the Owners sole option

### MAINTENANCE DURING WARANTEE PERIOD OF 5 YEARS

Schedule visit of the supplier’s engineer to the site on quarterly basis for maintenance/ assessing the maintenance requirements.

Visit to the site on call basis to provide maintenance services within 2 days of lodging of complaint.

Corrective & remedial maintenance services to set right the malfunction of the SPV-projects include supply and replacement of all damaged parts/ components including electronics/ charge controller, Inter connected cables/ parts and fuse etc. with new parts.

LIST OF DESIGN STANDARDS APPLICABLE TO ROOFTOP GRID TIE SOLAR PLANT		
Item	Standards	Description
<b>Photovoltaic (PV) module</b>	IEC 61215	Design Qualification and Type Approval for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules
	IS 14286	Design Qualification and Type Approval for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules
	IEC 61701	Salt Mist Corrosion Testing of Photovoltaic (PV) Modules
	IEC 61853- Part 1	Photovoltaic (PV) module performance testing and energy rating Irradiance and temperature performance measurements, and power rating
	IS 16170: Part 1	Photovoltaic (PV) Module performance testing and energy rating Part-1: Irradiance and temperature performance measurements, and energy rating
	IEC 62716	Photovoltaic (PV) Modules – Ammonia (NH3) Corrosion Testing (As per the site condition like dairies, toilets)
	IEC 61730-1,2	Photovoltaic (PV) Module Safety Qualification – Part 1: Requirements for Construction, Part 2: Requirements for Testing
	IEC 61730-2	Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing

**LIST OF DESIGN STANDARDS APPLICABLE TO ROOFTOP GRID TIE SOLAR PLANT**

Item	Standards	Description
	IEC 62804	Photovoltaic (PV) modules - Test methods for the detection of potential- induced degradation. IEC TS 62804-1: Part 1: Crystalline silicon (mandatory for applications where the system voltage is > 600 VDC and advisory for installations where the system voltage is < 600 VDC)
	IEC 61646	Design Qualification and Type Approval for Thin-Film Terrestrial Photovoltaic (PV) Modules
	IS 16077	Design Qualification and Type Approval for Thin-Film Terrestrial Photovoltaic (PV) Modules
	IEC 62108	Design Qualification and Type Approval for Concentrator Photovoltaic (CPV) Modules and Assemblies
	IEC 61725	Analytical expression for Daily Solar Profiles
	IEC 60721-2-1	Classification of environmental conditions - Part 2-1: Environmental conditions appearing in nature - Temperature and humidity
	IEC 60904-2	Photovoltaic devices - Part 2 : Requirements for photovoltaic reference devices (STC Performance, 1-V)
	IEC 60891	Photovoltaic devices - Procedures for temperature and irradiance corrections to measured I-V characteristics (STC Performance)
	NREL Report	Light - Induced Degradation (LID) of c-Si Solar Cells
	IEC 60364-4-41	Low-voltage electrical installations - part 4-41 : Protection for safety protection against electric shock
	IEC TS 62548	Photovoltaic (PV) Arrays - Design requirements
	IEC 61829	Crystalline silicon photovoltaic (PV) array- on-site measurement of I-V characteristics
	IEC 62759-1	Photovoltaic (PV) modules – Transportation testing, Part 1: Transportation and shipping of module package units
<b>Solar PV Inverters</b>	IEC 62109-1, IEC 62109- 2	Safety of power converters for use in photovoltaic power systems Part 1: General requirements, and Safety of power converters for use in photovoltaic power systems Part 2: Requirements for inverters. Safety compliance (Protection degree IP 65 for outdoor mounting, IP 54 for indoor mounting)

**LIST OF DESIGN STANDARDS APPLICABLE TO ROOFTOP GRID TIE SOLAR PLANT**

Item	Standards	Description
	IEC/IS 61683 (as applicable)	Photovoltaic Systems – Power conditioners: Procedure for measuring efficiency (10%, 25%, 50%, 75% & 90-100% Loading Conditions)
	BS EN 50530 (as applicable)	Overall efficiency of grid-connected photovoltaic inverters: This European Standard provides a procedure for the measurement of the accuracy of the maximum power point tracking (MPPT) of inverters, which are used in grid-connected photovoltaic systems. In that case the inverter energizes a low voltage grid of stable AC voltage and constant frequency. Both the static and dynamic MPPT efficiency is considered.
	IEC 62116/ UL 1741/ IEEE1547 (as applicable)	Utility-interconnected Photovoltaic Inverters - Test Procedure of Islanding Prevention Measures
	IEC 62093	Balance-of-system components for photovoltaic systems - Design qualification natural environments for solar inverters (grid-connected)
	IEC 62116	Utility-interconnected photovoltaic inverters- Test procedure of Islanding prevention measures
	UL 1741	Standard for Inverters, Converters, Controllers and interconnection system Equipment for use with Distributed Energy Resources
	IEEE 1547	Standard for interconnecting Distributed Resources with Electric Power Systems
	IEEE 1547.1	Standard for Conformance Test procedures for Equipment interconnecting Distributed Resources with Electric Power Systems
	DIN V VDE V 0126-1-1/A1 VDE V 0126-1 1/A1	Automatic disconnection device between a generator and the public low-voltage grid
	IEC 61727	Photovoltaic (PV) systems – characteristics of the utility interface (Parallel operation)
	CEA Guidelines/Regulations	Technical standards for connectivity of the distributed Generation Resources at Voltage - level of below 33kV
	IEC 62103	Electronic equipment for use in power installations
	BS EN 50438	Requirements for micro-generating plants to be connected in parallel with public low-voltage distribution networks
	IEC61850	Inverters with Reactive Power Control

**LIST OF DESIGN STANDARDS APPLICABLE TO ROOFTOP GRID TIE SOLAR PLANT**

Item	Standards	Description
	IEC 62124	Photovoltaic (PV) Stand -alone systems- Design verification Fuses
	IS/IEC 60947 (Part 1,2 &3)	General safety requirements for connectors, switches, circuit breakers (AC/DC)
	EN 50521 Part-1: General rules	(a).Low-voltage switchgear and Control-gear, (b).Low-voltage switchgear and Control-gear, Part- 2: Circuit Breakers, (c). Low-voltage switchgear and Control-gear, Part- 3: Switches, disconnectors, switch-disconnectors and fuse-combination units (d).EN. 50521: Connectors for photovoltaic systems - Safety requirement
	IEC 60255-27	Measuring relays and protection equipment – Part 27: Product safety requirements
	IEC 60068-2 (1, 2, 14, 27, 30)	Environmental Testing of PV System – Power Conditioners and Inverters a) IEC 60068-2-1: Environmental testing - Part 2-1: Tests - Test A: Cold b) IEC60068-2-2: Environmental testing - Part 2-2: Tests - Test B: Dry heat c) IEC60068-2-14: Environmental testing - Part 2-14: Tests - Test N: Change of temperature d) IEC 60068-2-27: Environmental testing - Part 2- 27: Tests - Test Ea and guidance: Shock e) IEC 60068-2-30: Environmental testing - Part2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)
	IEC 61000 – 2,3,5 (as applicable)	Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC) testing of PV Inverters
<b>Fuses</b>	IS/IEC 60947 (Part 1, 2 & 3), EN 50521	General safety requirements for connectors, switches, circuit breakers (AC/DC): Low-voltage Switchgear and Control-gear, Part 1: General rules b) Low-Voltage Switchgear and Control- gear, Part 2: Circuit Breakers c) Low- voltage switchgear and Control-gear, Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units d) EN 50521: Connectors for photovoltaic systems – Safety requirements and tests
<b>Surge Arrestors</b>	IEC 60269-6	Low-voltage fuses - Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems
	IEC 62305-4	Lightning Protection Standard

**LIST OF DESIGN STANDARDS APPLICABLE TO ROOFTOP GRID TIE SOLAR PLANT**

Item	Standards	Description
	IEC 60227/IS 694, IEC 60502/IS 1554 (Part 1 & 2)	General test and measuring method for PVC (Polyvinyl chloride) insulated cables (for working voltage up to and including 1100V, and UV resistant for outdoor installation)
	IEC 60364-5-53/ IS 15086-5 (SPD)	Electrical installations of buildings - Part 5-53: Selection and erection of electrical equipment - Isolation, switching and control
	IEC 61643-11:2011	Low-voltage surge protective devices - Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods
<b>Cables</b>	IEC 60227/IS 694, IEC60502/IS 1554 (Part 1 & 2) / IEC69947	General test and measuring method for PVC (Polyvinyl chloride) insulated cables (for working voltages up to and including 1100 V, and UV resistant for outdoor installation)
	BS EN 50618	Electric cables for photovoltaic systems (BT(DE/NOT)258), mainly for DC Cables
<b>Earthing /Lightning</b>	IEC62561 Series (Chemical earthing) IEC 62561-1	Lightning protection system components (LPSC) – Part 1: Requirements for connection components IEC 62561-2 Lightning protection system components (LPSC) Part 2: Requirements for conductors and earth electrode
	IEC62561 Series (Chemical earthing) IEC 62561-7	Lightning protection system components (LPSC) – Part 7: Requirements for earthing enhancing compounds
	IS 3043-1986	Earthing shall be done in accordance with IS-3043- 1986, provided that earthing conductors shall have a minimum size of 6.0 mm <sup>2</sup> copper, 10 mm <sup>2</sup> aluminum or 70mm <sup>2</sup> hot dip galvanized steel
	IEC 60364-5-53	The SPDs earthing terminal shall be connected to earth through the above mentioned dedicated earthing system; The SPDs shall be of type 2 as per IEC 60364-5-53
	IS 3043	Code of practice for earthing (ETD 20: Electrical Installation)
<b>Junction Boxes</b>	IEC 60529	Junction boxes and solar panel terminal boxes shall be of the thermo-plastic type with IP 65 protection for outdoor use, and IP 54 protection for indoor use

**LIST OF DESIGN STANDARDS APPLICABLE TO ROOFTOP GRID TIE SOLAR PLANT**

Item	Standards	Description
	IEC 529	Junction boxes and solar panel terminal boxes shall be of the thermo plastic type with IP 65 protection for outdoor use, and IP 54 protection for indoor use
	IE 62208, IP 54 as per IEC 529	General requirements for junction boxes, charge controllers
<b>Solar PV Roof Mounting Structure</b>	IS 2062/IS 4759	Material for the structure mounting
<b>Energy Meter</b>	CEA Regulations	Installation and operation of Energy Meters Regulations 2006, and as amended in 2010 & 2014
	IS 13779	AC Static watt-hour Meters Class 1 and 2 - specification
	IS 14697	AC Static Transformer Operated Watt-hour and Var-hour Meters, Class 0.2 S and 0.5 S - specification
	IS 15884	Alternating Current Direct connected static Prepayment Meters for Active Energy (Class 1 and 2) - Specification
	IS 15959	Data exchange for electricity meter reading, tariff and load control-companion specification
	IS 16444	AC Static direct connected watt-hour Smart Meter Class 1 and 2 specification (with Import & Export/Net energy measurements) System Performance Monitoring
	IS/IEC 61724	Guidelines for PV System Performance Monitoring- measurement, Data Exchange, and Analysis
<b>PV System/Power Plant inspection</b>	IEC 62446	Grid connected Solar PV Systems-Minimum requirements for system Documentation, Commissioning Tests, and Inspection
	IEC 61557-1	Electrical Safety in low voltage distribution systems up to 1000 V AC. and 1500 V DC- Equipment for testing, measuring or monitoring of protective measures - Part 1: General requirements
	IEC 60364-6	Low-voltage electrical installations - part 6: Verification
	IEC 61829	Crystalline silicon photovoltaic (PV) array- on-site measurement of I-V characteristics

## OPERATION AND MAINTENANCE GUIDELINES OF GRID CONNECTED PV PLANTS

<p><b>GENERAL</b></p>	<ul style="list-style-type: none"> <li>• For the optimal operation of a PV plant, maintenance must be carried out on a regular basis.</li> <li>• All the components should be kept clean. It should be ensured that all the components are fastened well at their due place.</li> <li>• Periodic cleaning of solar modules, preferably once every fortnight.</li> <li>• O&amp;M of Solar Power Plant shall be compliant with grid requirements to achieve committed energy generation.</li> <li>• Periodic checks of the Modules, PCUs/Invertors shall be carried out as a part of routine preventive and breakdown maintenance.</li> <li>• Immediate replacement of defective Modules, Invertors/PCUs and other equipment as and when required.</li> <li>• Supply of all spares, consumables and fixtures as required. Such stock shall be maintained for all associated equipments and materials as per manufacturer/ supplier's recommendations.</li> <li>• All the equipment testing instrument required for Testing, Commissioning and O&amp;M for the healthy operation of the Plant shall be maintained by the Contractor. The testing equipments must be calibrated once every 2 years from NABL accredited labs and the certificate of calibration must be kept for reference as required.</li> <li>• If negligence/ mal-operation on part of the Contractor's operator results in failure of equipment, such equipment should be repaired/ replaced by the Contractor free of cost.</li> <li>• If any jobs covered in O&amp;M Scope as per Agreement are not carried out by the contractor/ Contractors during the O&amp;M period, the Engineer-In-Charge shall take appropriate action as deemed fit.</li> </ul>
<p><b>SOLAR PANELS</b></p>	<p>Although the cleaning frequency for the panels will vary from site to site, it is recommended that</p> <ul style="list-style-type: none"> <li>• The panels are cleaned at least once every fifteen days.</li> <li>• Any bird droppings or spots should be cleaned immediately.</li> <li>• Use water and a soft sponge or cloth for cleaning.</li> <li>• Do not use detergent or any abrasive material for panel cleaning.</li> <li>• Iso-propyl alcohol may be used to remove oil or grease stains.</li> <li>• Do not spray water on the panel if the panel glass is cracked or the back side is perforated.</li> <li>• Wipe water from module as soon as possible.</li> <li>• Use proper safety belts while cleaning modules at inclined roofs etc.</li> <li>• The modules should not be cleaned when they are excessively hot. Early morning is particularly good time for module cleaning</li> <li>• Check if there are any shade problems due to vegetation or new building. If there are, make arrangements for removing the vegetation or moving the panels to a shade-free place.</li> </ul>

	<ul style="list-style-type: none"> <li>• Ensure that the module terminal connections are not exposed while cleaning; this poses a risk of electric shock.</li> <li>• Never use panels for any unintended use, e. g. drying clothes, chips etc.</li> <li>• Ensure that monkeys or other animals do not damage the panels.</li> </ul>
<b>CABLES AND CONNECTION BOXES</b>	<ul style="list-style-type: none"> <li>• Check the connections for corrosion and tightness.</li> <li>• Check the connection box to make sure that the wires are tight, and the water seals are not damaged.</li> <li>• There should be no vermin inside the box.</li> <li>• Check the cable insulating sheath for cracks, breaks or burns. If the insulation is damaged, replace the wire.</li> <li>• If the wire is outside the building, use wire with weather-resistant insulation.</li> <li>• Make sure that the wire is clamped properly and that it should not rub against any sharp edges or corners.</li> <li>• If some wire needs to be changed, make sure it is of proper rating and type.</li> </ul>
<b>INVERTER</b>	<ul style="list-style-type: none"> <li>• The inverter should be installed in a clean, dry, and ventilated area</li> <li>• Remove any excess dust in heat sinks and ventilations. This should only be done with a dry cloth or brush.</li> <li>• Check that vermin have not infested the inverter. Typical signs of this include spider webs on ventilation grills or wasps' nests in heat sinks.</li> <li>• Check functionality, e.g. automatic disconnection upon loss of grid power supply, at least once a month.</li> <li>• Verify the state of DC/AC surge arrestors, cable connections, and circuit breakers.</li> </ul>
<b>SHUTTING DOWN THE SYSTEM</b>	<ul style="list-style-type: none"> <li>• Disconnect system from all power sources in accordance with instructions for all other components used in the system.</li> <li>• Completely cover system modules with an opaque material to prevent electricity from being generated while disconnecting conductors.</li> <li>• To the extent possible, system shutdown will not be done during day time or peak generation.</li> </ul>

**INSPECTION AND MAINTENANCE SCHEDULE**

Component	Activity	Description	Interval	By
<b>PV MODULE</b>	Cleaning	Clean any bird droppings/dark spots on module	Immediately	Technician
		Clean PV modules with plain water or mild dishwashing detergent. Do not use brushes, any types of solvents, abrasives, or harsh detergents.	Fortnightly or as per the site conditions	Technician
	Inspection (for plants >10 kWp)	Use infrared camera to inspect for hot spots; bypass diode failure	Annual	Technician
<b>PV ARRAY</b>	Inspection	Check the PV modules and rack for any damage. Note down location and serial number of damaged modules.	Annual	Technician
		Determine if any new objects, such as vegetation growth, are causing shading of the array and move them if possible.	Annual	Technician
	Vermin Removal	Remove bird nests or vermin from array and rack area.	Annual	Technician
<b>JUNCTION BOXES</b>	Inspection	Inspect electrical boxes for corrosion or intrusion of water or insects. Seal boxes if required. Check position of switches and breakers. Check operation of all protection devices.	Annual	Electrician
<b>WIRING</b>	Inspection	Inspect cabling for signs of cracks, defects, loose connections, overheating, arcing,	Annual	Electrician

Component	Activity	Description	Interval	By
		short or open circuits, and ground faults.		
<b>INVERTER</b>	Inspection	Observe instantaneous operational indicators on the faceplate of the inverter to ensure that the amount of power being generated is typical of the conditions. Inspect Inverter housing or shelter for physical maintenance, if required.	Monthly	Electrician
	Service	Clean or replace any air filters.	As needed	Electrician
<b>INSTRUMENTS</b>	Validation	Spot-check monitoring instruments (pyranometer etc.) with standard instruments to ensure that they are operational and within specifications.	Annual	PV Specialist
<b>PLANT</b>	Monitoring	Daily Operation and Performance Monitoring	Daily	Site in charge
<b>SPARE PARTS</b>	Management	Manage inventory of spare parts.	As needed	Site in charge
<b>LOG BOOK</b>	Documentation	Document all O&M activities in a workbook available to all service personnel	Continuous	Site in charge

## SAFETY REGULATIONS

ELECTRICAL SAFETY & SECURITY SPECIFICATIONS	
1. Electrical Safety Protections	
a) Over/under voltage	a) Mains (Grid) over-under voltage and frequency protection. b) Over voltage protection against atmospheric lighting c) Protection against voltage fluctuations in the grid itself and internal faults in the power conditioner/ Inverter, operational errors and switching transients.

<b>ELECTRICAL SAFETY &amp; SECURITY SPECIFICATIONS</b>	
b) Fool proof Protection	Against ISLANDING. Note: MOV type surge arrestors on AC and DC terminals for over voltage protection from lightning-induced surges.
c) Accidental open circuit	Full protection against accidental open circuit and reverse polarity at the input.
d) Internal Faults	Inbuilt protection for internal faults including excess temperature, commutation failure, overload and cooling fan failure is obligatory.
e) Galvanic Isolation	Galvanic isolation shall be provided to avoid any DC component being injected into the grid and the potential for AC components appearing at the array.
f) Earth fault Supervision	An integrated earth fault detection device is provided to detect eventual earth fault on DC side and shall send message to the supervisory system.
g) Disconnection and islanding	Disconnection of the PV plant in the event of loss of the main grid supply shall be achieved by in built protection within the power conditioner. This may be achieved through rate of change of current, phase angle, unbalanced voltages or reactive load variants. Operation outside the limits of power quality as described in technical data sheet cause the power conditioner to disconnect the grid.
h)	Automatic disconnection is for <ul style="list-style-type: none"> <li>• Neutral voltage displacement</li> <li>• Over Current</li> <li>• Earth fault&amp;</li> <li>• Reverse Power</li> </ul> In each of the above cases, tripping time shall be less than 0.5 seconds. Response time in case of grid failure-based shutdown should be well within 60 seconds.
i) Automatic reconnection after the grid failure is resorted.	PCU/Invertor shall be facility to reconnect the inverter automatically to the grid following restoration of grid, subsequent to grid failure condition.
2. Array Tracking	Shall be Included authentic tracking of the solar Array's maximum power operating voltage (MPPT)
3. Array Ground Fault	To be provided
4. Operator Interface	LCD and keypad operator interface, Menu driven
5. Fault conditions	Automatic fault conditions reset for all parameters like voltage, frequency and/ or black out.
6. Control Logic Failure Detection	Via watch dog timers
7. Parameter access	All parameters accessible through an industry standard communication link
8. DC-AC conversion efficiency	98% for output ranging from 20% to full load
9. Parallel operation with Grid	Shall be provided & capable of interrupting line-to-line fault currents and line to ground fault currents
10. Unbalanced output load	PCU/Invertor shall be able to withstand an unbalanced output load to the extent of 30%.
11. Shut down/Standby mode	Shut down/standby mode with its contact open under the following conditions before attempting an automatic restart after an appropriate time delay; in sufficient solar power output. <p>a) Insufficient solar power input: When the power available from the PV array is insufficient to supply the losses of the INVERTOR, the INVERTOR shall go to a standby/shutdown mode. The inverter control shall prevent excessive cycling during rightly shut down or extended periods of insufficient solar radiation.</p> <p>b) Utility- Grid over or under voltage: The inverter shall restart after an over or under voltage shutdown when the utility grid voltage has returned to within limits for a minimum of two minutes.</p> <p>c) Utility-Grid over or under frequency: The INVERTOR shall restart after an over</p>

<b>ELECTRICAL SAFETY &amp; SECURITY SPECIFICATIONS</b>	
	or under frequency shutdown when the utility grid voltage has returned to the within limits for minimum of two minutes.
12. INVERTOR generated harmonics	Shall not exceed a total harmonic current distortion of 3%, a single frequency current distortion of 3%, and single frequency current distortion of 1%, when the first through the fifth integer harmonics of 50Hz are considered.
13. Circuit separation	High voltage & power circuits separated from low voltage & control circuits
14. Internal wiring	Standard Cu wiring, with resistant insulation
15. Cabling practice	a) Cables: Multi stranded tinned copper conductor cables as per relevant international Standards suitable for solar system applications b) Cable connections: suitable terminations c) PVC channel with covers to house the cables
16. High voltage test	INVERTOR shall withstand high voltage test of 2000 volts between either the input or the output terminals and the cabinet(chassis)
17. EMI (Electromagnetic interface)	INVERTOR shall not produce EMI which cause malfunctioning of electronic & electrical instruments including communication equipment's which are located within the facility in which the INVERTOR is housed
18. Display on front panel& indicators	a) Instantaneous INVERTOR ac power output and the DC voltage current and power input b) Accuracy of display:3% of full-scale factor or better c) Display shall be visible from outside the INVERTOR enclosure d)Operational status of the INVERTOR, ALARMS, TROUBLE INDICATORS and AC and DC disconnect switch positions shall also be communicated by appropriate messages or indicator lights on the front cover of the INVERTOR enclosure
19. Emergency OFF	Emergency off button shall be located at an appropriate position on the unit
20. Grounding	INVERTOR shall be provided with ground lugs for equipment and PV array groundings. The DC circuit ground shall be a solid single point ground connection
21. Operating Modes	a) Night or sleep mode: where the inverter is almost completely turned off, with just the timer and control system still in operation, losses<2W b) Standby mode: where the control system continuously monitors the output of the solar generator until pre-set value shall not exceed (typically 10W) Operational of MPP tracking mode: the control system continuously adjusts the voltage of the generator to optimize the power available. The power conditioner shall automatically re-enter standby mode input power reduces below the standby mode threshold. Front panel display providing the status of the INVERTOR, including AC power output & DC current voltage and power input, and unit fault indication.
22. Inverter/Array Size ratio	The ratio of the inverter continuous power rating and the array peak power rating shall be between 80 to 90% or any other value found suitable. Inverter efficiency should exceed 90% except when operating at less than 10% of maximum output.
23. MPPT	Maximum power point tracker shall be integrated in the power conditioner unit to maximize energy drawn from the array. The MPPT shall be microprocessor based to minimize power losses. The MPPT shall have provision (manual setting) for constant voltage operation.
24. Metering	a) PV array energy production: Meter to log the actual amount of AC energy generated/consumed by the PV system shall have to be provided. b) Solar irradiance: c) An integrating pyranometer (Class II or better) to be provided, with the sensor mounted in the plane of the array. Readout shall be integrated with data logging

## ELECTRICAL SAFETY & SECURITY SPECIFICATIONS

### 25. Data Logging System

a) All major parameters available on the digital bus and logging facility for energy auditing through the internal microprocessor should be available to be read on the digital front panel at any time (current values, previous values for up to a month and the average values)

The following parameters shall be accessible via the operating interface display:

- AC voltage & AC output current
- Output power
- DC input voltage & DC input current
- Time active
- Time disabled
- Time idle
- Temperatures (C)
- Converter status

Protective function limits (VIZ-AC over voltage, AC under voltage, Over frequency, under frequency, ground fault, PV starting voltage, PV stopping voltage, over voltage delay, under voltage delay over frequency, ground fault delay, PV stopping delay).

## SAFETY PRACTICES IN WORKS

### A. GENERAL SAFETY

- a. Contractor shall take all necessary precautions not only for safe working of his own workmen but also deploy all precautions to ensure safety of structures, equipment and workmen of other agencies in and around his work site.
- b. Contractor shall assign an experienced and trained safety In-charge who is aware of all the risks involved in the works related to Installation, testing Commissioning of such roof mounted or Rooftop Solar jobs.
- c. Contractor should conduct daily safety briefing with the team and ensure strict compliance of safety procedures.
- d. Contractor will follow all National and internationally applicable electrical safety norms in installation of solar plant and during operation and maintenance of the plant.
- e. SCTL will not be responsible for any clearances and permits.
- f. Contractor shall take permission from concerned authorities (Local/state/central) if required under any Laws, rules and regulations.
- g. Any damage caused to existing structure due to construction activities or the operation of the plant thereof will be the responsibility of the Contractor and it will be required to fix the damage as per the specification of SCTL or compensate an equivalent amount.
- h. It is responsibility of the Contractor to acquaint himself with the existing policies.
- i. Contractor has to comply with the Environmental, Occupational Health & Safety and Security requirements of SCTL and has to ensure that adequate measures have been taken from their end for the safe working of their men and machines.

- j. Contractor shall ensure that his workmen do not trespass into prohibited/restricted work areas.
- k. Contractor shall execute the work in a manner causing the least possible interference with the business of the Employer/ Consultant, or with the work of any other contractor who may be engaged on the premises and shall at all times co-operate with the other contractors working at site.
- l. Contractor shall obtain daily work permit from the Employer/ Consultant before start of any work at site. The work permits are issued to prevent the contractor from working in unauthorised areas and shall be valid for specific area for a stipulated period.
- m. Contractor shall ensure at all times that his workers do not lie down or sleep under or around any machine, equipment, vessel or vehicle in his work area at any time.
- n. Contractor must follow Entry to the project premises with valid Photo ID and mandatory PPE's (safety helmet, shoe & reflective jackets).
- o. The record of Entry / Exit of the personnel will be maintained

#### **B. WORKING AT HEIGHTS**

- a. Contractor workmen engaged must undergo medical fitness examination before deploying them for work at heights.
- b. Contractor workers should wear safety full body harness with double lanyard with hook properly fastened.
- c. Contractor workmen engaged on work at heights should be experienced in such work.
- d. Steel scaffold staging should be erected as per IS code. Design for Scaffold staging must be approved by Chartered Engineer.
- e. Wherever multiple work activities Contractor must use safety nets beneath the place of work for safety.
- f. Contractor when working over equipments or tanks, Full body safety harness with double lanyard, safety lifeline and safety nets should always be used whether or not staging and scaffolding is provided.
- g. Safe access to all points of works should be provided in the form of Suitable Ladders /stairways/ boom lifts by Contractor.
- h. Area around the work place should be barricaded suitably or fenced off to avoid Injuries to personnel passing by. Suitable warning boards and sign should be put up by Contractor.
- i. Life line and fall protection arrangements should be provided for working at heights by Contractor
- j. Contractor must ensure loose materials should be cleared on daily basis from scaffolds.

- k. Man-basket not permitted for height works.

### **C.HOT WORK (WELDING / GAS CUTTING WORK)**

- a. Only qualified welders should be employed at the work site.
- b. Contractor must organise for all welding work at site, Rectifier / Thyristor sets instead of AC transformer sets. AC transformer sets are banned for welding jobs (both open and closed top type).
- c. Contractor should get his welding sets certified by concerned engineer of the SCTL before start of the work. These certificates should have to be renewed every month. A copy of the certificates should be displayed on respective welding sets.
- d. Contractor welder should not use the structure etc. as a return path of the current. Adequately rated circuit breaker should be provided in the power circuit for human protection on all power supply points.
- e. Before starting any hot work like Gas cutting, welding and grinding etc., the Contractor should obtain hot work permit from the concerned engineer of the SCTL. The permit should be renewed on day-to-day basis.
- f. No combustible material should be stored on or near any source of heat like hot pipes, welding or gas. Before leaving the place of work or the Contractor's sheds, the Contractor's workmen should ensure that no material or item that could start a fire is left at site. Special attention should be paid to collection and disposal of oil soaked cotton waste or rags. On no account are these to be dropped into corners, pushed below equipment or left hanging on pipes.
- g. Contractor must use gas cylinders in a safe manner. These should not be dropped from heights or dragged on the floor. Trolley with rubber rimmed wheels should be used for transporting gas cylinders within the site. All cylinders should be kept in upright position. Oxygen cylinders should not be kept near inflammable materials like oil etc.
- h. Standard colour codes for the cylinder must be followed (Oxygen-Black, Acetylene-Maroon) by Contractor.
- i. Contractor must provide the gas cutting sets with flash back arrestor at both ends (Cylinder and Torch) and gas cutting rubber tube ends fixed with the clamps.
- j. Contractor must provide the fire blankets for fire protection in the vicinity of welding and gas cutting jobs.
- k. Contractor must provide charged fire extinguisher of DCP / CO2 type with each welding/gas cutting set.
- l. LPG shall not be used for cutting / heat treatment purpose (strictly prohibited).

### **D.MECHANICAL SAFETY:**

- a. Contractor shall ensure that all his equipment and machinery are safe to use while in motion or working. Operators shall have received training or instruction on operation of the machinery and the regulatory requirements.
- b. Contractor shall have adequate procedure to ensure the stability and securing of his working machinery during operation. He shall restrict repair and maintenance of the machinery to trained personnel and maintain records of repairs and maintenance. The equipment shall have appropriately designed means of isolating from sources of energy and shall have emergency stop control, which is easily accessible. All controls shall be clearly and uniformly marked. All operation controls, interlocks, sensing devices and guards on tools and equipment shall be functional and their status shall be regularly checked and recorded. Contractor shall provide evidence of compliance to these requirements in any contractual write-ups submitted to owner /Engineer for approval in respect of critical construction/ contract works.
- c. Contractor shall provide only good quality hand-tools and ensure control of condition, storage, routine inspection and use of such hand-tools. Unsafe tools such as with cracked or broken handles, mushroomed chisels and punches, worn screwdrivers, hardened hammerheads; power tools with unsafe resistance to earth or without safety guards shall be prohibited.
- d. All safety ladders and scaffolding and such access equipment shall meet requirements of IS 3696: and IS 4014:1967 and such standards Engineer/ Owner may stipulate. The safety work permits shall be issued only after ensuring that all safety requirements of access equipment are complied with. Access equipment shall be inspected on a routine basis to prevent injuries caused by falls.
- e. A checklist shall be used for inspection and certification of hand tools, safety ladders, scaffolding and other equipments.
- f. Pressurised gas and air systems shall be maintained safe in good working order and shall meet the requirements of the Factories Act 1948, The Static and Mobile Pressure Vessels Rules 1984 and the Gas Cylinder Rules 1934 as applicable. The safety relief valves, safety appurtenances and isolation systems shall be compliant with safety code of practices. Any statutory register of pressure vessel records and the code of practices shall be subject to periodic auditing by Owner and Engineer.
- g. The areas of highly dangerous activities like hoisting & lifting, shall be appropriately barricaded to protect personnel and machinery and guided by work permit discipline. Emergency plans shall cater to emergencies arising out of such activities.
- h. Signs, barricades, barrier tapes and warning or entry restriction devices or accessories shall be provided to minimise work related risks of accidents and injuries. Signage shall meet all regulatory requirements such as under The ` and other Construction Workers Act 1996,

Factory Act 1948, Manufacture, Storage, Import of Hazardous Chemicals Rules under Environmental Protection Act 1986, Indian Explosives Act 1984 and Gas Cylinder Rules 1981 and Indian Electricity Act 1910 and Rules thereof and any other safety requirements of Owner and Engineer.

- i. Contractor shall ensure safety of all those concerned with lifting and those who may be affected by material hoisting, lifting and handling using various mechanical aids.
- j. All lifting equipment such as cranes, hoists, lifting shackles, hooks chains and links shall be designed as per appropriate International codes of construction and shall have valid test certificate from competent person. Operators shall have been trained in operation and maintenance of such equipment besides training on standard hand signals to be employed during the hoisting and lifting operations.
  - The lifting machines, chain pulley blocks etc. must be tested and valid test certificates should be submitted to the Project in charge.
  - Ensure that the chain pulley blocks with locking lever (safety catch) are used.
  - Check the wire rope for distortion, kinking, unevenness and general corrosion. Never use ropes, which are having these defects.
  - Proper crimping should be done for wire rope joints and ends. Use standard 'U' clamp for tying up the rope and object.
  - The safe working loads should be clearly marked on each of the above items. In no case, this rated capacity should be exceeded.
  - Never work or move below the suspended loads.
  - Riding on construction equipment, forklifts and cranes shall be prohibited unless such vehicles are provided with passenger seats.
- k. Scaffolds:
  - Only MS tubes shall be used for scaffolding.
  - Scaffolding shall be erected, altered and dismantled under supervision of authorized person and by person with adequate experience.
  - No scaffold shall be left partly erected or dismantled unless adequate notices are displayed and access blocked.
  - Scaffoldings shall be mounted only on hard foundations. Bricks, concrete blocks and odd, uneven timber scraps shall not be used for sole plates. Adjustable base plates shall be used in uneven surface.
  - Bracing and Ties shall be done to ensure the stability of the scaffold. Bracing shall be done in both directions. Bracing shall be done on the outer face of the scaffold from base to

the full height in diagonal manner or along each bay in Zigzag manner. Braces shall be connected to standards using swivel coupler or to the ends of transoms with right angle coupler.

- Scaffold shall be securely tied to the structure throughout their length and height to prevent movement of the scaffold either towards or away from the structure.
- A scaffold should be strong enough to bear the load of the worker and the material. Normally, scaffolds are erected in such a way that they can withstand at least four times the anticipated working load.
- Width of the working platform shall be of minimum width of 600 mm. Boards free from damages/ paint /oil shall be used. Thickness of the planks used shall be from 32-38 mm and width shall be 225-300 mm. Width of the platform shall be decided to suit type of work from 600 mm to 1.5 M Planks shall be decked closely as close as practicable, locked or secured on both ends to prevent tipping and displacement during normal use. Overhang at least 50 mm but not more than 4 times thickness of the board, unless secured from tipping.
- Provide a safe and convenient means to gain access to the working platform. Keep the platform free from any unnecessary obstruction, rubbish and projected nails.
- Guardrails must be provided on the exposed sides and ends of all working platforms more than 3 m in height. The guardrail may be fixed to the outside of the standard.
- A toe board or equivalent protection must be fitted on the outside edge of every working platform more than 3 m in height, if materials and tools are placed on the platform and are likely to be dislodged. Scaffold plank of 225 mm minimum width may be used as a toe board.
- To facilitate the movement of materials, guardrails and toe boards may be temporarily removed, but they must be replaced as soon as practicable. Scaffolds more than 2 m in height shall be provided with secured ladder fixed at top or bottom for access and it shall extend at least 1 meter above platform.
- Inspect the scaffolding thoroughly before allowing the worker on it. A separate log shall be maintained by the Safety Engineer regarding inspection details and date of next inspection. Proper colour tagging shall be provided for the incomplete and complete with inspection scaffoldings.
- No scaffold shall be kept in partly dismantled condition. If for any reason, the scaffolding is left in partly dismantled condition, a suitable warning sign shall be displayed on or near the scaffold.
- Scaffold location must not foul access ways, roads and doors. If fouling is unavoidable, warning boards shall be installed and the area cordoned off for traffic.

## E. ELECTRICAL EQUIPMENT-SAFETY

- a. Contractor shall provide only such equipment for work that is electrically safe to work. Contractor shall have a procedure to identify and record all his electrical equipment in a register, with provisions to record his periodic inspections of such equipment. Inspection shall cover cables, extension leads, all electrical equipment drawing power from socket outlet. He shall identify and maintain in good working order all electrical installations such as distribution panels and major switchgear ensuring safe accessibility. A clear area shall be maintained around Panels and switchgears. The installed equipment shall be periodically inspected by qualified personnel to ensure their continued safe operating condition. Inspection shall include earth polarity checks, continuity checks and earth resistance checks. Contractor shall ensure use of flameproof and explosion proof switchgears and lighting fittings where required as per governing codes.
- b. Approved earth leakage relays or alternative safety devices conforming to relevant ARE /International codes shall be used on all portable electrical hand tools. Where possible low-voltage electric power supply shall be used for hand- tools. Earth leakage units shall protect electrical installations. Record of regular checks shall be maintained. Contractor shall comply with "Code of practice for earthing" as per IS 3043:1987
- c. Safety rubber matting of appropriate voltage rating conforming to IS 15652:2006 shall be provided in front of all switchgears and power distribution panels for the safety of personnel operating such equipment.
- d. All power cables providing construction power to various construction machinery and the connectors shall be in safe and sound condition. Cables shall be routed through cable trays/ UPVC or DWC pipes supported on appropriately designed structures, duly clamped, secured and identified. Road crossing cables shall be laid in conduits buried at least 750 mm below the surface to prevent damage due to vehicular traffic. All cables shall be off the floor to avoid damage or tripping hazard. Cables shall be terminated at the switchgears and sockets in a workman like manner to prevent loose contacts and flashover. Only safety receptacles shall be used for providing power connection to hand-tools. All switches and distribution boards shall be clearly marked. All electrical distribution and panel wiring diagrams shall be available with the electrical maintenance personnel. Contractor shall maintain a safe electrical isolation/lockout procedure.
- e. Contractor shall ensure lighting circuits are not used for hand-tools. No electrical equipment shall be overloaded. Tools and test equipment used on electrical systems shall be insulated.
- f. ELCB provided should be rated 100mA
- g. All the electrical work should be carried out by persons holding valid electrical license / certificate.

- h. No vehicle or construction equipment shall be parked and operated below / near HT and LT electrical lines.
- i. Use portable grinders, drilling machines, etc. conforming to IS standards. All these tools should be properly insulated.
- j. Never overload cables beyond the rated capacity. This is one of the common causes of fire.
- k. Provide the rubber gloves to electricians who work in HT zone. Ensure that the gloves are tested as per IS 4770 :1968 and the same are approved.
- l. Before commencing repair or maintenance work on any machine, switch off the main supply / remove fuse, display caution tags on machines and switchboards. Follow the standard lock out, tag out procedure.
- m. All equipment should have earthing arrangements.
- n. Do not insert bare wires in sockets for energizing any equipment. Use only plug tops for all electrical equipment.
- o. While laying cables, ensure that cables are so laid that they do not obstruct the smooth movement of men and machinery.
- p. Make sure that all cables are protected against abuses and possible damage.
- q. Use junction / extension boxes for long distances. Open connections are not permitted.
- r. Approved flameproof fittings shall be used in flameproof areas.
- s. Arrange for sufficient lighting, incase work extension is required beyond normal working hours. Obtain necessary approvals for the same.
- t. Check for any underground cables before starting excavation jobs.
- u. No loose cable allowed to cross the Road. If cable is required to cross the road it should hang at certain elevation. No joints allowed without proper connections.
- v. Contractor shall arrange displaying signage under Indian Electricity Act 1910, such as:
  - Danger notices as per IS 2551 in conspicuous places on all low, medium and High voltages as per Rule 35,
  - Instruction of restoration of persons suffering from electric shock in English and local languages as per Rule 44 in switch gear rooms, substations and places where electricity is used and
  - Notice prohibiting unauthorised entry in areas where electrical apparatus are used.

#### **F.SAFETY IN HANDLING SOLAR PANELS**

- a. Read the installation guidelines completely before installing, operating and maintaining

the Solar PV Panels.

- b. Contact with any solar panel connected or disconnected to the system is dangerous as the solar cells shall start generating power when they are exposed to light, hence it is imperative that proper care should be taken while storing and handling such panels. Installation of such panels shall be carried out by only trained personnel. Access to unauthorised persons to these areas should be strictly restricted.
- c. Adequate signage in this regards should be installed at the storage and installation site to make people aware of the hazards related to Solar Panels.
- d. All exposed conducting parts shall be well insulated while storing and installing.
- e. Housekeeping in the storage and installation areas should be strictly maintained to avoid accumulation of any combustible material in the surrounding which may lead to fire.
- f. These areas shall be maintained dry. Care should be taken not to damage the panels by keeping/ dropping material on top of it.
- g. Avoid artificially concentrated sunlight beam from falling on the stored panels.
- h. Use proper care while lifting these panels to avoid damage.

#### **G.HAZARDOUS SUBSTANCES CONTROL**

- a. Contractor shall prevent all injuries, illnesses and damage to property or the environment caused by any article or substance, which proves to be hazardous. The code of practices of construction and operation and maintenance and control procedures shall meet required statutory and regulatory requirements. Personnel shall be trained on use, handling, storage and disposal of and emergency spillage procedures.
- b. Contractor shall detail and deploy Operational controls to reduce hazardous wastes and their disposal as required by the statute "Hazardous Waste (Management and handling) Rules 2008". Oil wastes, used oils, soil and cotton soaked in oil consequent to handling operations, grease and many class of paints and asbestos sheets and gaskets are typical hazardous wastes.
- c. Contractor shall identify, contain and control all sources of radiation. Appropriate regulatory approvals shall be obtained before commencement of work involving radiation sources. Radiation protection advisors suitably qualified and experienced shall be appointed whose names shall be submitted to owner/ engineer. Dosimetry and surveillance of personnel engaged in such work shall be maintained in accordance with regulatory requirements.

#### **H.PERSONAL SAFEGUARDING**

Personal protection equipment (PPE): General Contractor shall provide his employees required PPE meeting the requirements of the stated IS Specifications and Guidelines or equivalent

International Standards as may be prescribed by the Engineer from time to time. Contractor shall have instituted good working procedures and practices in providing PPE, maintenance, issue and training on their use. All PPE shall be periodically checked to ensure worn, damaged equipment are replaced expeditiously.

- a. Control of use of issue, use and maintenance of PPE - Employees shall be responsible for PPE issued to them. Contractor shall meet requirements of IS 8519: 1977 titled "Guide for selection of Industrial safety equipment for body protection" or any equivalent international Specification that the Engineer/Owner may prescribe.
- b. Head Protection - Contractor shall comply with requirements as per IS 2925. Hardhats shall be used and worn where a hazard of falling or flying objects exist. Hard hats intended for use by visitors shall have replaceable paper lining. Wearing of helmets inside the project site is compulsory. Colour coding of helmets may be followed for different category of personnel working at the site / visitors.
- c. Eye and face protection - Eye protection shall be worn during all operations by operators and people in the vicinity, where there is a danger of flying particles of metal such as generated during use of hand tools such as chisels, grinding, welding and cutting lathe work on brass and cast iron, acid and alkali splash, and high pressure jet cleaning or insulation removal from heights using high pressure jets. Contractor shall meet the requirements of IS 8520 titled "Guide for selection of Industrial safety equipment for eye, face and ear protection".
- d. Footwear - Safety shoes, boots and gumboots fitted with steel toe-caps of approved quality conforming to prescribed Indian or international standards. Wearing of unsafe safety shoes such as jogging shoes, tennis shoes, slippers and sandal etc. are prohibited. Contractor shall meet the requirements of IS 10667:1983 titled "Guide for selection of Industrial safety equipment for protection of foot and leg".
- e. Protective clothing - Contractor shall prevent hazards of loose clothes worn by workmen getting caught in moving machine parts. Loose and thin garments such as Dhoti and pyjamas shall be prohibited. While Contractors shall ensure that all workmen wear long sleeved shirts, jackets or the like with the sleeves rolled down and secured at the cuff, long pants/ trousers extending up to the top of the safety shoes so as to prevent injuries caused by contact with heat, cold abrasive and sharp surfaces shall be strictly enforced. Contractor shall meet the requirements of IS 8990:1978 titled "Maintenance and care of industrial safety clothing." Women wearing saree and other loose dress should wear outer jacket / shirt. It is suggested to wear reflective jackets for better visibility.
- f. Hand Protection - Contractor shall provide appropriate hand gloves as per IS 8807:1978 titled: "Safety equipment for protection of arms and hands" to prevent injuries to hands during work. Contractor shall maintain appropriate inventory of gloves for different applications like Acid/ alkali handling, general-purpose work gloves and asbestos or heat resistant Hand gloves etc.

- g. Safety harness/ fall arrest - Contractor shall provide safety harness or means of restraint such as safety Belts, harness and lifelines etc to workmen engaged to work in heights such as Open –sided Floors, Open-sided scaffoldings, floor and roof openings, overhead construction works of various nature etc where there is a falling hazard of six feet or above. To prevent any fall from a height of 2 Metres or above. Storage, issue wearing and maintenance of safety harness shall be under strict supervision and records shall be maintained. Safety belts should be tested and certified by competent person. All fall arrests shall consist of full-body harnesses, lanyards with shock absorbers, lifelines, rope grabs and associated hardware. Two alternate lanyards shall be used to facilitate tying off at a new location before disconnecting from the previous locations of practices for safety harnesses and fall arrests shall conform to IS 4912:1978, IS 11972:1987, IS 8519:1977 or equivalent international codes.
- h. Falling object protection - Where work is in progress in elevated areas, barricades, barrier tapes signs and such entry restriction devices shall be used to keep area below clear of personnel to prevent injury due to falling objects. If work is required in the area below elevated work area, it shall be scheduled at a time different from elevated works. The workmen below shall be protected from falling objects by the debris net or a catch platform with an adequate toe board to prevent material from falling off. Use of safety net for elevated works shall be considered in the work-permits where appropriate. Where a lift is made above a working area, the area below the path of the lift shall be cleared of personnel during the lift and barricaded and guarded to prevent entry o persons generally in conformity with IS 4912, IS 11972 and IS 13416 “for protective barriers in and around structure and preventive measures against safety hazards in work places and safety requirements for floor and, wall opening, railings and toe-boards.” Hard barricading shall be provided for excavation more than 2 meter deep.
- i. Hearing conservation - Contractor shall ensure reasonable precautions are taken to avoid injury to the hearing of the employee. All noise levels shall be controlled within 90 dBA. Contractor shall identify noise areas where noise levels exceed prescribed safe level for arranging for appropriate Engineering revision. Where this is not feasible, appropriate Earmuffs or protectors shall be provided to workmen ensuring they are worn by those exposed to noise levels beyond safe levels. Periodic hearing acuity tests shall be conducted on such persons exposed to high noise levels to ensure that they do not suffer any hearing impairment` as per requirements of IS 8520: 1977

#### **I.MANUAL HANDLING: & ERGONOMICS**

- a. Contractor shall have procedures to identify risks involved in manual handling operation and tasks. He shall ensure appropriate training to prevent any possible injury. Full use of mechanical aids shall be made to avoid risks arising out of such manual handling. Employees shall be adequately trained on such manual tasks and related safety precautions to reduce the risk of injury to personnel engaged in such work.

- b. Contractor shall undertake ergonomic study of manual operations to prevent musculoskeletal injury during manual handling, besides visual fatigue and mental stress giving considerations to matters such as seating. Lighting and ventilation etc. Person should not lift / carry more than 50 Kg load.

#### **J.PREMISES AND HOUSE KEEPING**

- a. Contractor shall maintain a well-managed safe working place in sound clean condition. Contractor shall ensure that there is a place for everything and everything in its place so that optimum use is made of valuable floor space with commensurate cleanliness and reduced handling time. He shall ensure that his entire infrastructure is kept clean and good repair.
- b. All temporary constructions like rest sheds, storage sheds etc. shall be constructed using MS pipes and GI sheets only. The temporary sheds shall have substantial strength to withstand local site weather conditions.
- c. Contractor shall provide lighting, natural or artificial, to enable carry out work processes safely. Artificial lighting shall be adequate especially in the nights and emergencies. The lumen levels shall meet the statutory requirements.

#### **K.MOVEMENT OF EQUIPMENT AND MACHINERY**

- a. Before starting the activity, plan properly by examining the route, taking measurements, if needed, to ensure that sufficient clearances are available.
- b. While planning the route, look for overhead cables, pipelines, guide ropes and other protruding objects.
- c. Use properly rated trolley to move the equipment / machinery.
- d. Ensure no damage to the walls, or other surrounding machinery during movement. Make clear to all the fellow contract men about communication system, to avoid misunderstanding.
- e. If you are moving smaller items like pipelines etc. ensure that these items are properly secured and tied.
- f. Proper sling arrangement to provide for crane in case of lifting equipment to an elevated height. No person is allowed to lift with equipment.

#### **L.STACKING AND STORAGE PRACTICE**

- a. Contractor shall ensure stacked material is bonded on a stable and level footing capable of carrying the mass of the stack. Adequate clearances shall be provided between the sides of the stack and top to facilitate unimpeded access to service equipment like overhead wiring, cranes, forklifts and firefighting equipment, and hoses. Circular items shall be sufficiently choked with wedges not with odd bits of materials. Free-standing stacks of gunny bags and sacks such as Cement bags shall be stacked to prescribed safe-stack heights with layers formed for stable bonding, preventing slippage causing accidents. Stacking against walls shall not be

permissible.

- b. Contractor shall maintain the premises and surrounding areas in clean and clear manner with safe access and egress. There shall be sufficient and adequate storage racks, shelving, bins and pallets and material handling equipment to stack his construction materials such as Pipes, structural and his construction enabling materials. Unwanted materials shall be promptly moved away for efficient material movement.

#### **M.SCRAP AND REFUSE BINS REMOVAL SYSTEM**

Contractor shall ensure that he has sufficient waste bins that are identified for different wastes and maintained in clearly demarcated areas. Wastes with oily or other ignitable materials such as Oily cotton wastes and Hand gloves shall be stored separately with covers to prevent fires and shall be made of metal. Different Wastes shall be segregated and stored separately and disposed off. They shall be emptied at routine intervals to prevent that they do not overflow with wastes.

#### **N.EMERGENCY PLANNING / EMERGENCY RESPONSE**

Contractor shall plan to deal with onsite emergencies. An emergency planning/emergency response specific to the job site shall be written and communicated to all employees. The emergency planning/emergency response shall identify for the potential for and responses to incidents and emergency situations and for preventing and mitigating the likely illness and injury that may be associated with them.

#### **PENALTY ON LOWER PERFORMANCE**

The successful Contractor shall be responsible for the energy generation of the Solar PV power plant for the whole O&M period of 5 years. If in any year of the term of agreement the energy generation is found to be less than the value committed by successful Contractor as per the format (calculated on the basis of minimum CUF of 17% with acceptable degradation values as in tender), a penalty amount as per formula below will be imposed to successful Contractor. If successful Contractor is unable to pay the penalty in the stipulated time (i.e. 30 Days), the same will be deducted from the subsequent bills and the balance amount will be paid to the Contractor.

Penalty = (committed generation as per format – Actual generation during the same period) X Average cost of electricity from grid per unit at the end of that year applicable to Client in Normal period of the bill

Example:

Suppose Contractor has committed for a generation of 897900 kWh by a plant of 600 kWp for a particular year, The Average cost of electricity for grid in Normal period is Rs.5.40/kWh for the client.

The actual energy generated by that plant for that year is 870000 kWh.

So, the energy difference happened to be 27900 kWh.

Corresponding penalty imposed would be  $27900 \times 5.40 = \text{Rs. } 150660/-$ .

The average cost of Electricity for Grid will be calculated based on the actuals paid for the previous month by Client by considering the energy charges in Normal period of the bill

### **PENALTY ON LATE COMMISSIONING**

For any issues related to operation & maintenance, a toll-free number shall be made available to the SCTL to resolve within 48 hours. In case of any defect in the system after Commissioning, the Contractor shall repair it within forty eight (48) hours. After 48 hours, penalty shall be charged and the same shall be deducted / recovered from payments yet to be made by SCTL to the Contractor and / or from the Bank Guarantee submitted to SCTL. A penalty at the rate of "Average cost of electricity from grid per unit in Normal period of the bill of Client) shall be charged by the Owner for the loss of generation due to that effect post 48 hours. The loss of generation shall be calculated with respect to the committed generation as per format in that period.

If the Contractor fails to commission the project within specified time, penalty on per day basis calculated for the Performance Security on a 6 month's period would be levied. After 6 months, the project will get cancelled and the total PBG would be forfeited.

If any jobs covered in O&M Scope as per RFP are not carried out by the Contractor during the O&M period, the SCTL shall take appropriate action as deemed fit. SCTL reserves the right to make surprise checks/inspection visits at its own or through authorized representative to verify the O&M activities being carried out by the Contractor. Failure to adhere to guidelines, will result in penal action including debaring from participation in next tender

**Estimated Annual Solar Generation commencing on the Commercial Operation Date with respect to the System (Bidder to fill the following table information in its technical proposal)**

<b>Indicative total Solar Generation (kWh/Year)</b>						
<b>Year</b>	<b>Government College for Women</b>	<b>Kerala University Library</b>	<b>State Central Library</b>	<b>Government Central High School</b>	<b>Kerala Legislative Assembly</b>	<b>Total 607.525 kWp</b>
	<b>82.875 kWp</b>	<b>85.475 kWp</b>	<b>39.650 kWp</b>	<b>3.900 kWp</b>	<b>395.625 kWp</b>	
1						
2						
3						
4						
5						

**PERFORMANCE PARAMETER (Bidder to provide this form as part of Technical Proposal)**

1. Project
2. Site Location- (Latitude & Longitude)
3. Total Rooftop Area (m<sup>2</sup>)
4. Total Usable Rooftop Area for solar installation (m<sup>2</sup>)
5. Type of Roof & Tilt
6. Radiation data reference
7. Plant Capacity kWp

End Of year	Global Horizontal (kWh/m <sup>2</sup> /year)	Global Inclined (kWh/m <sup>2</sup> /year)	Net Energy at Metering point ((kWh/kWp/year))	PR (%) at the metering point
1				
2				
3				
4				
5				

<b>Guaranteed Technical Particular data Sheet for Solar PV Module (To be furnished by the bidder)</b>			
S.No.	Particulars	Unit	Type/value
1	PV Module Manufacture (Name & Country)		
2	PV Module type (Crystalline- Mono/ Multi)		
3	Product Code (commercial)		
4	No. of PV cells per Module	cells	
5	Mounting arrangement for Solar Module		
6	Solar Module frame material (if framed)		
7	Module dimensions		
8	Output Cables (viz., Polarized Weather Proof DC rated multi-contact connector)		
9	Availability of Reverse Blocking Diode and Bypass Diode		

10	Construction: Front glass description and thickness Back sheet details Encapsulating details		
11	Cell efficiency	%	
12	Module efficiency	%	
13	Nominal Wattage (Pnom)	W	
14	Power Tolerance ( $\leq +5W$ )	W	
15	Peak power voltage (Vmp)	V	
16	Peak power current (Imp)	A	
17	Open circuit voltage (Voc)	V	
18	Short circuit current (Isc)	A	
19	Weight of each module	kg	
20	Fill Factor	%	
21	Standards/Approvals from International Agencies	IEC 61215 IEC 61730 IEC 61646 IEC 61701 IEC 62716 Others	
22	Module is suitable to operate up to 50° ambient temp	Yes/No	

<b>Technical Particular Data Sheet for Power Conditioning Unit/Inverter (To be furnished by the bidder)</b>		
<b>Particulars</b>	<b>Unit</b>	<b>Value</b>
Make		
Capacity		
Origin		
<b>AC Side</b>		
Nominal AC power @ 25 °C	kW	
Nominal AC power @ 50 °C	kW	
Output AC voltage	V	
Output AC Current	A	
Frequency (and Variation)	Hz	
Total Harmonic Distortion (< 3%)	%	
AC over/under voltage, over/under frequency protection		

Phase shift (cos phi)		
<b>DC Side</b>		
Maximum Input DC power	kW	
Maximum DC voltage	V	
MPPT voltage range	V	
Maximum DC current	A	
DC over voltage protection		
DC voltage ripple	%	
<b>Others</b>		
Maximum Efficiency	%	
Euro Efficiency	%	
Ambient temperature range	°C	
Humidity (non-condensing)	RH	
Quiescent power	kW	
Degree of protection	IP	
Dimensions approx. (H x W x D)	mm	
Weight	kg	
Compliances (Reference Standards)		

<b>Guaranteed Technical Particular data Sheet for DCDB (To be furnished by the bidder)</b>	
Voltage	
Brand	
Color	
Material	
Number of Strings	
Number of Core	
UV Protected	
Power Type	
Dimension	
Application	
Conductor Material	
Size	
Type	
Current	
Maximum Continuous Current	
Maximum Dc Current	
No Of DC Inputs	
Operating Conditions Temp	
Degree Of Protection	

Weight	
Type of SPD	
Maximum discharge current of SPD	
Protection level of SPD	
Input cable size	
DC MCB Capacity	
Output cable size	
Standards/Approvals from Agencies	
Operating temperature	

<b>Guaranteed Technical Particular data Sheet for SOLAR MODULE MOUNTING STRUCTURE (To be furnished by the bidder)</b>	
Make	2kg
Configuration	
Installation Type	
Design Lifetime	
Size	
Material	
Tilt Angle	
Design Wind Load	
Tracker Type	
Design Snow Load	
Panel Type	
Module Orientation	
Structure	
Distance From Ground To Panel	
Distance Between Panel Airgap	
Maintenance	
Total Weight For 1kW	
Standards/Approvals from Agencies	
Compliances (Reference Standards)	

<b>Guaranteed Technical Particular data Sheet for ACDB (To be furnished by the bidder)</b>	
Voltage	
Brand	
Color	
UV Protected	
Dimension	
Type	
Current	
No of outgoing, rating amps	
Maximum Continuous Current	
Operating Conditions Temp & Humidity	
Degree Of Protection	
Weight	
Type of SPD	
Maximum discharge current of SPD	
Protection level of SPD	
Input cable size	
Output cable size	
Standards/Approvals from International Agencies	
Hazardous Area	
Particulars of Equipment - General Data	
<b>MCCB Specification / Standard Compliance</b>	
Type	
System Voltage & Number of Phases	
Rated Frequency	
Rated lightning impulse withstand voltage	
System rated short time withstand current	
System rated peak withstand current	
Short time withstand current	
Partition Class	
Internal Arc Classification & Internal Arc Rating	
Cable Compartment	
Circuit Breaker Compartment	
Bus bar Compartment	
Rated normal Bus bar current	
Individual phase insulated Bus bars	
Individual Section Bus bar compartment segregation	
Future Bus bar extension	
Circuit Breaker Type	
Control Circuit Supply Voltage	
Metering Class CTs	
Protection Class CTs	
Standards/Approvals from Agencies	
Compliances (Reference Standards)	



**Smart City Thiruvananthapuram Limited**  
**National Competitive Bidding**

**Request for Proposal (RFP)**

**For**

**Selection of Contractor for Providing  
Design, Supply, Installation, Erection, Testing &  
Commissioning, Operation & Maintenance of Grid -Tied Roof  
Mounted Solar PV Power Plant on Various Buildings  
in Thiruvananthapuram**

**Volume III: Draft Contract**

**Issued: 10<sup>th</sup> June, 2019**

**By**

**Chief Executive Officer**  
**SMART CITY THIRUVANANTHAPURAM LIMITED**

4th Floor, Annexe Building,  
Municipal Corporation of TVPM, Vikas Bhavan,  
Kerala – 695 033, India  
Tel:+91-471 -2339944

E-mail: [smartcitytvm@gmail.com](mailto:smartcitytvm@gmail.com)

Website: <https://smartcitytvm.in/sctl/>

This Agreement (hereinafter referred to as the “**Contract**” or “**Contract**” or “**Contract Agreement**”) is entered into on this \_\_\_\_\_ day of the month of \_\_\_\_\_ 20\_\_\_\_, at \_\_\_\_\_(Location) **BY and BETWEEN**, M/s SMART CITY THIRUVANANTHAPURAM LTD. (SCTL), a SCTL registered under the Indian Companies Act, 2013 with its principal office at 4th Floor, Annexe Building, Municipal Corporation of TVPM, Vikas Bhavan , Kerala – 695 033, India and (hereinafter referred to as the “**Project Sponsor**” or “**SCTL**”) which expression, shall where the context so admits be deemed to include its heirs, executors, administrators, representatives and permitted assigns) ONE PART;

**AND** \_\_\_\_\_, a SCTL incorporated under the Companies, Act 1956/2013 and having its registered office at – \_\_\_\_\_ (hereinafter referred to as the **Contractor**”) which expression shall, where the context so admits, be deemed to include its executors, administrators, representatives, and permitted assigns) SECOND PART;

The expressions "**Project Sponsor**" and "**Contractor**", wherever the context so permits or requires shall collectively be referred to as "**Parties**" and individually as the "**Party**".

WHEREAS:

- A. The Project Sponsor is a special purpose SCTL set up for the implementation of smart city projects in the city of Cochin under Smart City Mission of the Government of India.

- B. The Contractor is a fully integrated solar solutions provider that offers comprehensive solar solutions to governments, corporate houses, villages, industries and other consumers.
- C. The Project Sponsor is desirous of appointing an agency for Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of 607.525 KWp Grid connected Roof Top Solar Photovoltaic Power Plants on Various Buildings in Thiruvananthapuram Corporation Area with Monitoring, Operation, and Maintenance for 5 (five) years (the “**Project**”) as per the Scope of Work and Terms and Conditions as set forth in this Contract.
- D. Pursuant to above, the Project Sponsor, for the purpose of implementing the project on fast track basis, decided to award the Project on bidding basis to the Selected Contractor.
- E. The Contractor had submitted its Bid for the said Project under its Covering Letter No. dated \_ \_ and the clarifications/confirmations given under cover of its subsequent letters bearing numbers, \_ , and dated \_ , and \_\_\_\_\_ respectively (all put together are hereinafter referred to as the “**Bid**”).
- F. The Contractor through its communication no. \_\_\_\_\_ dated \_\_\_\_\_, submitted its offer letter (the “**Offer Letter**”).
- G. Subsequent to the submission of the Offer Letter, the Project Sponsor vide its communication no. \_\_\_\_\_ issued Letter of Acceptance (the “**Letter of Acceptance**” or “**LOA**”) to the Contractor. The Contractor vide its communication no. \_\_\_\_\_ accepted the LOA so issued, expressing its acknowledgment of the LOA.
- H. The legal Project Sponsor of the premises (address of the government organisation/ government bodies/municipal level organisations /state government organisations/ public sector undertaking/ any such organisation included in the Project scope) where the solar PV system, shall get installed, hereinafter referred to as the "**CUSTOMER(S) /BENEFICIARY(IES)**" which expression shall where the context so admits be deemed to include its heirs, executors, administrators, representatives and permitted assigns), have agreed for installation of the solar power system on its premises for the Project purposes.
- I. The Contractor has, for due and faithful performance of its obligations hereunder provided Performance Guarantee to the Project Sponsor;
- J. The Parties have agreed to enter into this Contract for implementation of the project subject to and on the terms and conditions set forth hereinafter;

NOW, this Contract witnesseth as follows, THEREFORE in consideration of the foregoing and the respective covenants and Contracts set forth in this Contract, the sufficiency and adequacy of which is hereby acknowledged and intending to be legally bound hereby, the Parties agree as follows:

## 1.1. Definitions

The words and expressions beginning with capital letters and defined in this Contract shall, unless the context otherwise requires, have the meaning ascribed thereto herein, and the words and expressions defined in the Schedules and used therein shall have the meaning ascribed thereto in the Schedules.

**“The Project Sponsor/SCTL”** means the Smart City Thiruvananthapuram Limited, incorporated in India having its registered office at \_ Regd. Office. 4th Floor, Annexe Building, Municipal Corporation of TVPM, Vikas Bhavan, Kerala – 695 033, India or their successors or assigns.

**“The Contractor”** means the SCTL, \_\_\_\_\_, whose Letter of Offer has been accepted by the Project Sponsor and includes the Contractor’s legal representative, his successor and permitted assigns.

The **“Chief Executive Office (CEO)”** shall mean the Chief Executive Officer of the Smart City Thiruvananthapuram Limited or his successor in office designated by the Project Sponsor.

The **“SCTL”** shall mean the person designated as such by the Project Sponsor and shall include those who are expressly authorised by the Project Sponsor to act for and on his behalf for operation of this Contract.

The **“Work”** shall mean the works to be executed in accordance with the Contract or part thereof as the case may be and shall include extra, additional, altered or substituted works as required for purpose of the Contract.

The **“Permanent Work”** means and includes works which will be incorporated in and form a part of the work to be handed over to the Project Sponsor by the Contractor on completion of the Contract.

The **“Construction Equipment”** means all appliances, Tools/Tackles and equipment of whatsoever nature for the use in or for the execution, completion, operation or maintenance of the work unless intended to form part of the Permanent work.

The **“Site”** means the areas on which the permanent works are to be executed or carried out and any other places provided by the Customers/Project Sponsor for purpose of the Contract.

The **“Contract Document”** means collectively the Letter of Offer, Letter of Intent (LOI), Written Communications, Designs, Drawings or Specifications, agreed variations, if any, and such other document constituting the offer and acceptance thereof.

The **“Sub-Contractor”** means any person or firm or SCTL (other than the Contractor) to whom any part of the work has been entrusted by the Contractor, with the written consent of the SCTL, and the legal personal representatives, successors and permitted assigns of such person, firm or SCTL.

The “**Contract**” shall mean the Contract between the Project Sponsor and the Contractor for the execution of the works including therein all Contract documents.

The “**Specification**” shall mean the various technical specifications attached and referred to in the Contract documents. It shall also include the latest editions, including all addenda/corrigenda, of relevant Indian Standard Specification(s), International Specification(s) or Specifications of the other country published before entering into Contract and as approved by the SCTL.

The “**Drawings**” shall include maps, plans and tracings or prints thereof with any modifications approved in writing by the SCTL and such other drawings as may, from time to time, furnished or approved in writing by the SCTL.

The “**Offer or Letter of Offer**” means the offer submitted by the Contractor for acceptance by the Project Sponsor.

The “**Alteration Order**” means an order given in writing by the SCTL to effect additions to or deletion from and alterations in the works.

The “**Completion Certificate**” shall mean the certificate to be issued by the SCTL to the Contractor when the works have been completed to his satisfaction.

The “**Final Certificate**” in relation to a work means the certificate issued by the SCTL after the period of liability is over for releasing the retention money/Performance Bank Guarantee.

The “**Period of Liability**” in relation to a work means the specified period during which the Contractor stands responsible for rectifying all defects that may appear in the works.

## 1.2. Interpretation of Contract Document

- (a) Except if and to the extent otherwise provided by the Contract, the provisions of the conditions of the Contract shall prevail over those of any other documents forming part of the Contract. Several documents forming the Contract Agreement are to be taken as mutually explanatory. Should there be any discrepancy, inconsistency, error or omission in the Contract or any of the matter may be referred to SCTL, who shall give his decisions and issue to the Contractor instructions directing in what manner the work is to be carried out. The decision of the SCTL shall be final and conclusive and the Contractor shall carry out work in accordance with this decision.
- (b) Works shown upon the drawing but not mentioned in the specifications or described in the specification without being shown on the drawings shall nevertheless be held to be included in the same manner as if they had been specifically shown upon the drawings and described in the specifications.
- (c) Headings and marginal notes to the clauses of these conditions of Contract or to specifications or to any other document are solely for the purpose of giving a concise indication and not a summary of the content thereof, and they shall never be deemed to be part thereof or be used in the interpretation or construction thereof of the Contract.
- (d) Singular and Plural:  
In these Contract documents unless otherwise stated specifically, the singular shall include the plural and vice-versa wherever the context so requires. Words indicating persons shall include relevant incorporated companies/ registered as associations/ body of individual/ firm or partnership.
- (e) In this Contract, unless the context otherwise requires,
  - (a) the Table of Contents, headings or sub-headings in this Contract are for convenience of reference only and shall not be used in, and shall not affect, the construction or interpretation of this Contract;
  - (b) references to any legislation or any provision thereof shall include amendment or re-enactment or consolidation of such legislation or any provision thereof so far as such amendment or re-enactment or consolidation applies or is capable of applying to any transaction entered into hereunder;
  - (c) references to laws of India or Indian law or regulation having the force of law shall include the laws, acts, ordinances, rules, regulations, bye laws or notifications which have the force of law in the territory of India and as from time to time may be amended, modified, supplemented, extended or re-enacted;
  - (d) references to a “**person**” and words denoting a natural person shall be construed as a reference to any individual, firm, SCTL, corporation, society, trust, government, state or agency of a state or any association or partnership (whether

or not having separate legal personality) of two or more of the above and shall include successors and assigns;

- (e) the words "**include**" and "**including**" are to be construed without limitation and shall be deemed to be followed by "without limitation" or "but not limited to" whether or not they are followed by such phrases;
- (f) any reference to any period of time shall mean a reference to that according to Indian Standard Time;
- (g) any reference to day, month or year shall mean a reference to a calendar day, calendar month or calendar year respectively;
- (h) references to a day means "**Working Day**" shall be the normal working days of the Project Sponsor;
- (i) references to any date, period or Stage shall mean and include such date, period or as may be extended pursuant to this Contract;
- (j) any reference to any period commencing "**from**" a specified day or date and "**till**" or "**until**" a specified day or date shall include both such days or dates; provided that if the last day of any period computed under this Contract is not a business day, then the period shall run until the end of the next business day;
- (k) the words importing singular shall include plural and vice versa;
- (l) references to any gender shall include the other genders;
- (m) "**lakh**" means a hundred thousand (100,000) and "**crore**" means hundred lakhs or ten million (10,000,000);
- (n) "**indebtedness**" shall be construed so as to include any obligation (whether incurred as principal or surety) for the payment or repayment of money, whether present or future, actual or contingent;
- (o) references to the "**winding-up**", "**dissolution**", "**insolvency**", or "**reorganisation**" of a SCTL or corporation shall be construed so as to include any equivalent or analogous proceedings under the law of the jurisdiction in which such SCTL or corporation is incorporated or any jurisdiction in which such SCTL or corporation carries on business including the seeking of liquidation, winding-up, reorganisation, dissolution, arrangement, protection or relief of debtors;
- (p) save and except as otherwise provided in this Contract, any reference, at any time, to any Contract, deed, instrument, licence or document of any description shall be construed as reference to that Contract, deed, instrument, licence or other document as amended, varied, supplemented, modified or suspended at the time of such reference; provided that this Sub-Article shall not operate so as to increase liabilities or obligations of CSML hereunder or pursuant hereto in any manner whatsoever;

- (q) any Contract, consent, approval, authorisation, notice, communication, information or report required under or pursuant to this Contract from or by any Party shall be valid and effective only if it is in writing under the hand of a duly authorised representative of such Party, as the case may be, in this behalf and not otherwise;
- (r) the Schedules and Recitals to this Contract form an integral part of this Contract and will be in full force and effect as though they were expressly set out in the body of this Contract;
- (s) references to Recitals, articles, Sub-articles or Schedules in this Contract shall, except where the context otherwise requires, mean references to Recitals, articles, sub-articles and Schedules of or to this Contract, and references to a paragraph shall, subject to any contrary indication, be construed as a reference to a paragraph of this Contract or of the Schedule in which such reference appears;
- (t) If an example is given of anything (including a right, obligation or concept), such as by saying it includes something else, the example does not limit the scope of that thing;
- (u) references to “implementation” include, unless the context otherwise requires,
- (v) Supply, transportation, unloading, installation and commissioning of grid connected solar roof top system with solar panels and other accessories testing, commissioning of the system.

Five years warranty from handing over of the Solar Roof Top System.

O&M for five years from the date of handing over of the Solar Roof Top System.

and maintenance and other activities incidental to the implementation, and “implement” shall be construed accordingly;

- (w) Unless expressly provided otherwise in this Contract, any documentation required to be provided or furnished by the Contractor to the Project Sponsor shall be provided free of cost and in three copies, and if Project Sponsor is required to return any such documentation with their comments and/or approval, they shall be entitled to retain two copies thereof.
- (x) The rule of construction, if any, that a Contract should be interpreted against the Parties responsible for the drafting and preparation thereof, shall not apply.

**1.3.** In case management of the assets/facilities/operation and maintenance responsibility etc. created as per this Contract is transferred from SCTL to any other organisation / departments such Thiruvananthapuram Municipal Corporation , any other Kerala state agency/organisation/authority etc., this Contract will remain valid with the successor department/ organisation/ agency etc. as the SCTL decides at its discretion. The term SCTL will be read as the name of successor department/ organisation etc. as the case may be.

**1.4. Measurements and arithmetic conventions**

All measurements and calculations shall be in the metric system and calculations done to two (2) decimal places, with the third digit of five (5) or above being rounded up and below being rounded down to the nearest integer.

**1.5. Priority of Contracts, articles and schedules**

(a) This Contract, and all other Contracts and documents forming part of or referred to in this Contract are to be taken as mutually explanatory and, unless otherwise expressly provided elsewhere in this Contract, the priority of this Contract and other documents and Contracts forming part hereof or referred to herein shall, in the event of any conflict between them, be in the following order:

(a) this Contract; and

(b) all other Contracts and documents forming part hereof or referred to herein; i.e. the Contract at (a) above, shall prevail over the Contracts and documents at (b).

- (b) The conditions of Contract shall be read in conjunction with Contract specification of work, Drawings and any other documents forming part of this Contract wherever the context so requires.
- (c) Where any portion of the conditions of the Contract is repugnant to or at variance with any provisions of the conditions of the Contract then, unless a different intention appears the provisions of the a specific conditions of the Contract relevant to the issue under consideration Contractshall prevail over those in other conditions of the Contract and shall to the extent of such repugnance or variations, prevail.
- (d) Wherever it is mentioned in the specifications that the Contractor shall perform certain work or provide certain facilities, it is understood that the Contractor shall do so at his own cost.
- (e) The materials, designs and workmanship shall satisfy the relevant Indian Standards, the Job specifications contained herein and codes referred to. Where the job specifications stipulate requirements in addition to those contained in the standard codes and specifications, these additional requirements shall also be satisfied.
- (f) Subject to the provisions of Article 1.4, in case of ambiguities or discrepancies within this Contract, the following shall apply:
  - (a) between two or more Articles of this Contract, the provisions of a specific Article relevant to the issue under consideration shall prevail over those in other Articles;
  - (b) between the Articles of this Contract and the Schedules, the Articles shall prevail and between Schedules and Annexure, the Schedules shall prevail;
  - (c) between any two Schedules, the Schedules relevant to the issue shall prevail;
  - (d) between the written description on the Design/Drawings and the System Requirements, the latter shall prevail;
  - (e) between the dimension scaled from the Design / Drawings and its specific written dimension, the latter shall prevail; and
  - (f) between any value written in numerals and that in words, the latter shall prevail.
- (g) If the Contractor becomes aware of any material inconsistency, ambiguity or discrepancy as contemplated under Article 1.4.1 and Article 1.4.2, the Contractor shall notify the Project Sponsor within ten (10) Working Days of becoming aware of any such material inconsistency, ambiguity or discrepancy. Within ten (10) Working Days of receipt by the Project Sponsor of the Contractor's notice, the Parties will meet to discuss and agree in good faith:
  - (a) the resolution of the material inconsistency, ambiguity or discrepancy; and
  - (b) an appropriate Variation where the resolution agreed by the Parties under Article 1.4.3 (a) results in a material change to the Contractor's obligations under this Contract,

- (h) To the extent that any requirement emanating from the Contract, imposes higher standards, greater responsibilities or additional requirements on the Contractor than the provisions of Contract, the Contractor shall satisfy and meet those higher standards, greater responsibilities or additional requirements unless the Project Sponsor otherwise directs in writing.
- (i) Without limiting Article 1.4.10, to the extent that the system provided by the Contractor imposes higher standards, greater responsibilities or additional requirements on the Contractor than the provisions of the Contract, the Contractor shall satisfy and meet those higher standards, greater responsibilities or additional requirements unless the Project Sponsor otherwise directs in writing.

**1.6. CONTRACTOR TO OBTAIN HIS OWN INFORMATION:**

The Contractor in fixing rate shall for all purposes whatsoever be deemed to have himself independently obtained all necessary information for the purpose of preparing his Offer. The Contractor shall be deemed to have examined the project scope and requirements, to have generally obtained his own information in all matters whatsoever that might affect the carrying out the works at the quoted rates and to have satisfied himself to the sufficiency to his offer. Any error description of quantity or omission there from shall not vitiate the Contract or release the Contractor from executing the work comprised in the Contract according to drawing and specifications at the scheduled rates. He is deemed to have known the scope, nature and magnitude of the works and the requirements of materials and labour involved etc. and as to what all works he has to complete in accordance with the Contract documents whatever be the defects, omissions or errors that may be found in the Contract documents. The Contractor shall be deemed to have visited surrounding to have satisfied himself to the nature of all existing structures, if any, and also as to the nature and the conditions of the Railways, roads, bridges and culverts means of transport and communications, whether by land, water or air, and as to possible interruptions thereto and the access to and regress from the site, to have made enquiries, examined and satisfied himself as to the sites for obtaining sand, stones, bricks and other materials, the sites for disposal of surplus materials the available accommodation as to whatever required, depots and such other building as may be necessary for executing and completing the works, to have made local independent enquiries as to the sub-soil water and variations thereof, storms, prevailing winds, climate conditions and all other similar matters affecting these works. He is deemed to have acquainted himself as to his liability for payment of Government taxes, customs duty and other charges. Any neglect or failure on the part of the Contractor in obtaining necessary and reliable information upon the foregoing or any other matters affecting the Contract shall not relieve him from any risk or liabilities or the entire responsibility from completion of the works at the scheduled rates and time in strict accordance with the Contract documents.

No verbal Contract or inference from conversation with any officer or employee of the Project Sponsor either before or after the execution of the Contract Agreement shall in any way affect or modify any of the terms or obligations herein contained.

## **1.7. PERFORMANCE SECURITY DEPOSIT:**

- (a) At the time of entering into this Contract or prior to it, the Contractor shall provide Performance Bank Guarantee (PBG) in favour of the Project Sponsor, in the form of an unconditional and irrevocable guarantee from a scheduled bank and in a form provided in Schedule \_\_\_\_ ("**Performance Guarantee**"). The Performance Guarantee shall remain valid till sixty (60) months from the date of handing over the system to project sponsor. The PBG shall be equal to a sum of five (5) percent of the Contract Value, till such time the number of Sites covered under the Project is fully commissioned with installed system. In the event, the Project Sponsor communicates to the Contractor to cover Sites beyond aforesaid Sites under the Project, the Contractor shall, within thirty (30) days of the date of such communication, submit to the Project Sponsor, Performance Guarantee for such additional Sites at the rate of five percent (5%) of incremental project cost for each additional Sites or part thereof. The PBG shall be valid and remain in force, from the Contract Signing Date till the Contractual completion period and with a claim period of six months thereafter.
- (b) The Project Sponsor shall release the Performance Guarantee(s) to the Contractor after expiry of the PBG or after the Termination Date, as the case may be, in the event the Termination has occurred for reasons other than a Contractor's Event of Default.
- (c) The Bank guarantee if submitted shall be from any scheduled Indian bank or Nationalised Bank having a branch in Thiruvananthapuram and shall be paid at its branch in Thiruvananthapuram. The Performance Bank Guarantee shall be in Indian Rupee.
- (d) Project Sponsor shall have the right to invoke the Performance Bank Guarantee, if the Bidder fails in any of his Contractual obligation. Prior to invoking the PBG, Project Sponsor shall give a written notice to the Contractor and a reasonable time of 7 days to respond. Project Sponsor shall have the right to invoke the Performance Bank Guarantee, if the Bidder fails to achieve scheduled date of commissioning as per the agreed project implementation schedule in terms of this Contract.
- (e) In case the successful Contractor is not maintaining the PBG as referred above on award of the Work, the same shall be deducted from each running account bills at the rate of 5% of bill value till overall security deposit of 5% as mentioned above is collected.
- (f) The Performance Guarantee will be retained till the successful completion of the work. This retention money/Bank guarantee held shall be released after the expiry of the Contract Period and in terms of the other clause(s) of this Contract, provided that any defects appearing during that period are corrected by the Contractor and subject to below:

(i) If the Contractor/sub-Contractor or their employees shall break, deface or destroy any property belonging to the Project Sponsor or other agency during the execution of the Contract, the same shall be made good by the Contractor at his own expenses and in default thereof, the SCTL may cause the same to be made good by other agencies and recover expenses from the Contractor (for which the certificate of the SCTL shall be final). These expenses can be recovered from the Performance Guarantee if recovery from other sources is not possible.

(ii) All the compensation or other sums of money payable by the Contractor to the Project Sponsor under terms of this Contract may be deducted from his Performance Guarantee or from any sums which may be or may become due to the Contractor by the Project Sponsor on any account whatsoever and in the event of his Performance Guarantee money being reduced by reasons of any such deductions. The Contractor shall within ten days thereafter make good any sum or sums, which may have been deducted from his Performance Guarantee. No interest shall be payable by the Project Sponsor from sum deposited as Performance Guarantee.

(iii) The Performance Guarantee shall be held by the Project Sponsor, as security for the due performance of the Contractor's obligations under the Contract, provided that nothing herein stated shall make it incumbent upon the Project Sponsor to utilize the Performance Guarantee in preference to any other remedy which the Project Sponsor may have, nor shall be construed as confining the claims of the Project Sponsor against the Contractor to the quantum of the Performance Guarantee.

- (g) Upon occurrence of a Contractor's Event of Default, the Project Sponsor shall, without prejudice to its other rights and remedies hereunder or in law, be entitled to encash the Performance Guarantee, in part or full, as damages for such Contractor's Event of Default.
- (h) Upon such encashment and appropriation from the Performance Guarantee, the Contractor shall, within, thirty (30) days thereof, replenish, in case of partial appropriation, to its original level of the Performance Guarantee, and in case of appropriation of the entire Performance Guarantee, provide a fresh Performance Guarantee, as the case may be, failing which the Project Sponsor shall be entitled to terminate this Contract Agreement .
- (i) To ensure performance of the Contract and due discharge of the Contractual obligations, the successful Contractor will have to provide Performance Guarantee of 10% of the Contract Agreement Price unless otherwise specified in the conditions of the Contract.

- (j) This Performance Guarantee may be furnished in the form of a Bank Guarantee in the prescribed format. The Bank Guarantee shall be valid and remain in force till the Contractual completion period and with a claim period of six months thereafter. The Bank Guarantee shall be in the form prescribed.
- (k) In case the Contractor is not maintaining the Performance Guarantee as referred above on award of the job, the same shall be deducted from each running account bills at the rate of 10% of bill value till overall Performance Guarantee of 10% as mentioned above is collected and maintained.
- (l) The Performance Guarantee will be retained till the successful completion of the work and thereafter as per terms of this Contract. This Bank Guarantee held shall be released after the expiry of the mentioned period as mentioned in the Contract.Contract.

Contract

- (m) If the Contractor/Sub-Contractor or their employees shall break, deface or destroy any property belonging to the Project Sponsor or other agency(ies) during the execution of the Contract Agreement, the same shall be made good by the Contractor at his own expenses and in default thereof, the SCTL may cause the same to be made good by other agencies and recover expenses from the Contractor (for which the certificate of the SCTL shall be final). These expenses can be recovered from the security deposit/retention money if recovery from other sources is not possible.
- (n) All the compensation or other sums of money payable by the Contractor to the Project Sponsor under terms of this Contract may be deducted from his Performance Guarantee or from any sums which may be or may become due to the Contractor by the Project Sponsor on any account whatsoever and in the event of his Performance Guarantee being reduced by reasons of any such deductions. The Contractor shall within ten days thereafter make good any sum or sums, which may have been deducted from his Performance Guarantee. No interest shall be payable by the Project Sponsor from sum deposited as Performance Guarantee.
- (o) The Performance Guarantee shall be held by the Project Sponsor, as security for the due performance of the Contractor's obligations under the Contract, provided that nothing herein stated shall make it incumbent upon the Project Sponsor to utilize the Performance Guarantee in preference to any other remedy which the Project Sponsor may have, nor shall be construed as confining the claims of the Project Sponsor against the Contractor to the quantum of the Performance Guarantee.

#### **1.8. Time of Performance**

- (a) The work covered by this Contract shall be commenced as detailed in t as per the instructions of the SCTL and be completed in stages on or before the dates as mentioned in the time schedule of completion of work. The Contractor should bear in mind that time is the essence of this Contract Agreement unless such time is extended pursuant to the provision of clause of this Contract.
- (b) Time schedule of completion: the general time schedule of completion is given in the Contract document. Contractor should prepare a detailed monthly and weekly execution programme, jointly with the SCTL within two weeks of receipt of signing of the Contract. The work shall be executed strictly as per the time schedule given in this document. The period of completion given includes the time required for testing, rectifications, if any, retesting and completion in all respects to the entire satisfaction of the SCTLContract.

#### **1.9. Force Majeure**

Any delays in or failure of the performance of either part hereto shall not constitute default here under or give rise to any claims for damages, if any, to the extent such delays or failure of performance is caused by occurrences such as Acts of God or the public enemy expropriation or confiscation of facilities by government /authorities,

compliances with any order or request of any government / authorities, acts of war, rebellion or sabotage or fires, floods, explosions, riots or strikes. The Contractor shall keep records of the circumstances referred to above and bring these to the notice of SCTL in writing immediately on such occurrences.

**1.10. Extension of Time:**

If the Contractor shall desire an extension of the time for completion of the work on the grounds of his having been unavoidably hindered in its execution or on any other grounds, he shall apply in writing to the SCTL within two weeks of the date of hindrance on account of which he desires such extension as aforesaid, and the SCTL Contractor shall if in his opinion (which shall be final), reasonable grounds have been shown thereof, authorize such extension of time as may in his opinion be necessary or proper.

In the event of extension of Time of the Contract, if granted, the Contractor shall be required to suitably extend the period of Bank Guarantee suitably.

**1.11. LIQUIDATED DAMAGES FOR DELAY:**

- (a) Time is the essence of the Contract. In case the Contractor fails to complete the whole work within the stipulated period, he shall be liable to pay liquidated damages of 0.5% of the value of Contract per week and or part thereof of the delay subject to a maximum of 10% of the value of the Contract. The Parties agree that this is a genuine pre- estimate of the loss/damage which will be suffered by the Project Sponsor on account of delay on the part of the Contractor and the said amount will be payable on demand without there being any proof of the actual loss or damages having been caused by such delay/breach. The Project Sponsor shall be at liberty to adjust or deduct the said amount of liquidated damages from any amount due to the Contractor including Performance Guarantee.
- (b) The Project Sponsor shall be at liberty to deduct or retain from any amount payable to the Contractor periodically, the proportionate or full amount of liquidated damages as the case may be for the delay periodically caused by the Contractor.

**1.12. SUM PAYABLE BY WAY OF COMPENSATION TO BE CONSIDERED AS REASONABLE COMPENSATION WITHOUT REFERENCE TO ACTUAL LOSS:**

All sums payable by way of compensation under any of the conditions shall be considered as reasonable compensation without reference to the actual loss or damage, which shall have been sustained by the Project Sponsor.

### **1.13. TERMINATION/ OFFLOADING:**

- (a) The Contractor fully understand that timely completion of the work as per the schedule is of paramount necessity as otherwise it would lead to adversely affecting the schedules of other works/project with resultant financial and other losses to the SCTLProject Sponsor. In view of this, the Contractor unconditionally agrees and binds himself to be liable for all the consequences for non-completion of the work within the stipulated time.
- (b) In case a situation is brought about by the Contractor warranting termination/off-loading of the whole or any part of the work for any reason whatsoever, the SCTLProject Sponsor shall have the liberty and right to entrust/engage/award the work so terminated/off loaded at the risk and cost of the Contractor to any other agency/Contractor by adopting any mode of inviting tenders, i.e. open/limited/single party/negotiation basis etc., in order to ensure completion of the work as per the schedule or at the quickest possible time.

### **1.14. Forfeiture of Performance Guarantee**

Whenever any claim against the Contractor for the payment of a sum of money arises out of or under the Contract, the Project Sponsor shall be entitled to recover such sum by appropriating in part or whole, security deposit of the Contractor, forming whole or part of such security being insufficient or if no security has been taken from the Contractor then the balance or the total sum recoverable, as the case may be, shall be deducted from any sum then due or which at any time thereafter may become due to the Contractor. The Contractor shall pay to the Project Sponsor on demand any balance remaining due.

### **1.15. Action When whole of Performance Guaranteels Forfeited:**

In any case in which, under any clause or clauses of this Contract, the Contractor shall have forfeited the whole of his Performance Guarantee as the case may be (whether paid in one sum or deducted by instalment) or have committed a breach of any of the terms contained in this Contract the Project Sponsor shall have power to adopt any of the following courses as he may deem best suited to his interest:

- (a) To terminate the Contract (of which rescission notice in writing to the Contractor under the hand of the Project Sponsor shall be conclusive evidence) in which case the Performance Guarantee of the Contractor shall stand forfeited and be absolutely at the disposal of the Project Sponsor.
- (b) To employ labour paid by the Project Sponsor and to supply materials to carry out the work any part of the work, debiting Contractor with the labour cost of tools and plants and equipment charges, the cost of the materials for which a certificate of the SCTL shall be final and conclusive against the Contractor and 10% of costs as above to cover all charges and crediting him with the value of the work done

in all respects in the manner and at the same rates as if it had been carried out by the Contractor under the term of his Contract. The certificate of Performance GuaranteeSCTL as to the value of the work done shall be final and conclusive against the Contractor.

- (c) To measure up the work of the Contractor and to take such part thereof as shall be unexecuted out of his hand to give it to another Contractor to complete in which case any expenses which may be incurred in excess of the sum which would have been paid to the original Contractor, if the whole work had been executed by him (of the amount of which excess, the certificate in writing of the SCTL shall be final and conclusive) shall be borne and paid by the original Contractor and may be deducted from any money due to him by the Project Sponsor under the Contract or otherwise or from his security deposit or from the proceeds of sale thereof, of a sufficient part thereof.

In the event of any of the above course being adopted by the Project Sponsor, the Contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any Contracts or made any advances on account of or with a view to the execution of the work of the performance of the Contract. In case the Contractor shall not be entitled to recover or be paid any sum for any work actually performed under this Contract unless the SCTL will certify in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified.

**1.16. CONTRACTOR REMAINS LIABLE TO PAY COMPENSATION IF ACTION NOT TAKEN UNDER CLAUSE 1.15:**

In any case in which any of the powers conferred upon the Project Sponsor by the clause 1.15 thereof shall have become exercisable and the same had not been exercised, the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercised in the event of any further case of default by the Contractor for which any clause of hereof he is declared liable to pay compensation amounting to the whole of his Performance Guarantees as the case may be and the liability of the Contractor for past and future compensation shall remain unaffected. In the event of the Project Sponsor putting in force the power under sub-clause (a), (b) or (c) vested in him under the proceeding clause he may, if he so desires takes possession of all or any tools and plants materials and stores in or upon the works or the site thereof belonging to the Project Sponsor or procured by him and intended to be used for the execution of the Work or any part thereof paying or allowing for the same in account at the Contract Agreement rates or in case of these not being applicable at current market rates to be certified by the SCTL whose certificate thereof shall be final otherwise the SCTL may give notice in writing to the Contractor or his clerk of the works, supervisor or other authorized agent, requiring him to remove such tools,

plant, materials or stores from the premises (within a time to be specified in such notice) and in the event of the Contractor failing to comply with any such requisition, the SCTL may remove them at the Contractor's expense or sell them by auction or private sale on account of the Contractor and at his risk in, all respects without any further notice as to the date, time or place of sale and the certificate of the SCTL as to the expense of any such removal and the amount of proceeds and any expenses of any such sale shall be final and conclusive against the Contractor.

**1.17. NO COMPENSATION FOR ALTERATION IN OR RESTRICTION OF WORK:**

If at any time from the commencement of the work the Project Sponsor shall for any reasons whatsoever, not require the whole or part thereof as specified in the Contract to be carried out, the SCTL shall give notice in writing of the fact to the Contractor, who shall have no claim to any payment or compensation whatsoever on account of any profit or advantage which he might have derived from the execution of the work in full, but which he did not derive in consequence of the full amount of the work not having been carried out, neither shall he have any claim for compensation by reason of any alterations having been made in the original specifications, drawings, designs and instructions which shall involve any curtailment of the work as originally contemplated.

**1.18. CHANGES IN Control:**

**"Change in Control"** shall mean one or more of the following during the Contract Period:

- (a) In relation to the Contractor
  - (i) a transfer of the direct and/or indirect legal or beneficial Project Sponsorship of any shares, or securities convertible into shares, that causes the aggregate holding of the Supporting Entity in the Contractor, to decline below fifty per cent (50%) of the total Equity thereof; or
  - (ii) all acquisitions of Equity by an acquirer, either by himself or with any person acting in concert, directly or indirectly, including by transfer of the direct or indirect legal or beneficial Project Sponsorship or control of any Equity, in aggregate of not less than fifteen per cent (15%) of the total Equity of the Contractor; or
  - (iii) acquisition of any control directly or indirectly of the Board of Directors of the Contractor by any person either by himself or together with any person or persons acting in concert with him.
- (b) The Contractor shall immediately notify the Project Sponsor of any proposed Change in Control (or, in the case of a Change In Control due to the transfer of shares or securities in a publicly listed SCTL, as soon as it becomes aware of that Change in Control or proposed Change in Control and is permitted by the laws applicable to that publicly listed SCTL to disclose that information to Project Sponsor) in the Contractor and shall provide Project Sponsor with details of:
  - (i) the identity of each proposed acquirer /entities seeking control;

- (ii) the address of the aforesaid acquirer / entities;
  - (iii) the extent and nature of the proposed change in control; and
  - (iv) any other information necessary for the Project Sponsor to determine whether to consent, or not to consent, to the Change in Control in the Contractor.
- (c) The Project Sponsor shall not unreasonably withhold its consent to such Change in Control of the Contractor, unless the Project Sponsor is of the reasonable opinion that:
- (i) the proposed acquirer /entities seeking control of the Contractor or Supporting Entity following the change in control:
    - is not solvent or reputable;
    - has an interest which conflicts in a material way with the interests of Project Sponsor or is involved in a business or activities which are incompatible with, or inappropriate in relation to the Project; or
    - does not have the same or greater financial and technical capacity than the entity it is replacing or from which it is taking control;
  - (ii) the proposed change is against the national security and / or public interest; or
  - (iii) the proposed change shall impact adversely on the ability of the Contractor to perform its obligations under this Contract.
- (d) The Contractor shall not undertake or permit any Change in Control, except with the prior approval of the Project Sponsor. Notwithstanding anything to the contrary contained in this Contract Agreement, the Contractor agrees and acknowledges that the decision of Project Sponsor in respect of Change of Control as being final, conclusive and binding on the Project Sponsor, and undertakes that it shall not give effect to any such acquisition of Equity or control of the Board of Directors of the Contractor without such prior approval of the Project Sponsor and the Project Sponsor shall endeavour to convey its decision thereon expeditiously.
- It is also agreed that the Project Sponsor shall not be liable in any manner on account of grant or otherwise of such approval and that such approval or denial thereof shall not in any manner absolve the Contractor from any liability or obligation under this Contract
- For the purposes of this Article
- (i) the expression "acquirer", "control" and "person acting in concert" shall have the meaning ascribed thereto in the Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeover) Regulations, 1997 or any statutory re-enactment thereof as in force as on the date of acquisition of Equity, or the control of the Board of Directors, as the case may be, of the Contractor;

- (ii) the indirect transfer or control of legal or beneficial Project Sponsorship of Equity shall mean transfer of the direct or indirect beneficial Project Sponsorship or control of any SCTL or companies whether in India or abroad which results in the acquirer acquiring control over the shares or voting rights of shares of the Contractor; and
- (iii) power to appoint, whether by Contract or by virtue of control or acquisition of shares of any SCTL holding directly or through one or more companies (whether situate in India or abroad) the Equity of the Contractor, not less than half of the directors on the Board of Directors of the Contractor or of any SCTL, directly or indirectly whether situate in India or abroad, having ultimate control of not less than fifteen per cent (15%) of the Equity of the Contractor shall constitute acquisition of control, directly or indirectly, of the Board of Directors of the Contractor.

**1.19. REPRESENTATIVES OF THE PROJECT SPONSOR NOT INDIVIDUALLY LIABLE:**

No director or official or employee or advisor or consultant of the Project Sponsor shall in any way be personally bound or liable for the acts or obligations of the Project Sponsor under the Contract or answerable for any default or omission in the observance or performance of any of the acts, matters or things which are herein contained.

**1.20. PROJECT SPONSOR NOT BOUND BY PERSONAL REPRESENTATIONS:**

The Contractor shall not be entitled to any increase on the item rates of the Contract or any other right or claim whatsoever by reason of representation, explanation or statement or alleged representation, promise or guarantees given or alleged to have been given to him by any person.

**1.21. CONTRACTOR'S OFFICE:**

The Contractor shall provide and maintain an office at Thiruvananthapuram for the accommodation of his agent and staff and such office shall be open at all reasonable hours to receive instruction, notices, or other communications from the SCTL.

### **1.22. CONTRACTOR'S SUBORDINATE STAFF AND THEIR CONDUCTS:**

- (a) The Contractor, on or after award of the work shall name and depute a qualified personnel having sufficient experience in carrying out work of similar nature to whom the equipment materials, if any, shall be issued and instructions for works given. The Contractor shall also provide to the satisfaction of the SCTL sufficient and qualified staff to supervise the execution of the-works, competent sub-agents, supervisor and leading hands including those specially qualified by previous experience to supervise the type of works comprised in the Contract in such manner as will ensure work of the best quality, expeditious working. Whenever in the opinion of the SCTL, additional properly qualified supervision staff is considered necessary, they shall be employed by the Contractor without additional charges on account thereof. The Contractor shall ensure to the satisfaction of the SCTL that Sub-Contractors, if any shall provide competent and efficient supervision over the work entrusted to them.
- (b) If and whenever any of the Contractor's or Sub-Contractor's agents, sub-agents, assistants supervisor or other employees shall in the opinion of SCTL be guilty of any misconduct or be incompetent or insufficiently qualified or negligent in the performance of their duties or that in the opinion of the Project Sponsor or SCTL, it is undesirable for administrative or any other reason for such person or persons to be employed in the works, the Contractor, if so directed by the SCTL, shall at once remove such person or persons from employment thereon. Any person or persons so removed from the works shall not again be employed in connection with the works without the written permission of the SCTL. Any person so removed from the works shall be immediately replaced at the expense of the Contractor by a qualified and competent substitute. Should the Contractor be requested to repatriate any person removed from the works he shall do so and shall bear all costs in connection herewith.
- (c) The Contractor shall be responsible for the proper behaviour of all the staff, supervisor, workmen and others and shall exercise a proper degree of control over them and in particular, and without prejudice to the said generality, the Contractor shall be bound to prohibit and prevent any employees from trespassing or acting in any way detrimental or prejudicial to the interest of the community or of the properties or occupiers of land and properties in the neighbourhood and in the event of such employee so trespassing, the Contractor shall be responsible therefore and relieve the Project Sponsor of all consequent claims or actions for damages or injury or any other grounds whatsoever. The decision of the SCTL upon any matter arising under this clause shall be final. Contractor shall ensure that none of their employees are ever engaged in any anti-national activities.
- (d) All Contractor's personnel entering upon the Project Sponsor's premises shall be properly identified by badges issued by Project Sponsor which must be worn all times on Project Sponsor's premises.

### **1.23. Sub-Letting of Work:**

Subletting of Contracts shall not be generally permitted. However the Project Sponsor may permit subletting of work on specific cases subject to the following:-

- (i) No part of the Contract or any share of interest there shall in any manner or degree be transferred assigned sublet by the Contractor directly or indirectly to any firm or corporation whosoever except as provided for in the succeeding sub-clause, without the consent in writing of the Project Sponsor.
- (ii) Sub-Contractors for temporary works etc.:- The Project Sponsor may give written consent to sub-Contract for execution of any part of the works at the site, being entered into by the Contractor provided each individual sub-Contract is submitted to the SCTL before being entered into and is approved by him.
- (iii) List of Sub-Contractors to be supplied: - At the commencement of every month the Contractor shall furnish to the SCTL list of all sub-Contractors or firms engaged by the Contractor and working at the site during the previous month with particulars of the general nature of the Sub-Contract or works.
- (iv) Contractor's Liability Not Limited By Sub-Contractors:- Notwithstanding any sub-letting with such approval as aforesaid and notwithstanding that the SCTL shall have received copies of any sub-Contracts, the Contractor shall be and shall remain solely responsible for the quality and proper and expeditious execution of the works and the performance of all the conditions of the Contract in all respects as if such sub-letting or sub-Contracting had not taken place and as if such work had been done directly by the Contractor.
- (v) Project Sponsor may Terminate Sub-Contracts:- If any Sub-Contractor engaged upon the works at the site executes any work which in the opinion of the SCTL is not in accordance with the Contract documents, the Project Sponsor may by written notice to the Contractor request him to terminate such Sub-Contract and the Contractor upon the receipt of such notice shall terminate such Sub Contract and the Sub-Contractor(s) shall forthwith leave the works, failing which the Project Sponsor shall have right to remove such Sub-Contractors from the Site.
- (vi) No Remedy For Action Taken Under This Clause:- No action taken by the Project Sponsor under the clause shall relieve the Contractor of any of his liabilities under the Contract or give rise to any right to compensation, extension of time or otherwise failing which, the Project Sponsor shall have right to remove suchS-Contractors from the Site.

#### **1.24. Power of Entry:**

If the Contractor shall not commence the work in the manner previously described in the Contract Document or if he shall, at any time, in the opinion of the SCTL;

- (i) Fail to carryout the works in conformity with the Contract documents, or
- (ii) Fail to carryout the works in accordance with the time schedule, or

- (iii) Substantially suspend work or the works for a period of Fourteen days without authority from the SCTL, or
- (iv) Fail to carryout and execute the works to the satisfactions of the SCTL, or
- (v) Fail to supply sufficient or suitable constructional equipments, temporary works, labour materials or things etc., or
- (vi) Commit or suffer or permit any other breach of any of the provisions of the Contract on his part to be performed or observed or persist in any of the above mentioned breaches of the Contract for the fourteen days, after notice in writing shall have been given to the Contractor by the SCTL requiring such breach to be remedied, or
- (vii) Abandon the works, or
- (viii) During the continuance of the Contract, become bankrupt, make any arrangement or composition with his creditors, or permit any execution to be levied or go into liquidation whether compulsory or voluntary not being merely a voluntary liquidation for the purpose of amalgamation or reconstruction.

Then in any such case, the Project Sponsor shall have the power to enter upon the works and take possession thereof and of the materials, temporary works, constructional equipment, and stock thereon, and to revoke the Contractor's license to use the same, and to complete the works, by his agents, other Contractor or workmen, or to re-let the same upon any terms and to such other person firm or corporation as the Project Sponsor in his absolute discretion may think proper to employ and for the purpose aforesaid to use or authorize the use of any materials, temporary works constructional equipment, and stock as aforesaid without making payment or allowances to the Contractor for the said materials other than such as may be certified in writing by the SCTL to be reasonable, and without making any payment or allowance to the Contractor for the use of the temporary said works, constructional equipments and stock or being liable for any loss of damage thereto, and if the Project Sponsor shall by reason of his taking possession of the works or of the works being completed by other Contractors (due account being taken of any such extra work or works which may be omitted) then the amount of such excess as certified by the SCTL shall be deducted from any money which may be due for work done by the Contractor under the Contract and not paid for. Any deficiency shall forthwith be made good and paid to the Project Sponsor by the Contractor and the Project Sponsor shall have power to sell in such manner and for such price as he may think fit all or any of the constructional equipment, materials etc. belonging to and to recoup and retain the said deficiency or any part thereof out of the proceeds of the sale.

#### **1.25. CONTRACTORS RESPONSIBILITY WITH OTHER AGENCIES:**

Without repugnance to any other condition, it shall be the responsibility of the Contractor executing the work of installation of grid connected solar roof top system with associated civil works, to work in close co-operation and co-ordinate the works with other Contractors or their authorized representatives and the Contractor will put up a joint scheme, showing the arrangements, with other Contractors / agencies for carrying his portion of work to the SCTL, and get the approval. The Contractor before finally submitting the schemes to the SCTL shall have the written Contract of the other agencies. The SCTL before communicating his approval of the scheme, with any required modifications shall get the final Contract of all the agencies, which shall be binding. No claim shall be entertained on account of the above.

The Contractor shall conform in all respects with the provisions of any statutory regulations, ordinances or by laws of any local or duly constituted authorities or public bodies which may be applicable from time to time to the works or any temporary works. The Contractor shall keep the Project Sponsor indemnified against all penalties and liabilities of every kind arising out of non-adherence to such statutes ordinances, laws, rules, regulations, etc.

#### **1.26. OTHER AGENCIES AT SITE:**

The Contractor shall have to execute the work in such place and condition where other agencies might also be engaged for other works such as site grading, filling and levelling, electrical and mechanical engineering works etc. No claim shall be entertained to works being executed in the above circumstances.

#### **1.27. Notices**

Any notice hereunder may be served on the Contractor or his duly authorized representative at the job site or may be served by registered mail direct to the address furnished by the Contractor. Proof of issue of any such notice could be conclusive of the Contractor having been duly informed of all contents therein.

#### **1.28. RIGHTS OF VARIOUS INTERESTS:**

- (i) The Project Sponsor reserves the right to distribute the work between more than one Contractor. The Contractor shall co- operate and afford other Contractors reasonable opportunity for access to the works for the carriage and storage of materials and execution of their works. Whenever the work is being done by any department of the Project Sponsor or its stakeholders or by other Contractors employed by the Project Sponsor is contingent upon work covered by the Contract, the respective rights of the various interests involved shall be determined by the SCTL to secure the completion of the various portions of the work in general harmony.

#### **1.29. RIGHT OF PROJECT SPONSOR TO DETERMINE/TERMINATE CONTRACT**

- i. Project Sponsor shall, at any time be entitled to determine and terminate the Contract, if in the opinion of the Project Sponsor the cessation of the work becomes necessary owing to paucity of funds or for any other cause whatsoever, in which case, the cost of approved materials at the site at current market rates or based on calculation from quoted bid price whichever is lower as verified and approved by SCTL and of the value of the work done to date by the Contractor shall be paid for in full at the rates specified in the Contract. A notice in writing from the Project Sponsor to the Contractor of such determination and termination and the reason thereof, shall be the conclusive proof of the fact that the Contract has been so determined and terminated by the Project Sponsor.
- ii. Should the Contract be determined under sub-clause (i) of this clause and the Contractor claims payments to compensate expenditure incurred by him in the expectation of completing the whole of the work, the Project Sponsor shall consider and admit such claim as are deemed fair and reasonable and are supported by vouchers to the satisfaction of the SCTL. The Project Sponsor's decision on the necessity and propriety of any such expenditure shall be final and conclusive and binding on the Contractor.

### **1.30. PATENTS AND ROYALTIES:**

- (a) The Contractor, if licensed under any patent covering equipment, machinery, materials or compositions of matter to be used or supplied or methods and process to be practiced or employed in the performance of this Contract, agrees to pay all royalties and licence fees which may be due with respect thereto. If any equipment, machinery, materials or composition matters, to be used or supplied or methods and process to be practised or employed in the performance of this Contract, is covered by a patent under which Contractor is not licensed then the Contractor before supplying or using the equipment, machinery, materials, compositions method or processes shall obtain such licences, and pay such royalties and licence fees as may be necessary for performance of the Contract. In the event, the Contractor fails to pay any such royalties or obtain any such licence, any suit for infringement of such patents which is brought against the Contractor or the Contract as a result of such failure will be defended by the Contractor at his own expenses and the Contractor will pay any damages and costs awarded in such suit. The Contractor shall promptly notify the Project Sponsor if the Contractor has acquired knowledge of any patent under which a suit for infringement could be reasonably brought because of the use by the Contractor of any equipment, machinery, materials, and process methods to be supplied hereunder. The Contractor agrees to and does hereby grant to Contractor, together with the right to extend the same to any of the subsidiaries of the Contractor as irrevocable, royalty-free licence to use in any country, any invention made by the Contractor or his employee in or as a result of the performance of the work under the Contract.
- (b) The Project Sponsor shall indemnify and save harmless the Contractor from any loss on account of claims on Contractor for the contributory infringement of patent rights arising out and based upon the claim that the use by the Project Sponsor of the process included in the design prepared by the Project Sponsor and used in the operation of the plant infringes on any patent right with respect to any sub-Contract entered into by Contractor pursuant to the provisions of sub-Contract an undertaking to provide the Project Sponsor with the same patent protection that Contractor is required to provide under the provisions of this clause. All drawings, blue prints, tracings, reproducible, models, plans, specification and copies thereof, furnished by the Project Sponsor as well as drawings, tracings, reproducible, plans specifications, design, calculations etc. prepared by the Contractor for the purpose of execution of works covered in or connected with this Contract shall be the property of Project Sponsor and shall not be used for any other work but are to be delivered to the Project Sponsor at the completion of the Contract.

- (c) Where so desired by SCTL, the Contractor agrees to respect the secrecy of any document, drawings etc. issued to him for the execution of this Contract, and restrict access to such documents, drawing etc. to the minimum and further, the Contractor agrees to bind its employees, sub Contractors or any person associated with the Contractor having access to such documents, drawings for such secrecy requirements and to any other agency or individual, without the written approval by SCTL.

### **1.31. Liens**

- (a) If, at any time, there should be evidence or any lien or claim for which the Project Sponsor might have become liable and which is chargeable to the Contractor, the Project Sponsor shall have the right to retain out of any payment then due or thereafter to become due an amount sufficient to completely indemnify the Project Sponsor against such lien or claim and if such lien or claim be valid the Project Sponsor may pay and discharge the same and deduct the amount so paid from any money which may be or may become due and payable to the Contractor. If any lien or claim remain unsettled after all payments are made, the Contractor shall refund or pay to the Project Sponsor all moneys that the latter may be compelled to pay in discharging such lien or claim including all costs and reasonable expenses.
- (b) The Contractor will not disclose details of the work to any person or persons except those engaged in its performance, and only to the extent required for the particular portion of the work being done.
- (c) The Contractor will not give any items concerning details of the work to the press or a news disseminating agency without prior written approval from SCTL. Contractor shall not take any pictures on site without written approval of SCTL.

### **1.32. OPERATION OF CONTRACT:**

- (a) Law Governing:

Regardless of the place of Contracting, place of performance or otherwise, this Contract, and all amendments, modifications, alterations, or supplements, thereto shall be governed by the laws of India and respective state laws for the nature, validity and interpretation thereof.

- (b) Non-Waiver of Default

Any failure by the Project Sponsor or Contractor at any time, or from time to time, to enforce or require the strict keeping and performance of any of the terms or conditions of this Contract, or to exercise a right hereunder, shall not constitute a waiver of such terms, conditions or rights, and shall not affect or impair same, or the right of the Project Sponsor or the Contractor, as the case may be at any time to avail itself of same.

### **1.33. Execution of Work**

- (a) All the works shall be executed in strict conformity with the provisions of the Contract documents and with such explanatory detailed drawings, specifications, and instructions as may be furnished from time to time to the Contractor by the SCTL whether mentioned in the Contract or not. The Contractor shall be responsible for ensuring that works throughout are executed in the most substantial, proper and workman like manner with the quality of material and workmanship in strict accordance with the specifications following all safety requirements of Project Sponsor and as stipulated in work permits as per the directions and to the entire satisfaction of the SCTL.
- (b) Wherever, it is mentioned in the specifications that the Contractor shall perform certain work or provide certain facilities/materials, it is understood that the Contractor shall do, so at his cost unless otherwise specified.
- (c) The materials, design and workmanship shall satisfy the relevant Indian Standards, the Job specification contained herein and codes referred to. Where the job specification stipulate requirements in addition to those contained in the standards codes and specifications, these additional requirements shall also be satisfied.

### **1.34. COORDINATION AND INSPECTION OF WORK:**

The coordination and inspection of the day-to-day work under the Contract shall be the responsibility of the SCTL. The written instructions regarding any particular job will be normally be passed by the SCTL or his authorized representative. A work order book / logbook will be maintained by the Contractor for each job in which the aforesaid written instructions will be entered. These will be signed by the Contractor or his authorized representative by way of acknowledgment within 12 hours. The non-maintaining of the order book or non-signing by the Contractor shall not preclude the Contractor from complying with the instructions.

### **1.35. Work in Monsoon and Dewatering:**

- (a) The completion of the work may entail working in the monsoon also. The Contractor must maintain a minimum labour force as may be required for the job and plan and execute the construction and erection according to the prescribed schedule. No extra rate will be considered for such work in monsoon.
- (b) During monsoon and other period, it shall be the responsibility of the Contractor to keep the construction work site free from water at his own cost.

### **1.36. WORK ON DAYS OTHER THAN WORKING DAYS:**

For carrying out work on days other than Working Day if needed, the Contractor will approach the SCTL or his representative at least two days in advance and obtain permission in writing. No special compensation on this account will be payable.

### **1.37. GENERAL CONDITIONS FOR CONSTRUCTION AND ERECTION WORK:**

#### **(a) Place of Work:**

The work has to be executed at specified premises as per the Contract. Contractor should apprise himself of all the conditions prevailing in such location and the restrictions placed on movement of personnel and equipment, types of equipment and tools permitted, working methods allowed etc. in the light of security and safety regulations operative in the area.

The safety regulations to be complied with, by the Contractor will also be provided along with the Contract. No idle time wages or compensation for temporary stoppage of work or restrictions would be paid, and the rate quoted for the various items of work should cover the cost of all such contingencies and eventualities. Substantial structures and utilities exist both above ground and underground, adjacent to the work site. (The construction activity gets restrained by the existence of such structures and utilities). Special care is necessary in transportation, storage, working on equipments and other construction activities to protect the existing features and prevent damage to any facility. Necessary protective structures barricades etc. have to be erected at various places as directed by SCTL. No extra payment of such protective works will be made unless specially provided in the Contract.

- (b) The working time or the time of work is 48 hours per week normally. Overtime work is permitted in cases of need and the Project Sponsor will not compensate the same. Shift working at 2 or 3 shifts per day may become necessary and the Contractor should take this aspect into consideration for formulating his rates for quotation. No extra claims will be entertained by the Project Sponsor on this account.
- (c) The Contractor must arrange for the placement of in such a way that the delayed completing of the work or any part thereof for any reasons whatsoever will not affect their proper employment. The Project Sponsor will not entertain any claim for idle time payment whatsoever.
- (d) The Contractor shall submit to the Project Sponsor reports at regular intervals regarding the state and progress of work. The details and performa of the report will mutually be agreed after the award of Contract.

**1.38. DRAWINGS TO BE SUPPLIED BY THE PROJECT SPONSOR:**

- (a) Where drawings are attached with Contract, these shall be for the general guidance of the Contractor to enable him to visualize the type of work contemplated and scope of work involved. The Contractor will be deemed to have studied the drawings and formed an idea about the work involved.
- (b) Detailed working drawings on the basis of which actual execution of the work is to proceed will be furnished from time to time during the progress of the work. The Contractor shall be deemed to have gone through the drawings supplied to him thoroughly and carefully and in conjunction with all other connected drawings and bring to the notice of the SCTL, discrepancies, if any, therein before actually carrying out the work.
- (c) Copies of all detailed working drawings relating to the works shall be kept at the Contractor's office of the site and shall be made available to the SCTL at any time during the Contract. The drawings and other documents issued by the Project Sponsor shall be returned to the Project Sponsor on completion of the works. Reference is also invited to clause above regarding drawings and other documents.

**1.39. DRAWINGS TO BE SUPPLIED BY THE CONTRACTOR:**

- (a) Where drawings/data are to be furnished by the Contractor, they shall be as enumerated in the conditions of the Contract, and shall be furnished within the specified time.

- (b) Where approval of drawings before manufacture / construction / fabrication has been specified, it shall be Contractor's responsibility to have these drawings prepared as per the directions of SCTL and got approved before proceeding with manufacture construction / fabrication, as the case may be. Any changes that may have become necessary in these drawings during the execution of the work shall have to be carried out by the Contractor to the satisfaction of SCTL at no extra cost. All final drawings shall bear the certification stamps duly signed by both the Contractor and the SCTL.
- (c) A period of 2 weeks from the date of receipt shall be required normally for approval of drawings by the SCTL.

**1.40. SETTING OUT WORKS:**

- (a) The SCTL shall furnish the list of government buildings along with consent letter from the owner of each building for installation of grid connected solar roof top system.
- (b) The Contractor shall mark the location of solar panels, inverters, energy meter, earth pits, cable routing for each site and get the approval from the Engineer –in-charge prior to installation. The, work shall be set out to the satisfaction of the SCTL. The approval thereof or joining in setting out the work shall not relieve the Contractor of any of his responsibilities.

**1.41. RESPONSIBILITY FOR LEVEL AND ALIGNMENT:**

The Contractor shall be entirely and exclusively responsible for the horizontal and vertical alignment, the levels and correctness of every part of the work and shall rectify effectually any errors or imperfections therein. Such rectifications shall be carried out by the Contractor, at his own cost, when instructions are issued to that effect by the SCTL.

#### **1.42. MATERIALS TO BE SUPPLIED BY CONTRACTOR:**

- (a) The Contractor shall manufacture the solar panels and procure and provide the Balance materials required for construction including tools, tackles, construction plant and equipment for the completion and maintenance of the works except the materials which will be issued by Project Sponsor and shall make his own arrangement for procuring such materials and for the transport thereof. The materials procured by the Contractor shall be Project Sponsor approved/specified quality.
- (b) All materials procured should meet the specifications given in the Contract. The SCTL may, at his discretion, ask for samples and test certificates for any batch of any material procured. Before procuring, the Contractor should get the approval of SCTL for any material to be used for the works.
- (c) Manufacturer's certificate shall be submitted for all materials supplied by the Contractor. If, however, in the opinion of the SCTL any tests are required to be conducted on the materials supplied by the Contractor, these will be arranged by the Contractor promptly at his own cost.

#### **1.43. MATERIALS SUPPLIED BY PROJECT SPONSOR:**

- (a) If the specifications of the work provides for the use of any materials of special description to be supplied from the Project Sponsor's stores, price for such material to be charged therefore as herein after mentioned being so far as practicable for the convenience of the Contractor but not so as in any way to control the meaning or effect of the Contract. The Contractor shall be bound to purchase and shall be supplied such materials as are from time to time required to be used by him for the purpose of the Contract only. The sums due from the Contractor for the value of the actual materials supplied by the Project Sponsor will be recovered from the running account bill on the basis of the actual consumption of materials in the work covered and for which the running account bill has been prepared. After the completion of the works, however, the Contractor has to account for the full quantity of materials supplied to him as per relevant clauses in this document.

- (b) The value of the materials as may be supplied to the Contractor by the Project Sponsor will be debited to the Contractor's account at the rates shown in the schedule of chargeable materials and if they are not entered in the schedule, they will be debited at cost price, which for the purpose of the Contract shall include the cost of carriage and all other expenses whatsoever such as normal storage supervision charges which shall have been incurred in obtaining the same at the Project Sponsor's stores. All materials so supplied to the Contractor shall remain the absolute property of the Project Sponsor and shall not be removed on any account from the site of the work, and shall be at all times open for inspection to the SCTL. Any such materials remaining unused at the time of completion or termination of the Contract shall be returned to the Project Sponsor's stores or at a place as directed by the SCTL in perfectly good condition, at Contractor's cost.

**1.44. CONDITIONS FOR ISSUE AND STORAGE OF MATERIALS:**

- (i) Materials specified to be issued by the Project Sponsor will be supplied to the Contractor by the Project Sponsor from his stores/location. It shall be the responsibility of the Contractor to take delivery of the materials and arrange for its loading, transport and unloading at the site of work at his own cost. The materials shall be issued between the working hours and as per the rules of the Project Sponsor framed from time to time.
- (ii) The Project Sponsor shall allocate a central storage space in the project area to store the solar panels and other accessories required for the project.
- (iii) The Contractor shall bear all incidental charges for the storage and safe custody of materials at site after these have been issued to him.
- (iv) Materials specified to be issued by the Project Sponsor shall be issued in standard sizes as obtained from the manufacturer.
- (v) Project Sponsor shall provide a central location for storing the materials and the Contractor shall safeguard the materials against damage by rain, dampness, fire, theft etc. He shall also employ necessary watch and ward establishment for the purpose.
- (vi) It shall be duty of the Contractor to inspect the material supplied to him at the time of taking delivery and satisfy himself that they are in good condition. After the materials have been delivered by the Project Sponsor, it shall be the responsibility of the Contractor to keep them in good condition and if the materials are damaged or lost, at any time, they shall be repaired and/ or replaced by him at his own cost, according to the directions of the SCTL.
- (vii) The Project Sponsor shall not be liable for delay in supply or non-supply of any materials which the Project Sponsor has undertaken to supply where such failure or delay is due to natural calamities, act of enemies, transport and procurement difficulties and any circumstances beyond the control of the Project Sponsor. In no case, the Contractor shall be entitled to claim any compensation or loss suffered by him on this account.

- (viii) It shall be the responsibility of the Contractor to arrange in time all materials required for the works other than those to be supplied by the Project Sponsor. If, however, in the opinion of the SCTL the execution of the work is likely to be delayed due to the Contractor's inability to make arrangements for supply of materials which he has to arrange for, the SCTL shall have the right, at his own discretion, to Issue such materials If available with the Project Sponsor or procure the materials from the market or elsewhere and the Contractor will be bound to take such materials at the rates decided by the SCTL. This, however, does not in any way absolve the Contractor from responsibility of making arrangements for the supply of such materials in part or in full, should such a situation occur, nor shall this, constitute a reason for the delay in the execution of the work.
- (ix) None of the materials supplied to the Contractor will be utilized by the Contractor for manufacturing item, which can be obtained from standard manufacturer in finished form.
- (x) The Contractor shall, if desired by the SCTL, be required to execute an indemnity bond for safe custody and accounting of all materials issued by the Project Sponsor.
- (xi) The Contractor shall furnish to the SCTL sufficiently in advance a statement showing his requirements of the quantities of the materials if any thing to be supplied by the Project Sponsor and the time when the same will be required by him for the works, so as to enable the SCTL to make necessary arrangement for procurement and supply of the material.
- (xii) A daily account of the materials issued by the Project Sponsor shall be maintained by the Contractor indicating the daily receipt, consumption and balance in hand. This account shall be maintained in a manner prescribed by the SCTL along with all connected papers viz. requisition, issues etc. and shall be always available for inspection in the Contractor's office at site.
- (xiii) The Contractor should see that only the required quantities of materials are got issued. The Contractor shall not be entitled to cartage and incidental charges for returning the surplus materials, if any, to the stores/location where from they were issued or to the place as directed by the SCTL.
- (xiv) Materials/Equipments supplied by Project Sponsor shall not be utilized for any other purpose(s) than issued for.

#### **1.45. MATERIALS PROCURED WITH ASSISTANCE OF PROJECT SPONSOR:**

Notwithstanding anything contained to the contrary in any or all the clause of this document where any materials for the execution of the Contract are procured with the assistance of Project Sponsor either by issue from Project Sponsor's stock or purchase made under orders or permits or licences issued by Government, the Contractor shall hold the said materials as trustee for the Project Sponsor and use such materials

economically and solely for the purpose of the Contract and not dispose them off without the permission of the Project Sponsor and return, if required by the SCTL, all surplus or unserviceable materials that may be left with him after the completion of the Contract or at its termination for any reason, whatsoever on his being paid or credited such prices as the SCTL shall determine having due regard to the condition of the materials. The price allowed to the Contractor however, shall not exceed the amount charged to him excluding the storage charges if any. The decision of the SCTL shall be final and conclusive in such matters. In the event of breach of the aforesaid condition, the Contractor shall in terms of the licenses or permits, and/or for criminal breach of trust, be liable to compensate the Project Sponsor a double rate or high rate, in the event of those materials at that time having higher rate or not being available in the market, then any other rate to be determined by the SCTL and SCTL decision shall be final and conclusive.

**1.46. MATERIALS OBTAINED FROM DISMANTLING:**

If the Contractor in the course of execution of the work is called upon to dismantle any part for reasons other than those stipulated in clauses hereunder, the materials obtained in the work of dismantling etc., will be considered as the Project Sponsor's property and will be handed over to the owner of the building or Project Sponsor as decided by the SCTL.

**1.47. ARTICLES OF VALUE FOUND:**

All gold, silver and other materials, of any description and all precious stones, coins, treasure relics, antiquities and other similar things which shall be found in, under or upon the site, shall be property of the Government of Kerala and the Contractor shall duly preserve the same to the satisfaction of the SCTL and shall from time to time deliver the same to such person or person indicated by the Project Sponsor.

**1.48. DISCREPANCIS BETWEEN INSTRUCTIONS:**

Should any discrepancy occur between the various instructions furnished to the Contractor, his agents or staff or any doubt, arise as to the meaning of any such instructions or should there be any misunderstanding between the Contractor's staff and the SCTL's staff, the Contractor shall refer the matter immediately in writing to the SCTL whose decision thereon shall be final and conclusive and no claim for losses alleged to have been caused by such discrepancies between instructions, or doubts, or misunderstanding shall in any event be admissible.

**1.49. ALTERATIONS IN SPECIFICATIONS AND DESIGNS AND EXTRA WORK:**

- i. The SCTL shall have power to make any alterations in, omissions from, additions to of substitutions for, the schedule of rates, the original specifications, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work and the Contractor shall be bound to carry out

such altered / extra / new items of work in accordance with any instructions which may be given to him in writing signed by the SCTL and such alterations, omissions, additions or substitutions shall not invalidate the Contract and any altered additional or substituted work which the Contractor may be directed to do in the manner above specified as part of the work shall be carried out by the Contractor on the same conditions in all respect on which he agree to do the main work. The time for completion of work may be extended for the part of the particular job at the discretions of the SCTL, for only such alteration, additions or substitutions of the work, as he may consider as just and reasonable. The rates for such additional, altered or substituted work under this clause shall be worked out in accordance with the following provisions:

- (a) If the rates for the additional, altered or substituted work are specified in the Contract for the work, the Contractor is bound to carry out the additional, altered or substituted work at the same rates as are specified in the Contract.
  - (b) If the rates for the additional, altered or substituted work are not specifically provided in the Contract for the work, the rates will be derived from the Schedule of Rates of CPWD for similar class of works as specified in the Contract for the work. The opinion of the SCTL as to whether the rates can be reasonably so derived from items in the Contracts will be final and binding on the Contractor.
  - (c) If the rates of the altered, additional or substituted work cannot be determined in the manner specified in sub-clause (a) and (b) above, then the Contractor shall inform the SCTL of the rate which is his intension to charge for such class of work supported by analysis of the rate or rates claimed, and the SCTL shall determine the rates on the basis of the prevailing market rates of materials, labour cost at schedule of labour plus 10% to cover Contractor's supervision, overheads and profit and pay the Contractor accordingly. The opinion of the SCTL as to the current market rates of materials and the quantum of labour involved per unit of measurement will be final and binding on the Contractor.
  - (d) Provisions, contained in sub-clause (a) to (c) above shall not, however, apply: Where the value of alteration / additions / deletions or substitutions exceeds beyond plus or minus 25% of the estimated Contract value (i.e. quoted item rates of Contractor shall hold good for variations etc. within plus or minus 25% of estimated Contract value).
- ii. In the event and result of such alternatives / additions / substitutions / deletion, the scope of Contract work exceed the value stipulated in the Contract by more than the limits given in clause (d) above, the Contractor shall claim revision of the rates supported by the proper analysis in respect of such items for quantities in excess of the above limits, notwithstanding the fact that the rates for such items exist in the Contract for the main work or can be derived in accordance with the provision of sub-clause (b) of Clause 1.49, and the SCTL may revise their rates

having regard to the prevailing market rates, and the Contractor shall be paid in accordance with the rates so fixed. But, under no circumstances the Contractor shall suspend / stop / slowdown the work on the plea of non-settlement of rates of items falling under this clause.

**1.50. ACTION WHERE NO SPECIFICATIONS ISSUED:**

In case of any class of work for which there is no such specification given by the Project Sponsor in the Contract documents, such work shall be carried out in accordance with Indian Standard Specifications and if the Indian Standard Specifications do not cover the same the work should be carried out as per standard engineering practice subject to the approval of the SCTL.

**1.51. ABNORMAL RATES:**

The Contractor is expected to quote rate for each item after analysis of cost involved for the completion of item/work, considering all specifications and conditions of Contract. This will avoid loss of profit or gain, in case of curtailment or change of specification for any item. In case it is noticed that the rates for any item, quoted by the Contractor unusually are high or unusually low it will be sufficient cause for the rejection of the Contract unless the Project Sponsor is convinced about the reasonableness of the rates on scrutiny of the analysis for such rate to be furnished by the Contractor on demand.

**1.52. Inspection of Work:**

The SCTL will have full power and authority to inspect the works at any time wherever in progress either on the Site or at the Contractor's premises / workshop where situated premises /workshops of any person, firm or corporation where work in connect with the Contract may be in hand or where materials are being or are to be supplied, and the Contractor shall afford or procure for the SCTL every facility and assistance to carry out such Inspection. The Contractor shall at all time during the usual working hours and at all other time for which reasonable notice of the intention of the Engineer in-Charge or his representative to visit the works have been given to the Contractor, either himself be present to receive order and instructions or post a responsible agent duly accredited in writing for the purpose. Orders given to the Contractor's agent shall be considered to have the same force as if they had been given to the Contractor himself. The Contractor shall give not less than seven days, notice in writing to the SCTL before covering up or placing any work beyond reach of inspection and measurement any work in order that the same may be inspected and measured. In the event of breach of above the same shall be uncovered at Contractor's expense carrying out such measurement or inspection.

No materials shall be dispatched by the Contractor before obtaining the approval of SCTL in writing. The Contractor is to provide at all times during the progress of the work and the maintenance period, proper means of access with ladders, gangways, etc. and

the necessary attendance to move and adopt as directed for inspection or measurement of the works by the SCTL.

**1.53. ASSISTANCE TO THE ENGINEERS:**

The Contactor shall make available to the SCTL, free of cost necessary instruments and assistance in checking of setting out of works and taking measurement of work and testing and commissioning of the system.

**1.54. TESTS FOR QUALITY OF WORKS:**

- (a) All workmanship shall be of the respective kinds described in the Contract documents and in accordance with the instructions of the SCTL and shall be subjected from time to time to such test at Contractor's cost as the SCTL may direct at place of manufacture or fabrication or on the site or at all or any such places. The Contractor shall provide assistance, instruments, labour and materials as are normally required for examining, measuring and testing any workmanship as may be selected and required the SCTL.
- (b) All the tests at site necessary in connection with the execution of the work shall be carried out as per standards and shall be witnessed by SCTL. In case of non-availability of test facility at site, the required test shall be carried out at the cost of Contractor at government or any other testing laboratory as directed by SCTL.
- (c) If any tests are required to be carried out in connection with the work or materials workmanship not supplied by the Contractor, such tests shall be carried out by the Contractor as per the instructions of SCTL and cost of such tests shall be reimbursed by the Project Sponsor.

**1.55. Samples**

The Contractor shall furnish to the SCTL for approval when requested or if required by the specifications, adequate samples of all materials and finishes to be used in the work. Such samples shall be submitted before the work is commenced and in ample time to permit tests and examinations thereof. All materials furnished and finishing applied in actual work shall be fully identical to the approval samples.

**1.56. ACTION AND COMPENSATION IN CASE OF BAD WORK:**

If it shall appear to the SCTL that any work has been executed with unsound, imperfect or unskilled workmanship or with materials of any inferior description, or that any materials or articles provided by the Contractor for the execution of the work are unsound or of a quality inferior to that Contracted for, or otherwise not in accordance with the Contract, the Contractor shall on demand in writing from the SCTL or his authorised representative, specifying the work, materials or articles complained of, notwithstanding that the same have been inadvertently passed, certified and paid for forthwith shall rectify or remove and reconstruct the works specified and provide other proper and suitable materials or articles at his own charge and cost, and in the event of failure to do so within a period to be specified by the SCTL in his demand aforesaid, the

Contractor shall be liable to pay compensation at the rate of one percentage of the estimated cost of the whole work, for every week limited to a maximum of 10% (ten per cent) of the estimated cost of the whole work, while his failure to do so shall continue and in the case of any such failure the SCTL may on expiry of notice period rectify or remove and re-execute the work or remove and replace with others, the materials or articles complained of as the case may be at the risk and expenses of the Contractors in all respects. The decision of the SCTL as to any question arising under this clause shall be final and conclusive.

**1.57. SUSPENSION OF WORKS:**

The Contractor shall, if ordered in writing by the SCTL or his representative, temporarily suspend the works or any part thereof for such period and such time as so ordered and shall not, after receiving such written order, proceed with the work therein ordered to be suspended, until he shall have received a written order to proceed therewith. The Contractor shall not be entitled to claim/ compensation for any loss or damage sustained by him by reason of temporary suspension of the works aforesaid. An extension of time for completion, corresponding with the delay caused by any such suspension of the works as aforesaid will be granted to the Contractor, should he apply for the same, provided that suspension was not consequent to any default or failure on the part of the Contractor.

**1.58. PROJECT SPONSOR MAY DO PART OF WORK:**

Upon failure of the Contractor to comply with any instructions given in accordance with the provisions of the Contract, the Project Sponsor has the alternative right, instead of assuming charge for entire work to place additional labour force, tools, equipments and materials on such parts of the work, as the Project Sponsor may designate or also engage another Contractor to carry out the work. In such cases, the Project Sponsor shall deduct from the amount which otherwise might become due to the Contractor, the cost of such work and materials with ten percent added to cover all departmental charges and should the total amount thereof exceed the amount due to the Contractor, the Contractor shall pay the difference to the Project Sponsor.

**1.59. POSSESSION PRIOR TO COMPLETION:**

The SCTL shall have the right to take possession of or use any completed or partially completed work or part of the work. Such possessions or use shall not be deemed to be an acceptance of any work completed in accordance with the Contract. If such prior possession or use by the SCTL delays the progress of work, suitable adjustment in the time of completion will made and Contract shall be deemed to be modified accordingly.

#### **1.60. PERIOD OF LIABILITY FROM THE DATE OF COMPLETION OF WORK:**

(a) The project implementation period is 6 months including rainy season from the date of signing of Contract and handing over the building to Contractor for project implementation. The Contractor shall guarantee the installation/site work for a period of 60 (sixty) Months from the date of successful commissioning of grid connected Solar Roof Top system, unless otherwise specified. Any damage that may lie undiscovered at the time of issue of completion certificate, connected in any way with the equipment or materials supplied by him or in the workmanship shall be rectified or replaced by the Contractor at his own expense as deemed necessary by the SCTL or in default, the SCTL may cause the same made good by other workmen and deduct expenses (for which the certificate of SCTL shall be final) from any sums that may be then or at any time thereafter, become due to the Contractor or from his security deposit.

(b) If the Contractor feels that any variation in work or in quality of materials or proportions would be beneficial or necessary to fulfil the guarantee called for, he shall bring this to the notice of the SCTL in writing. The work will not be considered as complete and taken over by the Project Sponsor until all the temporary works etc., constructed by the Contractor is removed and work site cleaned to the satisfaction of SCTL.

(c) Care of Works:

From the commencement to completion of works, the Contractor shall take full responsibility for the care of all works including all temporary works, and in case any damage, loss or injury happens to the works or to any part thereof or to any temporary work, from any cause whatsoever, he shall at own cost repair and make good the same, so that at completion, the work shall be in good order and in conformity in every respect with the requirements of the Contract and the SCTL's instructions.

(d) Effects prior to taking over:

If at any time, before the work is taken over, the SCTL shall

(a) Decide that any work done or materials used by the Contractor or any sub-Contractor is defective or not in accordance with the Contract or that the works or any portion thereof are defective or do not fulfill the requirements of Contract (all such matters being herein after called 'Defects' in this clause) and

(b) As soon as reasonably practicable, notice given to the Contractor in writing of the said decisions specifying particulars of the defects alleged to exist or to have occurred, then the Contractor shall at his own expenses and with all speed make good the defects so specified.

In the case Contractor shall fail to do so, the Project Sponsor may take, at the cost of the Contractor, such steps as may in all circumstances, be reasonable to make good such defects. The expenditure, so incurred by the Project Sponsor shall be recovered from the amount due to the Contractor. The decision of the SCTL with

regard to the amount be recovered from the Contractor will be final and binding on the Contractor. As soon as the works have been completed in accordance with the Contract (except in minor respects that do not affect their use for the purpose for which they are intended and except for maintenance thereof provided in clause 1.59 (a)) and have passed the tests on completion, the SCTL shall issue a certificate (hereinafter called completion certificate) in which he shall certify the date on which the work have been so completed and have passed the said tests and the Project Sponsor shall be deemed to have taken over the works on the date so certified. If the works have been divided into various groups in the Contract, the Project Sponsor shall be entitled to take over any group or groups before the other or others and thereupon the SCTL shall issue a completion certificate which will however, be for such group or groups as taken over only.

(e) Defects after taking over:

In order that the Contractor could obtain a completion certificate, he shall make good with all possible speed, any defect arising from the defective materials supplied by the Contractor or workmanship or any act of omission of the Contract that may have been noticed or developed after the works or group of the works has been taken over. The period allowed for carrying out such work will be normally one month. If any defect be not remedied within a reasonable time, the Project Sponsor may proceed to do the work at the Contractor's risk and expense and deduct from the final bill such amount as may be decided by the Project Sponsor. If by reason of any default on the part of the Contractor a completion certificate has not been issued in respect of every portion of the work within one month after the date fixed by the Contract for the completion of the works, the Project Sponsor shall be at his liberty to use the works or any portion thereof in respect of which a completion certificate has been issued provided that the works or the portion thereof so used as aforesaid shall be afforded reasonable opportunity for completing these works for the issue of completion certificate.

(f) The Security Deposit/retention money deducted / furnished as per the terms and conditions of this Contract and shall be retained for the period of liability as given in clause 1.60 (a) above. This Bank Guarantee furnished shall be released only on expiry of the Contract Period and also based on the certification of the SCTL that no defect/damage has been reported / observed during the stipulated period of liability for the Contract.

(g) Performance of Contractor shall be evaluated on each job by SCTL and recorded. Review of performance will be carried out at appropriate intervals by SCTL or its designated agency(ies).

**1.61. SCHEDULE OF RATES AND PAYMENTS:**

(i) Contractor's Remuneration

The price to be paid by the Project Sponsor to the Contractor for the whole of the work to be done and the performance of all the obligations undertaken by the Contractor under the Contract documents shall be ascertained by the application of the respective item rates (the inclusive nature of which is more particularly defined by way of application but not of limitation, with the succeeding sub-clause of this clause) and payment to be made accordingly for the work actually executed and approved by the SCTL. The sum so ascertained shall (excepting only as and to the extent expressly provided herein) constitute the sole and inclusive remuneration of the Contractor under the Contract and no further payment whatsoever shall be or become due or payable to the Contractor under the Contract.

(ii) Schedule of rates to be inclusive:

The prices/rates quoted by the Contractor shall remain firm till the issue of final completion certificate and shall not be subject to escalation. Schedule of rates shall be deemed to include and cover all costs, expense and liabilities of every description and all risk of every kind to be taken in executing, completing and handing over the work to the Project Sponsor by the Contractor. The Contractor shall be deemed to have known the nature, scope, magnitude and the extent of the works and materials required, though the Contract document may not fully and precisely furnish them. He shall make such provision in the item rates as he may consider necessary to cover the cost of such items of work and materials as may be reasonable and necessary to complete the works. The opinion of the SCTL as to the items of work which are necessary and reasonable for completion of work shall be final and binding on the Contractor, although the same may not be shown on or described specially in Contract documents.

Generality of this present provision shall not be deemed to cut down or limit in any way because in certain cases it may and in other cases it may not be expressly stated that the Contractor shall do or perform a work or supply articles or perform services at his own cost or without addition of payment or without extra charges or words to the same effect or that it may be stated or not stated that the same are included in and covered by the schedule of rates.

(iii) Schedule of Rates to Cover Constructional Equipments, Materials, Labour etc.

Without in any way limiting the provisions of the preceding sub-clause the schedule of rates shall be deemed to include and cover the cost of all constructional equipment, temporary work (except as provided for herein), pumps, materials, labour, the insurance, fuel, stores and appliances to be supplied by the Contractor and other matters in connection with each item in the schedule of rates and the execution of the works or any portion thereof, finished, complete in every respect and maintained as shown or described in the Contract documents or may be ordered in writing during the continuance of this Contract.

- (iv) Schedule of Rates to cover Royalties, Rents and Claims:  
The Schedule of Rates shall be deemed to include and cover the cost of all royalties and fees for the articles and processes, protected by letters, or otherwise incorporated in or used in connection with the works, also all royalties, rents and other payments in connection with obtaining materials of whatsoever kind for the works and shall include an indemnity to the Project Sponsor which the Contractor hereby gives against all actions, proceedings, claims damages, costs and expenses arising from the incorporation in or use on the works of a such articles, processes or materials, Octroi or other municipal or local Board charges levied on materials, equipment or machineries to be brought to site for use on work shall be borne by the Contractor.
- (v) Schedule of Rates to Cover Taxes and Duties:  
No claim or exemption or reduction of customs duties, excise duties, sales tax, quarry or any port dues, transport charges, stamp duties or Central or States Government or Local Body or Municipal Taxes or duties, taxes or charges (from or of any other body), whatsoever, will be granted or obtained, all of which expenses shall be deemed to be included in and covered by the Schedule of Rates. Contractor shall also obtain and pay for all permits, or other privileges necessary to complete work.
- (vi) Schedule of Rates to cover Risk of Delay:  
The schedule of Rates shall be deemed to include and cover the risk of all possibilities of delay and interference with the Contractors conduct of work which occur from any cause including orders of Project Sponsor in the exercises of his powers and on account of extension of time granted due to various reasons and for all other possible or probable cause of delay.
- (vii) Schedule of Rates cannot be altered:  
For work under unit rate basis, no alteration will be allowed in the schedule of Rates by reason of work or any part of them being modified, altered, extended, diminished or omitted. The schedule of Rates are fully Inclusive rates which have been fixed by the Contractor and agreed to the Project Sponsor and cannot be altered. For lumpsum Contract, the payment will be made according to the work actually carried out for which purpose an item wise or workwise, Schedule of rates shall be furnished, suitable for evaluating the value of work done and preparing running account bills.

#### **1.62. PROCEDURE FOR MEASUREMENT / BILLING OF WORK IN PROGRESS:**

- (i) Measurements:  
All measurements shall be in metric system. All the works in progress will be jointly measured by the representative of the SCTL and the Contractor's authorise agent progressively. Such measurement will be got recorded in the measurement

book by the SCTL or his authorised representative and signed in token of accepted by the Contractor or his authorised representative.

For the purpose of taking joint measurement the Contractor's representative shall be bound to be present whenever required by the SCTL. If, however, he absents for any reason whatsoever the measurement will be taken by the SCTL or his representative and this will be deemed to be correct and binding on the Contractor.

(ii) Billing

The Contractor will submit a bill to the SCTL of the work giving abstract and detailed measurements for the various items executed during a month, before the expiry of the 1<sup>st</sup> week of the succeeding month. The SCTL shall take or cause to be taken the requisite measurements for the purpose of having the same verified and the claim, as far as admissible, adjusted, if possible, before the expiry of 15 days from presentation of the bill.

(iii) Dispute in Mode of Measurements:

In case of any dispute as to the mode of measurement not covered by the Contract to be adopted for any item of work, mode of measurement as per latest Indian Standard Specifications shall be followed.

**1.63. LUMPSUMS IN Contract:**

For the items in Contract where it includes lumpsum in respect of parts of work, the Contractor shall be entitled to payment in respect of the items at the same rates as are payable under this Contract for such items, or if part of the work in question is not in the opinion of the SCTL capable of measurement of determination, the Project Sponsor may at his discretion pay the lumpsum amount entered in the Contract or a percentage thereof and the certificate in writing of the SCTL shall be final and conclusive against the Contractor with regards to any sum or sums payable to him under the provisions of the clause.

**1.64. RUNNING ACCOUNT PAYMENTS TO BE REGARDED AS ADVANCES:**

All running account payments shall be regarded as payment by way of advance against the final payment only and not as payments for work actually done and completed and shall not preclude the requiring of bad, unsound and imperfect, or unskilled work to be removed and taken away and reconstructed or re-erected or be considered as an admission of the due performance of the Contract, or any part thereof in this respect, or of the accruing of any claim by the Contractor, nor shall it conclude, determine or affect in any way the powers of the Project Sponsor under these conditions or any of them as to the final settlement and the adjustments of the accounts or otherwise, or in any other way vary or affect the Contract.

The final bill shall be submitted by the Contractor within one month of the date of physical completion of the work, and settled immediately but not later than 60 days otherwise the Engineer-in charge's certificate of the measurement and of total amount payable for the work accordingly shall be final and binding on all parties. The final bill shall be presented by the Contractor along with 'No claim certificate' in a format acceptable to the Project Sponsor or such other documents as directed by the Project Sponsor.

**1.65. EXTRA WORK:**

Should the Contractor consider that he is entitled to any extra payment for extra job carried out whatsoever in respect of the works, he shall forthwith give notice in writing to the SCTL that he claims extra payment for the extra work. Such notice shall be given to the SCTL within one week from the ordering of any extra work or happening of any event, upon which the Contractor bases such claims, and such notice shall contain full particulars of the nature of such claim with full details and amount claimed. Failure on part of the Contractor to put forward any claim with the necessary particulars as above within the time above specified shall be an absolute waiver thereof. No omission by the Project Sponsor to reject any such claim and no delay in dealing therewith shall be waiver by the Project Sponsor of any rights in respect thereof.

**1.66. PAYMENT OF CONTRACTOR'S BILL:**

Contractor's offer does not include claiming of subsidy/incentive and the payments shall be completely independent of any subsidy/incentive milestone.

The price quoted is exclusive of Goods and Services Taxes as applicable. However, the Contractor should submit the bills showing the basic price and GST separately, by splitting the quoted price.

All payments to the Contractor, including advance payments, if any would be made after deducting TDS calculated at the quoted rate of the price.

Generally, no payment shall be made for works estimated to cost less than rupees fifty (50) lakhs till the whole of the work shall have been completed. But in case of works estimate to cost more than Rupees fifty (50) lakhs, the Contractor on submitting the bill thereof be entitled to receive a monthly payment proportion to the part thereof approved and passed by the SCTL, whose certificate of such approval and passing of the sum so payable shall be final and conclusive against the Contractor. This payment will be made after making necessary deductions as stipulated elsewhere in the Contract document for materials, security deposit or any moneys due to the Project Sponsor etc.

**1.67. MODE OF PAYMENT:**

Payment will be made to the Contractor normally through electronic transfer mode or other modes as per the applicable provisions of payment for the Project Sponsor in terms of laws of India.

#### **1.68. COMPLETION CERTIFICATE:**

(a) Application for Completion Certificate:

When the Contractor fulfils his obligation under this Contract, he shall be eligible to apply for completion certificate. The Contractor may apply for separate completion certificate respect of each such portion of the work by submitting the completion documents along with such application for completion certificate. The SCTL shall normally issue to the Contractor the completion certificate within one month after receiving an application therefore from the Contractor after verifying from the completion documents and satisfying himself that the work has been completed in accordance with and as set out in the construction and erection drawings and the Contract documents.

The Contractor, after obtaining the completion certificate is eligible to present the final bill for the work executed by him under the terms of Contract.

(b) **Completion Certificate:**

The Contractor shall be furnished with a certificate by the SCTL of such completion, but no certificate shall be given nor shall the work be deemed to have been executed until all scaffolding surplus materials and rubbish is cleared off the site completely or until the work shall have been measured by the SCTL whose measurement shall be binding and conclusive. The work will not be considered complete and taken over by the Project Sponsor, until all the temporary works, labour and staff colonies etc. constructed are removed and the work site cleaned of all debris etc., as described in clause below and to the satisfaction of the SCTL.

If the Contractor shall fail to comply with the requirements of this clause on or before the date fixed for the completion of the work, the SCTL may at the expenses of the Contractor remove such scaffolding, surplus materials and rubbish and dispose off the same as he thinks fit and clean off such dirt as aforesaid, and the Contractor shall forthwith pay the amount of all expenses so incurred and shall have no claim in respect of any such scaffolding or surplus materials as aforesaid except for any sum actually realised by the sale thereof.

#### **1.69. Clearing the site:**

The Contractor shall remove all debris generated from the work and dispose it off without giving rise to any complaints from local, municipal or government authorities. Metal scraps or any other scrap including wooden packing materials shall be disposed as instructed by the SCTL or as follows:

- (a) All unused scrap steel bar/ structural steel sections/pipe materials etc., (Free issue by Project Sponsor) shall be the property of the Project Sponsor and the same shall be returned by the Contractor category-wise at their own cost to Project Sponsor's store. The weighment slip issued by the Warehouse (in original) is

required to be attached along with the final bill/ material reconciliation statement. In case, the material is supplied by the Contractor, as per their scope of work, the scrap material generated out of the same should be taken out at their own cost before the settlement of the final bill.

- (b) Insulation material (either issued by Project Sponsor to the Contractor or supplied by Contractor) shall be kept in the area allocated by Project Sponsor. During the insulation activities, the Contractor should keep the work area clean on day-to-day basis. On completion of insulation job, all debris/packing should be taken out to the designated location or as directed by the SCTL for disposal at their own cost before the settlement of the final bill.

**1.70.** The financial implication of above, if any, should be taken care of in the quoted rates; and no separate claim shall be entertained on this account. The final bill of the Contractor shall be linked with the area cleaning in all respects, including removal of shuttering material, disposal of debris/scrap etc. to the entire satisfaction of SCTL.

**1.71. FINAL DECISION AND FINAL CERTIFICATE:**

Upon Expiry of the period of liability and subject to the SCTL being satisfied that the works have been duly maintained by the Contractor during monsoon or such period as herein before provided in the Contract and that the Contractor has in all respect duly made up any subsidence and performed all his obligations under the Contract, the SCTL shall (without prejudice to the rights of the Project Sponsor to retain the provisions of relevant clause hereof) give a certificate herein referred to as the final certificate to that effect. The Contractor shall not be considered to have fulfilled the whole of his obligations under the Contract until Final Certificate have been given by the SCTL notwithstanding any previous entry upon the work and taking possession, working or using of the same or any part thereof by the Project Sponsor.

**1.72. CERTIFICATE FOR PAYMENTS AND EVIDENCE OF COMPLETION:**

Except the final certificate, no other certificate or payments against a certificate or on general account shall be taken to be an admission by the Project Sponsor of the due performance of the Contract or any part thereof or occupancy or validity of any claim by the Contractor.

**1.73. TAXES & DUTIES:**

The Contractor agrees to and does hereby accept full and exclusive liability for the payment of any and all taxes, duties, now in force or hereafter Imposed, increased or modified, from time to time in respect of work and materials and all contributions and taxes for unemployment compensation, insurance and old age pensions or annuities now or hereafter imposed by any Central or State Government authorities which are imposed with respect to or covered by the wages, salaries, or other compensations paid to the persons employed by the Contractor and the Contractor shall be responsible for the compliance with all obligations and restrictions imposed by the Labour Law or any

other law affecting employer - employee relationship and the Contractor further agrees to comply and secure the compliance by all sub-Contractors, with all applicable Central, State, Municipal and local laws and regulations and requirements of any Central, State or Local Government agency or authority. Contractor further agrees to defend, indemnify and hold harmless from any liability or penalty which may be Imposed by the Central, State or Local Authority by reason of any violation by Contractor or sub-Contractor of such laws, regulations or requirements and also from all claims, suits or proceeding that may be brought against the Project Sponsor arising under, growing out of, or by reason of the work provided for by this Contract by third parties, or by Central or State Government authority or any administrative sub-division thereof.

(a) **Goods and Services Tax (GST)**

The Contractor, including its sub-Contractor(s) shall have GST registration in the concerned State from where he intends to supply the goods. Contractor shall declare the source location of supply and shall provide their GSTN number in the bills to be raised against work done.

Contractor shall provide HSN/SAC code of the goods/services and corresponding GST rate for the same.

In case GST is not applicable to the Contractor currently, as per turnover criteria, GST due to change in turnover is not payable. If applicable in future, the same will be borne by Contractor.

GST as applicable by the Contractor at the time of delivery within scheduled delivery period will be payable by the Project Sponsor.

Contractor shall submit the tax Invoice, for SCTL to claim the input tax Credit of the GST paid by the Contractor, wherever applicable.

The Contractor shall take steps viz uploading invoice in GSTR 1, payment of the tax liability on the said invoices and filing of Returns etc. and comply with all the requirements of applicable laws including GST laws for the time being in force, to enable the Project Sponsor to avail tax credit/s including input tax credit. Any loss or non-availability of input tax credit by the Project Sponsor due to non-compliance of applicable tax laws including but not limited to GST laws in force or otherwise, on the part of Contractor, an amount equivalent to any tax liability accruing to the Project Sponsor and/or to the extent of any loss accrued to the Project Sponsor shall be deducted from the payment due to the Contractor or shall be reimbursed by the Contractor, as the case may be, till such default is either rectified or made good by the Contractor and the Project Sponsor is satisfied that it is in a position to claim valid input tax credit within the time-lines as per applicable laws.

Any cost, liability, dues, penalty, fees, interest as the case may be, which accrues to the Project Sponsor at any point of time on account of non-compliance of applicable tax

laws or rules or regulations thereof or otherwise due to default on the part of Contractor shall be borne by the Contractor. An amount equivalent to such cost, liability, dues, penalty, fees, interest as the case may be, shall be reimbursed by the Contractor within 30 days. Any GST as may be applicable on such recovery of amount shall also be borne by Contractor and same shall be collected by the Project Sponsor.

Any increase/decrease in statutory levies within Contractual delivery period shall be on SCTL's account. Any upward variation in statutory levies after Contractual delivery period shall be on the bidder's account.

**1.74. Insurance:**

Contractor shall at his own expenses carry and maintain insurance with reputable insurance companies to the satisfaction of the Project Sponsor as follows:

(a) Employees State Insurance Act:

The Contractor agrees to and does hereby accept full and exclusive liability for the compliance with all obligations imposed by the Employees State Insurance Act, 1948, and the Contractor further agrees to defend, indemnify and hold Project Sponsor harmless from any liability or penalty which may be imposed by the Central, State or Local Authority by reason of any asserted violation by Contractor or sub-Contractor, of the Employee State Act, 1948 and also from all claims suits or proceedings that may be brought against the Project Sponsor arising under, growing out of or by reason of the work provided for by this Contract whether brought by employees of the Contractor, by third parties or by Central or State Government authority or any political sub-division thereof.

The Contractor agrees to filing, with the Employees State Insurance Corporation, the Declaration Forms and all forms which may be required in respect of the Contractor's or sub-Contractor's employees whose aggregate remuneration as fixed by the concerned authorities and who are employed in the work provided for or those covered by ESI Act under any amendment to the Act from time to time. The Contractor shall deduct and secure the Contract of the sub-Contractor to deduct the employee's contribution as per the first schedule of the Employee State Insurance Act from wages and affix the Employee's contribution Cards at Wages payment intervals. The Contractor shall remit and secure the contract of the Sub-Contractor to remit to the authorized bank, Employee's State Insurance Corporation Account, the Employee's contribution as required by the Act. The Contractor agrees to maintain all Cards and records as required under the Act in respect of employees and the payments and the Contractor shall secure the Contract of the subContractor to maintain such records. Any expenses incurred for the contribution, making contribution or maintaining records shall be to the Contractor's or sub-Contractor account.

The Project Sponsor shall retain such sum as may necessary, from the total Contract value until Contractor shall furnish satisfactory proof that all contributions as required by the Employees State Insurance Act, 1948, have been paid.

(b) Workman's Compensation and employee's Liability Insurance:

Insurance shall be effected for all the Contractor's employees engaged in the performs of this Contract, if any of the work is sublet, the Contractor shall require the sub-Contractor to provide workman's compensation and employer's liability Insurance for the latter's employees if such employees are not covered under the Contractors insurance.

(c) Any other Insurance Required under Law or Regulations or by Project Sponsor:

Project Sponsor shall cover Project Material and Equipments under and over all other Insurance Policies. Contractor shall carry and maintain any and all other insurance which be required under any law or regulation from time to time. He shall also carry and main any other insurance which may be required by the Project Sponsor.

(d) Automobile Liability Insurance:

Contractor shall take out an Automobile Liability Insurance to cover all risks to Project Sponsor for each of his vehicles plying on works of this Contract and these insurance shall be valid for the total Contract period. No extra payments will be made for this insurance. Project Sponsor shall not be liable for any damage or loss not made good by the insurance SCTL, should such damage or toss result from unauthorised use of the vehicle.

### **1.75. DAMAGE TO PROPERTY:**

- (a) Contractor shall be responsible for making good, to the satisfaction of the Project Sponsor any loss of and any damage to all structures and properties belonging to the Project Sponsor or being executed or procured or being procured by the Project Sponsor or of other agencies within the premise all the work of the Project Sponsor, if such loss or damage is due to fault and/or the negligence willful acts or omission of Contractor, his employees, agents, representative or \ sub-Contractor.
- (b) The Contractor shall indemnify and keep the Project Sponsor harmless of all claims for damage to property other than Project Sponsor's property arising under or by reason of this Contract if such claims results from the fault and/or negligence or willful acts or omission of Contractor, his employees, agents, representatives or sub-Contractors.

### **1.76. LABOUR LAWS:**

- (a) No labour below the age of eighteen years shall be employed on the work.
- (b) The Contractor shall not pay less than what is provided under the Minimum Wages Act as applicabale for the Kerala for the applicable trade or category of workman to the worker engaged by him on the work and also ensure that any sub-Contractors engaged by him also pay not below the applicable minimum wages under the Act and hold the SCTL, indemnified in respect of any claims that may arise in respect or non-compliance with this requirements.
- (c) The Contractor shall observe all the formalities required under the provisions of the Contract labour (Regulation and abolition) Act 1970 and the rules made thereunder and as may be amended from time to time. He shall pay the required deposit under the Act Appropriate to the number of workmen to be employed by him or through sub-Contractor and get him self registered under the Act. He shall produce the certificate of registration granted by the Govt. authority under the Act to the SCTL before commencement of work. The SCTL recognises only the Contractor and not his sub-Contractors under the provisions of the Act. The Contractor will have to submit daily a list of his employees, who will be entering the SCTL's premises for the work awarded. He will also keep his wage register available at all times as close to the work site as possible and produce the same for inspection whenever required by designated SCTL officials. If the SCTL so desires, a deposit may be taken from the Contractor to be refunded only after the SCTL is satisfied that all the workmen employed by the Contractor have been fully paid for the period of work in SCTL's premises at least at rates equal to or better than wages provided for under the Minimum Wages Act.

- (d) The Contractor will comply with the provisions of the employee's Provident Fund Act and the Family Pension Fund Act, The Employees State Insurance Act 1948, as may be applicable and as amended from time to time. Contractor shall obtain their own provident fund account number. Offer of the Contractor who does not have provident fund account will be liable for rejection.
- (e) The Contractor will comply with the provisions of the Payment of Gratuity Act 1972 as may be applicable and as amended from time to time.
- (f) The Contractor acknowledge the statutory right of the Project Sponsor (as a Principle Employer) to recover the amount of the contributions, paid by it in the first instance in respect of the employees employed by or through him (the Contractor), as well as the employee's contribution, if any, either by deduction from any amount payable to him by the Project Sponsor under any Contract or as debt payable by him to the Project Sponsor.

**1.77. IMPLEMENTATION OF APPRENTICES ACT 1961:**

The Contractor shall comply with provisions of the Apprentices Act 1961 and the Rules/orders issued thereunder from time to time. If he fails to do so, his failure will be breach of the Contract and the SCTL may, at his discretion, cancel the Contract. The Contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provision of the act.

**1.78. CONTRACTOR TO INDEMNIFY THE PROJECT SPONSOR:**

- (i) The Contractor shall indemnify the Project Sponsor and every member, officer and employee of the Project Sponsor, also the SCTL and his staff against all actions, proceedings, claims, demands, costs, and expenses whatsoever arising out of or in connection with the matters referred to in clauses hereof of this Contract and all actions/ proceedings, claims, demands, costs and expenses which may be made against the Project Sponsor for or in respect of or arising out of any failure by the Contractor in the performance of his obligations under the Contract documents. The Project Sponsor shall not be liable for or in respect of any demand or compensation payable by law in respect of or in consequence of any accident or injury to any workmen or other person in the employment of the Contractor or his sub-Contractor and Contractor shall indemnify and keep indemnified the Project Sponsor against all such damages and compensations and against all claims, damage, proceedings, costs, charges and expenses whatsoever, thereof or in relation thereto.
- (ii) **Payment of Claims and Damages:**  
Should the Project Sponsor have to pay any money in respect of such claims or demands as aforesaid the amount so paid and the costs incurred by the Project Sponsor shall be charged to and paid the Contractor and the Contractor shall not

be at liberty to dispute or question the rig of the Project Sponsor to make such payments notwithstanding the same may have been made without his consent or authority or in law or otherwise to the country.

In every case to which by virtue of the provisions of Section 12, sub-section (1) of workmen's compensation Act 1923 or other applicable provisions of workmen's Compensation Act any other Act, the Project Sponsor is obliged to pay compensation to a workmen employed by Contractor in execution of the works, the Project Sponsor will recover from the Contractor the amount of compensation so paid and without prejudice to the rights of Project Sponsor under Section 12 sub-section (2) of the said Act. Project Sponsor shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due to the Contractor whether under the Contract or otherwise. The Project Sponsor shall not be bound to contest any clime made under Section 12, sub-section (1) of the said Act except on the written request of Contractor and upon his giving to the Project Sponsor full security for all costs for which the Project Sponsor might become liable on consequence of contesting such claims.

(iii) Employment Liability:

(a) The Contractor shall be solely and exclusively responsible for engaging or employing persons for the execution of work. All employees engaged by the Contractor shall be on his/ their payroll and paid by him/ them. All disputes or differences between the Contractor and his/ their employees shall be settled by him/ them. The Project Sponsor has absolutely no liability whatsoever concerning the employees of the Contractor. The Contractor shall indemnify Project Sponsor against all loss or damage or liability arising out of or in the course of his/ their employees. The Contractor shall make regular and full payment of wages without giving any complaint by any employee of the Contractor or his sub-Contractor regarding non-payment of wages/ salaries or other dues. The Project Sponsor reserves the right to make such payments directly, to such employee or sub-Contractor of the Contractor and recover the amount in full from the bills of Contractor, and the Contractor shall not claim any compensation or reimbursement thereof. The Contractor shall comply with the Minimum Wages Act applicable to the area with regard to payment of wages of his employees and also of employees of his sub-Contractor.

(b) The Contractor shall advise in writing to all of his employees and the employees of his sub-Contractor as follows:

It is fully understood that your appointment and/ or deployment is only in connection with the Project Sponsor and it does not give you any right of claim for employment by Project Sponsor.

#### **1.79. HEALTH AND SANITARY ARRANGEMENTS FOR WORKERS:**

In respect of all labour directly employed in the works for performance of the Contractor's part of this Contract, the Contractor shall comply with or cause to be complied with all the rules and regulations of the local sanitary and other authorities or as framed by the Project Sponsor from time to time for the protection of health and sanitary arrangements for all workers.

#### **1.80. SAFETY REGULATIONS:**

- (i) In respect of all labour, directly or indirectly employed in the work for the performance of Contractor's part of this Contract, the Contractor shall at his own expenses arrange for all safety provisions as per safety codes of Kerala PWD, other departments of Kerala government, Project Sponsor, C.P.W.D. Indian Standard Institution, the Electricity Act, The Mines Act and any such other acts as applicable in India.
- (ii) The Contractor shall ensure that he, his sub-Contractor and his, or their personnel or representatives shall comply with all Fire / Safety regulations issued from time to time by the SCTL or otherwise howsoever and should any injury resulting in death or not or loss / or damage due to Fire to any property or a portion thereof, occurred as a result of failure to comply with such regulations, the Contractor shall be held responsible for the consequences thereof and shall keep the SCTL harmless and indemnified.

#### **1.81. ARBITRATION:**

- (a) Any dispute or difference of any nature whatsoever, any claim, cross-claim, counter-claim or set off of Project Sponsor against the Contractor or regarding any right, liability, act, omission on account of any of the parties hereto arising out of or in relation to this Contract shall be referred to the sole Arbitration of the Chief Executive Officer, SCTL (herein after named as CEO) of the Project Sponsor or of some officer of the Project Sponsor who may be nominated by the concerned CEO. The Contractor will not be entitled to raise any objection to any such arbitrator on the ground that the arbitrator is an Officer of the Project Sponsor or that he has dealt with the matters to which the Contract relates or that in the course of his duties as an Officer of the Project Sponsor he had expressed views on all or any other matters in dispute or difference. In the event of the arbitrator to whom the matter is originally referred being transferred or vacating his office or being unable to act for any reason, the CEO as aforesaid at the time of such transfer, vacation of office Or inability to act may in the discretion of the CEO designate another person to act as arbitrator in accordance with the terms of the Contract to the end and intent that the original Arbitrator shall be entitled to continue the arbitration proceedings notwithstanding his transfer or vacation or office as an Officer of the Project Sponsor if the CEO does not

designate another person to act as arbitrator on such transfer, vacation of office or inability of original arbitrator. Such persons shall be entitled to proceed with the reference from the point at which it was left by his predecessor. It is also a term of this Contract that no person other than the CEO or a person nominated by such CEO of the Project Sponsor as aforesaid shall act as arbitrator, hereunder. The award of the arbitrator so appointed shall be final conclusive and binding on all parties to the Contract subject to the provisions of the Arbitration and Conciliation Act, 1996 or any statutory modification or re-enactment thereof and the rules made thereunder for the time being in force shall apply to the arbitration proceedings under this clause.

- (b) The arbitrator shall have power to order and direct either of the parties to abide by, observe and perform all such directions as the arbitrator may think fit having regard to the matters in difference i.e. dispute before him. The arbitrator shall have all summary powers and may take such evidence oral and/ or documentary, as the arbitrator in his absolute discretion thinks fit and shall be entitled to exercise all powers under the Arbitration and Conciliation Act, 1996 including admission of any affidavit as evidence concerning the matter in difference i.e. dispute before him.
- (c) The parties against whom the arbitration proceedings have been initiated, that is to say the Respondents in the proceedings, shall be entitled to prefer a cross-claim, counter-claim or set off before the Arbitrator in respect of any matter an issue arising out of or in relation to the Contract, without seeking a formal reference of arbitration to the CEO for such counter-claim, cross or set off and the Arbitrator shall be entitled to consider and deal with the same as if the matters arising therefrom has been referred to him originally, and deemed to form part of the reference made by the CEO.
- (d) The arbitrator shall be at liberty to appoint, if necessary, any accountant or engineering or other technical person to assist him and to act by the opinion so taken.
- (e) The arbitrator shall have power to make one or more awards whether interim or otherwise, in respect of the dispute and difference and in particular will be entitled to make separate awards in respect of claims or cross-claims of the parties.
- (f) The arbitrator shall be entitled to direct any one of the parties to pay the costs of the other party in such manner and to such extent as the arbitrator may in his discretion determine and shall also be entitled to require one or both the parties to deposit funds in such proportion to meet the arbitrators' expenses whenever called upon to do so.
- (g) The parties hereby agree that the courts in the city of Ernakulam, alone shall have jurisdiction to entertain any application or other proceedings in respect of

anything arising under this Contract and any award or awards made by the Sole Arbitrator hereunder shall be filed in the concerned courts in the city of Ernakulam, only.

#### **1.82. Jurisdiction**

The Contractor shall be governed by the Laws in force in India. The Contractor hereby submits to the jurisdiction of the Courts situated at Thiruvananthapuram, for the purpose of actions and proceedings arising out of the Contract and the courts at Thiruvananthapuram, only will have jurisdiction to hear and decide such actions and proceedings.

#### **1.83. Inspection of site**

The Contractor has been given an opportunity before or at the time of the entrusting of the work to him of making an inspection of the site to set at rest any doubt he may have had about the difficulties attending his offer, and any difficulties which may be met with by him in the course of the execution of the work shall neither relieve him from fulfilling the terms of this Contract, nor entitled him to claim extra payment or an extension of the period stipulated for the completion of the work, except where it will be agreed by the SCTL's authorized Engineer that such difficulties could not have been foreseen.

#### **1.84. Supply of Labour and Materials:**

The Contractor shall furnish all labour, materials, equipment or tools necessary for the construction of the work, except such materials, equipment or tools as will be supplied by the SCTL and are detailed in Purchase order/Contract. The Contractor will assume full responsibility for the protection and safety of the work during its construction. The details and dimensions shown on the said plans referred to in the Purchase order/Contract shall be strictly adhered to by the Contractor and no alterations shall be made therein unless previous sanction thereto has been given in writing by the SCTL.

- (a) The Contractor shall prepare detailed and shop drawings and any other data required.
- (b) All materials supplied by the Contractor shall be of the best quality. The Contractor shall at his own cost arrange for and/or carry out any test of materials, which the SCTL's authorized Engineer may require.
- (c) The Contractor shall at the request of the SCTL's authorized Engineer immediately dismiss from the work any person employed thereon who, in the opinion of the SCTL's authorized Engineer, is unsuitable or incompetent or who, has been guilty of misconduct, and such person shall not again be employed or allowed on the works without the permission of the SCTL, in writing.

**1.85. E. & O. E.** No advantage is to be taken by the Contractor of any clerical error or mistake, which may occur in the specification, schedule of rates, plans, Contract or any other papers supplied to or by the Contractor in connection with the work.

**1.86. Damage on account of Incomplete work:** The Contractor shall commence the work and shall complete the work as mentioned in Purchase order/Contract failing which the Contractor shall pay or allow to the SCTL to recover as liquidated damages, at the rate of minimum 0.5% per week of delay or part there of up to a maximum of 10 % of the total Contract value, if Liquidated damages clause is made applicable in the Contract. Such damages may be deducted by the SCTL from any amount due to the Contractor; otherwise they shall be recoverable by lawful means.

**1.87. Determination of the Contract:**

(a) The SCTL shall, at any time, be entitled to determine and terminate the Contract, if in the opinion of the SCTL, the cessation of the work becomes necessary owing to paucity of funds or for any other cause whatsoever. On such determination / termination, the cost of approved materials, brought by the Contractor and lying at the site, at current market rates as verified and approved by SCTL's engineer and of the value of the work done to date by the Contractor shall be paid for in full at the rate specified in the Contract. A notice in writing from the SCTL to the Contractor of such determination and termination and reasons therefore shall be the conclusive proof of the fact that the Contract has been so determined and terminated by the SCTL.

The Contractor shall not be entitled to get any possible loss of profit that he could have earned had the Contract been not determined / terminated under the above clauses of this article.

Should the Contract be determined as above and the Contractor claims payment to compensate expenditure incurred by him in the expectation of completing the work, the SCTL shall consider and admit such claim as are deemed fair and reasonable and are supported by the vouchers to satisfaction of the SCTL. The SCTL's decision on the necessity and propriety of such expenditure shall be final and conclusive and binding on the Contractor.

(b) **Termination/Offloading:** The Contractor fully understands that timely completion of the work as per the schedule is of paramount necessity as otherwise it would lead to adversely affecting the schedules of other works/project with resultant financial and other losses to the SCTL. In view of this, the Contractor unconditionally agrees and binds himself to be liable for all the consequences for non-completion of the work within the stipulated time.

In case a situation is brought about by the Contractor warranting termination/off-loading of the whole or any part of the work for any reason whatsoever, the SCTL shall have the liberty and right to entrust/engage/award the work so terminated off

loaded at the risk and cost of the Contractor to any other agency/Contractor by adopting any mode of inviting tenders, i.e. open/limited/single party/negotiation basis etc. in order to ensure completion of the work as per the schedule or at the quickest possible time.

**1.88. Defective Work/ Materials:**

If the work done by the Contractor or any part thereof shall be found defective in workmanship or by reason of bad or inferior materials used, then in such case he shall at his own risk and cost without delay, demolish all such defective work and rebuild or replace the same in a satisfactory manner. The SCTL may, if necessary, at the cost and risk of the Contractor, temporarily stop all other activities by the Contractor in connection with the work until such time as the defective work has been rebuilt or replaced at the Contractor's cost. In case of default on the part of the Contractor to remove defective work and rebuild or replace the same without delay and in a manner satisfactory to the SCTL, the SCTL shall be entitled to employ another Contractor or its own workman to carry out the removal and rebuilding or replacing at the risk and cost of the Contractor.

**1.89. Substitution of Contractor:**

If the SCTL finds it necessary to employ a person or persons for the purposes provided in clauses of this Contract, then the SCTL may deduct and retain from out of the sums due to the Contractor all such amounts as they may require to pay or to reimburse themselves there from in respect of the costs and expenses which they have incurred in completing the work and or in removing defective work and rebuilding or replacing the same in a manner satisfactory to the SCTL and if such amounts be more than the sums due or thereafter becoming due to the Contractor, than the balance, shall be a debt recoverable from the Contractor by the SCTL. The Contractor shall not in any manner do or cause to be done any act, matter or things whatsoever to prevent the person or persons so employed by the SCTL from removing defective work and rebuilding or replacing the same in a manner satisfactory to the SCTL and/or from, completing the work in the manner aforesaid.

**1.90. Removal of Material:**

On the Determination of the Contract as referred to in clause 1.86, the Contractor shall at his own risk and cost remove from site within Seven days all his materials, equipment and tools. It is agreed that in case of such determination the SCTL shall be entitled to purchase from the Contractor such materials as will be approved by the Authorized Engineer of the SCTL at the prices then current. If the Contractor does not remove the other materials, equipment and tools which he has been asked to remove within the time prescribed as aforesaid, the SCTL may remove and sell the same holding the proceeds less the cost of storage, removal and sale to the credit of the Contractor. Should SCTL incur any loss in respect of the sale, it shall be entitled to recover same from the Contractor.

**1.91. Inspection of work:**

Inspection will be made periodically during the progress of the work by the authorized engineer of the SCTL and all work performed must be of acceptable quality of which the said SCTL will be the sole judge.

**1.92. Supervision:**

The Contractor shall during the whole time the work is in progress, employ one or more competent and technical English speaking Supervisors acceptable to the SCTL's authorized engineer, one of whom at least shall be in constant attendance at the site while persons are at work there. Any directions, explanations, instructions, or notices in connection with the work given by the SCTL's authorized Engineer to these Supervisors shall be deemed to have been given to the Contractor.

**1.93. Payment:**

The SCTL, in consideration of the Contractor carrying out and completing the said work at the SCTL's said site, to the satisfaction of the SCTL, shall pay the Contractor as per the said schedule of Rates, subject to deductions, retentions and abatements, if any to be made therefrom in accordance with the provisions of this Contract. During the progress of the work and provided the work is progressing according to the time-table laid down to the Contractor, the Contractor shall be entitled once a month to receive advance payment on the above mentioned sum proportionate to such part of the work as shall have been executed during the preceding month but only after such part of the work as has been executed has been inspected and approved by the SCTL's authorized Engineer. From such interim payments each time 10% will be withheld as Security deposit and this 10% will be paid to the Contractor after the defect liability period, provided that any defects appearing during that period are corrected by him. OR

100% payment will be made on the basis of actual executed quantities after satisfactory completion and due certification by Project Sponsor's SCTL. In lieu of 10% Retention money towards Security deposit, Contractor shall submit bank guarantee of equivalent amount of retention money (10% of Contract Price) before submission of 1st Running Account (RA) bill valid for defects liability period specified. Further, the Bank Guarantee shall have a claim period of six months beyond the date of expiry, and the same shall be mentioned clearly in the Bank Guarantee.

**1.94. Defects after Completion:**

Any defects which may appear within the defect liability period specified shall, upon the directions in writing of the SCTL and within such reasonable time as shall be specified therein be amended and made good by the Contractor, at his own cost unless the SCTL shall decide that the Contractor will be paid for such amending and making good, and in case of default on the Contractor's part, the SCTL may amend and make good or have amended and made good such defects and all damages, losses and expenses consequent thereon, incidental to those shall be borne by the Contractor and such damages, losses and expenses shall be recoverable from him by the SCTL or may be deducted by the SCTL from any moneys due to or thereafter becoming due to the Contractor. Alternatively, the SCTL may, in lieu of such amending and making good by the Contractor elect to deduct from any moneys due or thereafter becoming due to the Contractor a sum to be determined by the SCTL sufficient to cover the cost of amending and making good such defects, and in the event of the amount withheld in accordance with clause 1.92 being insufficient, recover the balance from the Contractor together with any expenses the SCTL may have incurred in connection with such recovery. Should any defective work have been done or bad inferior materials supplied by any Sub-Contractor employed on the work, has been approved by the SCTL as provided in clause 1.95, the Contractor shall be liable to amend and make good in the same manner as if such work or materials had been done or supplied by the Contractor. The Contractor

shall remain liable under this Clause notwithstanding the signing by the SCTL's authorized Engineer of any certificate or the passing of any account.

**1.95. Alterations:**

The SCTL reserves the right at any time to alter any quantities of any item indicated in the Purchase order/Contract, in which case the total amount payable to the Contractor shall be less or higher, proportionate with the reduction or increase in quantity of such item, allowance for which will be made at the Contractor's agreed rates.

**1.96. Subletting Contract:**

The Contractor shall not sublet or assign the work or any part thereof to another party without the written consent of the SCTL and no such subletting or assignment shall relieve the Contractor from the full and entire responsibility of his obligation under this Contract.

**1.97. Cancellation:**

The SCTL shall at any and all times during the period stipulated for the work, has the right forthwith to cancel this Contract by giving written notice thereof to the Contractor and in such case the Contractor shall be paid for such part of the work as has been executed by him up to the date of cancellation, on the basis of schedule of rates as per Purchase order/Contract and shall be reimbursed by the SCTL for the cost and expenses incurred by him but which would now be wasted as a direct consequence of the cancellation of the Contract.

**1.98. Workmen's Compensation Liability:**

The Contractor shall hold the SCTL harmless and indemnified from and against all claims, costs and charges for which the SCTL shall be liable under the Workmen's Compensation Act, 1923 and any amendments thereof and the expenses to which it shall be put thereunder, both in respect of personal injuries (within the meaning of the said Act) to the employees and servants of the Contractor or Sub-Contractors, (if any), arising out of, or occasioned during the currency of this Contract through the acts or omissions, whether due to negligence or not of the Contractor, Sub-Contractor and/or SCTL and/or their respective servants and employees and also in respect of the personal injuries (within the meaning of the said Act) to the servants and employees of the SCTL arising out of, or occasioned through the acts and omissions whether due to negligence or not of the Contractor, Sub-Contractor and or their servants and employees in carrying out any of the provisions of this Contract. This indemnity shall be in addition to and not in lieu of any indemnity to which the SCTL shall be entitled in law. The Contractor shall at his own expense effect and maintain, until the completion of the work, with an approved office a Policy of Insurance in the joint names of the SCTL and the Contractor, against such risks and deposit such Policy or policies with the SCTL from time to time during the currency of this Contract. The Contractor shall be responsible for anything

not included in the Insurance Policies above referred to and also for all other damage to person or property arising out of or incidental to the negligent or defective carrying out of this Contract and shall keep the SCTL harmless and indemnified. He shall also indemnify the SCTL in respect of any costs, charges or expenses arising out of any claim or proceedings and also in respect of any award of compensation or damages arising therefrom. The SCTL shall be entitled to deduct the amount of any damages compensation costs, charges and expenses arising or accruing from or in respect of any such claim or damages from any sum or sums due or thereafter becoming due to the Contractor.

**1.99. Safety Regulation:**

The Contractor shall ensure that he/his Sub-Contractor and his, or their personnel or representatives shall comply with all safety regulations issued from time to time by the SCTL or otherwise howsoever and should any injury resulting in death or not or damage to any property occur as result of failure to comply with such regulations the Contractor shall be held responsible for the consequences thereof, shall keep the SCTL harmless and indemnified.

**1.100. LOCATION OF SITE AND SCOPE OF WORK**

Location of Site and Scope of Work has been given in Scope of Work.

**1.101. PAYMENTS**

Payments shall be released location-wise and based on the actual capacity of the Solar PV Plant installed in that location, in the following manner after furnishing of Security cum Performance Bank Guarantee by the bidder and signing of Contract as per provisions of bidding document:

Considering the above condition, the following payment terms will be applicable for the respective scope:-

For solar plant at each location:

The price quoted is exclusive of Goods and Services Taxes as applicable

(i) Payment terms

- 1) 5% on confirmation and approval of the confirmatory survey, design and drawings, work plan etc required to implement the Project.
- 2) 25% on supply of all requisite materials at respective sites/locations as approved by the SCTL prorated for each site/location.
- 3) 10% on installation, testing and commissioning for each site/location as approved by the SCTL prorated for each site/location.
- 4) 30% on system acceptance by the SCTL , based on completion report of the Project as certified by the SCTL.

- 5) 20% of the remaining amount site wise to be paid, after six months of successfully running of the Project.
- 6) 10% of the total amount remaining shall be retained as security deposit till completion of Defects Liability Period.
- 7) O&M cost quoted for each of five years shall be paid in quarterly instalments on successful operation of the Project and verification of the submitted bills by the Contractor to the SCTL.

If there is any increase or decrease in the capacity, then the payment will be done based on the per kWp rate quoted.

Payment shall be made based on the location wise progress.

Due to uncertain reason if any of the power plant installation is not happened then the payment for the particular location will not be released.

### **1.102. Contractor Guarantee/Warranties**

- (a) Contractor must warrant that they shall perform the work in a first class, workmanlike and professional manner and in accordance with the highest degree of quality, efficiency, and with the state of the art technology and in conformity with all specifications, standards and drawings set forth or referred to in the Terms of Reference and with instructions and guidance which Project Sponsor may, from time to time, furnish to the Contractor.
- (b) The Contractor guarantees that the Goods or Materials supplied under the Contract are new, unused, of the most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in the Contract. The Contractor further warrants that the goods supplied under this Contract shall have no defect arising from design, materials or workmanship.
- (c) No deviation from such specifications or alterations or of these conditions shall be made without Contract with the Project Sponsor in writing, which must be obtained before any work against the order is commenced. All materials supplied by the Contractor pursuant to the Contract (irrespective of whether engineering, design data or other information has been furnished, reviewed or approved by SCTL) are guaranteed to be of the best quality of their respective kinds, (unless otherwise specifically authorized in writing by SCTL) and shall be free from faulty design, workmanship and materials, and to be of sufficient size and capacity and of proper materials so as to fulfill in all respects operating conditions, if any, specified in the Contract.
- (d) In the event that the materials supplied do not meet the specifications and/ or not in accordance with the drawings data sheets or the terms of Contract and rectification is required in site, BPCL shall notify the Contractor giving full details of differences. The Contractor shall attend the site within 3 (three) days of receipt of such notice to meet and agree with representatives of Project Sponsor, the action required to correct the deficiency. Should the Contractor fail to attend meeting at site within the time specified above, Project Sponsor shall immediately rectify the work/ materials and Contractor shall reimburse Project Sponsor all cost and expenses incurred in connection with such trouble or defect. In case the Contractor fails to perform remedial work, the Performance Bank Guarantee shall be invoked.
- (e) The Solar PV module shall have a Power Performance Warranty of 15 years with degradation of power generated not exceeding 10% upto 10 years and not exceeding 20% after 10<sup>th</sup> year of operation and maintenance of the minimum rated power over the 15 years period.
- (f) The guarantee/warranty for the balance material and/or equipment and/or accessories and/or structures shall be for five years from the date of commissioning.

- (g) The OEM's guarantee for all supplied items shall be made available to the Project Sponsor and shall be valid at least for the entire defect liability period.
- (h) If OEM's guarantee is not so available to the Project Sponsor, the Contractor shall guarantee the items supplied for the entire defect liability period. However, in case the OEM's guarantee period is in excess of the defect liability period, such guarantees for such excess period shall be passed on by the Contractor to the Project Sponsor.
- (i) Any material and/or equipment and/or accessories which shall prove defective or which shall fail to meet the desired design guarantee or performance guarantee during the defects liability period, the Contractor shall replace at his own cost. Manufacturer's/ Contractor's guarantee for such replaced equipment shall also be made available to the Project Sponsor and should be kept valid at least for one year from the date of last replacement.
- (j) Project Sponsor reserves their right to call for required guarantee directly by the manufacturer / Contractor's consultant/ Associate/ sub-Contractor through suitable Contract.
- (k) Should the Project Sponsor discover at any time during the tenure of the Contract or within the Performance Liability Period of the Contract that the work carried out by the Contractor does not conform to and perform as per terms & conditions of the Contract, Contractor shall after receipt of notice from SCTL, promptly perform all corrective work required to make the services conform to the Warranty. Such corrective work shall be performed entirely at Contractor's own expenses. If such corrective work is not performed within a reasonable time, the SCTL, at its option, may have such remedial work carried out by others and charge the cost thereof to Contractor, which the Contractor must pay promptly. In case Contractor fails to perform remedial work, the performance security shall be forfeited.
- (l) The Project Sponsor shall be at liberty to realize and enforce payment of the Performance Guarantee for non-fulfillment and unsatisfactory performance of the Contract without any notice or reference to the Contractor.
- (m) The Project Sponsor may, at its option, remove such defective materials, at Contractor's expense in which event Contractor shall, without cost to BPCL and as promptly as possible, furnish and install proper materials. Repaired or replacement materials shall be similarly guaranteed by the Contractor for a period of no less than 12 months from the date of replacement/ repair or five years from the date of commissioning whichever is later.

**1.103. REBATES/EXEMPTION IN DUTIES FROM MNRE**

It is the responsibility of the Contractor to prepare complete project report and other Performa as per Ministry of New and Renewable Energy (MNRE) guidelines and get any concession/rebate including among other things excise duty, custom duty etc. from MNRE, and pass it on the Project Sponsor.

#### **1.104. Discontinuance of the Project Sponsor**

Subject to anything contrary:

- (a) if the Project Sponsor is reconstituted, renamed or replaced, or if its powers or functions are transferred to another entity, this Contract is deemed to refer to that new entity;
- (b) if the Project Sponsor ceases to exist, this Contract is deemed to refer to that entity which serves substantially the same purpose or object as the former entity; and
- (c) notwithstanding any other provision of this Contract, the Project Sponsor may transfer this Contract and any rights under this Contract to any new or substitute entity referred to in Articles 1.111.1(a) and 1.111.1 (b) or any other entity to which the assets created under this Contract is transferred for operation and maintenance purposes or other terms and conditions of this Contract.

#### **1.105. Due Diligence**

The Contractor acknowledges, represents, warrants and undertakes that:

- (a) prior to the Contract Date it has had the opportunity and responsibility to conduct appropriate due diligence for the Project. The Contractor acknowledges that prior to the execution of this Contract, the Contractor has, after a complete and careful examination, made an independent evaluation of the Project scope, the Offer Letter, LOI, Scope of Services, System Requirements, Site, existing structures, local conditions, physical qualities of present and potential locations, and all information provided by the Project Sponsor or obtained procured or gathered otherwise, and has determined to its satisfaction the accuracy or otherwise thereof and the nature and extent of difficulties, risks and hazards as are likely to arise or may be faced by it in the course of performance of its obligations hereunder. The Project Sponsor makes no representation whatsoever, express, implicit or otherwise, regarding the accuracy, adequacy, correctness, reliability and/or completeness of any assessment, assumptions, statement or information provided by it and the Contractor confirms that it shall have no claim whatsoever against the Project Sponsor in this regard and that the Project Sponsor has delivered or made available all documentation, materials and other information, including any other information document the Contractor considers necessary, or which were requested by the Contractor with particularity in writing, to enable it to:

- (i) form the decision to enter into this Contract;
  - (ii) satisfy itself that it is able to perform its obligations under this Contract; and
  - (iii) identify and ascertain the risks associated with the Project.
- (b) no representation or warranty has been given or is given by or on behalf of the Project Sponsor or any person on behalf of any of them as to:
- (i) the potential use of the Project;
  - (ii) the suitability, completeness or efficacy of documentation, materials or other information supplied or made available by any of them, including those related to the Scope of Services and / or any other documentation, materials or other information which relates to the Project; or
  - (iii) all relevant documentation, materials and other information in the possession or control of the Project Sponsor relating to the Project Sponsor or the Project having been provided to the Contractor;
- (c) as between the Parties, it bears the risk that compliance with the Scope of Services will not in itself fulfill the Contractor's obligations under this Contract and accordingly, the Contractor shall undertake any further work required in order to fulfill its obligations under this Contract; and
- (d) it has conducted its own review and evaluation of the suitability and accuracy of the documentation, materials and other information supplied or made available without reliance on the Project Sponsor or any person on behalf of any of them.

**1.106. Non-reliance**

The Contractor acknowledges, represents, warrants and undertakes to the Project Sponsor that it:

- (a) did not rely upon any representation, documentation or other information made available, or provided to it, by the Project Sponsor in entering this Contract, other than for the purposes of Article 1.112 (a); and
- (b) does not rely on any representation or warranty made by or on behalf of the Sponsor which is not set out in this Contract.

**1.107. Omissions or misdescriptions of details**

The Contractor acknowledges and hereby accepts the risk of inadequacy, mistake or error in or relating to any of the matters set forth in the Article 1.112 above and hereby acknowledges that the Project Sponsor shall not be liable for the omission or misdescriptions of details or such things:

- (a) generally acknowledged to be customary and/or necessary to perform works and services in the nature of the Project; or

(b) which the Contractor knew or reasonably should have known and should have included in the Scope of Services,

in any manner, whatsoever to the Contractor or any person claiming through or under any of them. The Contractor shall not be relieved from performing such omitted or misdescribed details relating to the Project, and they shall be performed as if fully and correctly set forth and described in the Project Contracts, without entitlement to a Variation.

- (c) In the event that either Party becomes aware of any mistake or error relating to any of the matters set forth in Articles 1.112 and 1.113 above, that Party shall immediately notify the other Party, specifying the mistake or error; provided, however, that a failure on part of the Contractor to give any notice pursuant to this Article shall not prejudice the disclaimer of the Project Sponsor contained in Article 1.112 and shall not in any manner shift to the Project Sponsor any risks assumed by the Contractor pursuant to this Contract.
- (d) Except as otherwise provided in this Contract, all risks relating to the Project shall be borne by the Contractor and the Project Sponsor shall not be liable in any manner for such risks or the consequences thereof.

**1.108.** If there is any conflict between a direction, instruction or notice given to the Contractor by the Project Sponsor and that given by any other entity including Customer(s), the Contractor shall notify the Project Sponsor of such conflict within one (1) business day of receipt of such notices/instructions/directions. The Project Sponsor shall notify the Contractor of the resolution of the conflict as soon as practicable and the Contractor shall comply with the directions, instructions or notices specified in Project Sponsor's notice.

**1.109.** Subject to this Article, the Contractor shall comply with directions, instructions or notices which are given by an entity including the Project Sponsor/Customers, provided such directions, instructions or notices are given in accordance with this Contract.

**1.110. Contract Period**

The scheduled project completion period is six (6) months from the date of signing of Contract and handing over the buildings to the Contractor for project implementation. After successful commissioning of the project, the solar roof top system shall be operated and maintained remotely with quarterly visit for five years and shall be guaranteed for five years (60 months) period from such commissioning as accepted by the Project Sponsor.

This Contract shall come into effect on execution hereof and, unless terminated earlier or extended in accordance with the provisions hereof, and shall be valid for a period of five (5) years and six (6) months from the Date of Signing of the Contract.

Provided that in the event of the Contract being extended by the Project Sponsor beyond aforesaid period, the Contract Period shall include the period/ aggregate period by which the Contract is so extended;

Provided further that in the event of Termination, the Contract Period shall mean and be limited to the period commencing from the Contract Date and ending on the Termination Date.

**1.111.** The Contract may be renewed by the Project Sponsor, at its sole and absolute discretion, by giving the Contractor a written notice one hundred and eighty days (180) days prior to the Expiry, for up to two additional periods each of two (2) years duration. The Contractor shall be under obligation to discharge its Scope of Services during such additional periods on same terms and conditions as provided herein unless otherwise agreed by the Project Sponsor.

**1.112.** The Contract may be further renewed by the Project Sponsor, at its sole and absolute discretion, by giving the Contractor a written notice one hundred and eighty days (180) days prior to the Expiry, for any additional period(s) on mutually agreed terms.

**1.113.** The Contract may be amended with the mutual Contract of both the Parties at any time during the Contract Period or after the issued date of acceptance of letter of acknowledgement till upto the Contract Period, whichever is earlier.

**1.114. Relation between the Parties**

(a) Fundamental obligation

The Contractor shall discharge its Scope of Services in accordance with this Contract.

**1.115. Review by the Project Sponsor**

(a) Notwithstanding any other provision of this Contract, any:

- (i) review of, comment upon or input into any System Documents or any other documents by any Entity including the Customer or any person on their behalf;
- (ii) inspection or testing by any Entity or any person on its behalf; or
- (iii) information set out in any Schedule or other document attached to, or included within a Schedule,

shall not:

- (iv) relieve the Contractor of its responsibility for such System Documents or of its obligations or liabilities under this Contract;
- (v) evidence or constitute an extension of time or a direction by the Project Sponsor to accelerate, disrupt, prolong or vary any, or all, of the Project; or;
- (vi) affect the rights of the Project Sponsor or obligations of the Contractor under this Contract including the time for performance of the Project Sponsor's or the Contractor's obligations under this Contract.
- (vii) Notwithstanding any other provision of this Contract, a failure by the Entities or any person on their behalf to inform the Contractor of any defect in or concern associated with any such System Document or following any such inspection or testing will not relieve the Contractor of its liabilities, or

constitute a waiver of any of the Project Sponsor's rights, under this Contract.

**1.116. No Partnership**

Nothing contained in this Contract shall be construed or interpreted as constituting a partnership, joint venture or agency between the Parties. No Party shall have any right or authority to represent on behalf of the other nor shall any such representation to third party (ies) bind the other in any manner whatsoever. This Contract is being entered into on a principal to principal basis. The Contractor shall be an independent Contractor and is fully independent in performing any/all its Scope of Services. The Contractor shall not act or hold itself out as a servant or employee of the Project Sponsor.

**1.117. Non-Exclusiveness**

This Contract is being entered into by the Parties on a non-exclusive basis. The Parties shall be free to work or associate with any third party and enter into any Contract, Contract, joint venture, partnership or an arrangement of whatsoever nature with respect to the matters covered in the Contract.

- (a) Notwithstanding the provisions of this and notwithstanding any sub-Contract or approval to sub-Contract work, the Contractor remains bound by the Contractor's obligations under this Contract to discharge the Scope of Services in accordance with this Contract and will be liable for all acts, omissions and defaults of its Sub-Contractors, all Contractor personnel and any other persons performing work relating to, or in any way connected with, the Project, as if such acts, omissions or defaults were its own acts, omissions or defaults.
- (b) The Contractor shall obtain and ensure the Project Sponsor has the benefit of warranties and guarantees from Sub-Contractors with respect to each relevant part of the Project.
- (c) The Contractor shall submit a signed written statement in a form which complies with the Applicable Laws or otherwise required by the Project Sponsor confirming that it has paid all amounts payable to, or in connection with, its employees and Sub-Contractors for work undertaken in relation to this Contract with each payment claim or invoice.
- (d) Each statement submitted by the Contractor shall be in respect of all Work which is the subject of the relevant payment claim or invoice. The Project Sponsor is not obliged to make any payment to the Contractor under this Contract unless the Contractor has complied with its obligations under this Contract.
- (e) Where the Project Sponsor is liable for any amount under the Applicable Laws in respect of a Sub-Contractor or employee of the Contractor, the Contractor will be liable to pay the same amount as a debt due and payable to the Project Sponsor within five (5) Working Days of demand by the Project Sponsor.

#### **1.118. Site and Access**

- (a) The site location(s) is described in the Scope of Work. The Contractor should inspect the site and make himself familiar with site conditions and available facilities. Non-availability of access roads or permits for entry of vehicles/equipment to any specific area shall in no case be the cause to condone any delay in execution of works or be the cause for any claims or extra compensations. Subject to and in accordance with the provisions of this Contract, the Contract hereby granted shall oblige or entitle (as the case may be) the Contractor to Right of Way, access and licence to the Site for the purpose of and to the extent conferred by the provisions of this Contract.
- (b) The Project Sponsor agrees to provide support to the Contractor in procuring procure that no barriers are erected or placed on or about the Project Sites by any Government Instrumentality or persons claiming through or under it, except for reasons of Emergency, national security, law and order or as such necessary as in the interest of the Project.

- (c) The Project Sponsor agrees to the use its best endeavours to facilitate the provision of Access to the Contractor in a timely manner to enable the Contractor to meet the Project Implementation Schedule and Detailed Project Schedule including access to the Site for carrying out any surveys, investigations and tests that the Contractor may deem necessary during the Contract Period, it being expressly agreed and understood that the Project Sponsor shall have no liability whatsoever in respect of survey, investigations and tests carried out or work undertaken by the Contractor on or about the Site pursuant hereto in the event of Termination or otherwise. In this regard, the Project Sponsor shall act reasonably and fairly in good faith having regard to the interests of Project Sponsor, the Project, the Entities, the Stakeholders, and the Contractor.
- (d) The Contractor shall bear all costs and charges for any special or temporary right of way required by it in connection with access to the Site. The Contractor shall obtain at its cost such facilities on or outside the Site as may be required by it for the purposes of the Project and the performance of its obligations under this Contract.
- (e) The licence, right of way and right to the Site granted to the Contractor hereunder shall always be subject to the right of access of the Project Sponsor, Entities and its representatives and their employees and agents for purposes of this Contract including inspection, viewing and exercise of their rights and performance of their obligations under this Contract.
- (f) The Contractor agrees to use its best endeavours to cooperate with Entities, Customers in installing Devices in a way which reasonably minimises adverse impacts to such Customers.
- (g) The Project Sponsor shall use best endeavours to facilitate the provision of Access to the Contractor from additional persons to the extent that access to their property is required for the Contractor to perform the work in terms of this Contract.
- (h) The Contractor shall co-ordinate and manage all Access it requires to carry out the Scope of Services.
- (i) The Contractor acknowledges and warrants that prior to entering into this Contract, it has carried out all investigations and examinations necessary in respect of the adequacy of the existing Entities'/Customers' Property and it is satisfied that the existing and potential Entities'/Customers Properties are adequate or expected to be adequate and sufficient for the Project and for it to carry out the work and satisfy its obligations under this Contract, including in accordance with the System Requirements and the System Documents.
- (j) The Contractor makes no representation or warranty to the Contractor as to the adequacy or sufficiency of each Entities'/Customers' Property.

- (k) The Contractor shall procure, for the Project Sponsor and its employees and agents, full access to any Site where work is being carried out, at all times during the Contract Period. The Project Sponsor agrees that any person accessing any such Site shall comply with the Contractor's normal safety and security procedures and shall not unduly interfere with the performance of work being undertaken on the Site. To the extent possible, reasonable advance notice shall be given of the Project Sponsor's intention to access a Site.
- (l) The Contractor agrees that, at all times, the Project Sponsor or any person authorised by it shall:
  - A. subject to normal safety and security constraints as notified by the Contractor, have the right of access during business hours or on reasonable notice to:
    - i. all of the Contractor's design offices involved in the design of the System;
    - ii. the Sites where the work is being carried out; and
    - iii. all other areas relevant to the work; and
    - iv. be entitled to exercise this right of access for the purposes of:
      - 1. observing the work and monitoring compliance by the Contractor with its obligations under this Contract including the System Requirements;
      - 2. undertaking progress inspections of the System by the Project Sponsor; and
      - 3. any other reason relating to the System or this Contract.

**1.119. Quality, Testing and Inspection**

- (a) The Contractor shall undertake comprehensive inspection, testing and evaluation of all parts of the Project in accordance with the System Requirements and System Documents, in a controlled and transparent manner, to demonstrate that the Project complies with each requirement of this Contract.
- (b) Strict compliance with the approved and proven quality assurance norms and procedures during the different phases of the project.
- (c) Contractor will submit and get finalized detailed comprehensive Standard Field Quality Plan (SFQP) within 30 days from date of issue of the order for bought out items and items manufactured by them. The Standard Field Quality Plan shall relate to the specific and objective erection practices right from storage of equipment till final inspection and testing to be followed for bought out items and items manufactured by Contractor.
- (d) The quantum of check for each and every inspection/test items shall be based on an established sampling method and the quantum of check indicated in the SFQP should be designed adequate quality protection.

- (e) The Contractor will allow the Project Sponsor to carry out Quality/Audit/Quality surveillance on bidders and our sub-Contractor's work with reference to Contractual obligations to ensure that the quality management practices/norms as detailed out in the Quality Manual are adhered to. To facilitate this activity, the Contractor shall keep the Project Sponsor informed all progress of work in this Contract on monthly basis.
- (f) The Project Sponsor shall also carry out quality audit and quality surveillance of the systems, procedures and quality control activities. However, this shall not relive the Contractor of any of Contractual responsibilities under the Contract.
- (g) The Contractor shall be responsible for ensuring that works throughout are executed in the most substantial, proper and workman like manner with the quality of material and workmanship in strict accordance with the specifications following all safety requirements of the Project Sponsor and as stipulated in work permits as per the directions and to the entire satisfaction of the Project Sponsor.
- (h) All workmanship shall be of the respective kinds described in the Contract documents and in accordance with the instructions of the Project Sponsor and shall be subjected from time to time to such test at Contractor's cost as the Project Sponsor may direct at place of manufacture or fabrication or on the site or at all or any such places. The Contractor shall provide assistance, instruments, labour and materials as are normally required for examining, measuring and testing any workmanship as may be selected and required the Contractor.

**1.120. Notices**

All communications (including notices, consents, approvals, requests and demands) under or in connection with this Support Contract,

- (a) shall be in writing;
- (b) shall be addressed as follows (or as otherwise notified by that Party to each other Parties from time to time):

<b>If to Smart City Thiruvananthapuram Limited:</b>	<b>If to Contractor:</b>
Chief Executive Officer, SMART CITY THIRUVANANTHAPURAM LTD. 4th Floor, Annexe Building, Municipal Corporation of TVPM, Vikas Bhavan Kerala – 695 033, India Tel:+91-471 -2339944 <a href="mailto:smartcityvm@gmail.com">smartcityvm@gmail.com</a>	_____ _____

- (c) shall be signed by the Party making the communication or (on its behalf) by the solicitor for, or any attorney, director, secretary or authorized agent of, that Party;
- (d) shall be delivered or posted prepaid to the address, or sent by fax to the number, of the addressee, in accordance with Article 1.120; and
- (e) shall be taken to be received by the addressee:
  - (i) in case of prepaid post on the day that is the third Working Day after the date of posting to an address within India, and on the fifth Working Day after the date of posting by airmail to an address outside India.
  - (ii) in the case of fax at the local time (in the place of receipt of that fax) which then equates to the time that fax is sent as shown on the transmission report produced by the machine from which that fax is sent confirming transmission of that fax in its entirety, unless that local time is not on a Working Day, or is after 5.00 pm on a day, when that communication is taken to be received at 9.00 am on the next day; and
  - (iii) in the case of delivery by hand on delivery at the address of the addressee as provided in Article 1.128, unless that delivery is made on a day that is not a day, or after 5.00 pm on a day, when that communication is taken to be received at 9.00 am on the next day.

**1.121. Counterparts**

- (a) This Contract may be executed in two originals, each of which when executed and delivered shall constitute an original of this Contract.

IN WITNESS WHEREOF, the Parties have executed this Contract as of the date first written above.

<b>Smart City Thiruvananthapuram Limited</b>	<b>Contractor</b>
Signature:	Signature:
Witness 1	Witness 2
Signature	Signature
Name	Name
Designation	Designation

## Letter of Award

## Price Quote

**List of approved Sub-Contractors**

Validate

Print

Help

[Item Rate BoQ](#)

Tender Inviting Authority: SMART CITY THIRUVANANTHAPURAM LIMITED

Name of Work: Selection of Contractor for Providing Design, Supply, Installation, Erection, Testing & Commissioning, Operation & Maintenance of Grid -Tied Roof Mounted Solar PV Power Plant on Various Buildings in Thiruvananthapuram

Contract No: <Enter Contract No Details>

Name of the Bidder/ Bidding Firm / Company	
--	--

**PRICE SCHEDULE**

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only )

NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder Rs. P	TOTAL AMOUNT	TOTAL AMOUNT In Words
1	2	4	5	7	9	10
1	<b>LOCATION-Kerala Legislative Assembly</b>					
1.01	Design, Manufacturing, Supply, Erection, Testing & Commissioning of Roof top Solar PV system as per the scope of work & technical specifications	395.625	kWp		0.00	INR Zero Only
1.02	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for first year	395.625	kWp		0.00	INR Zero Only
1.03	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for second year	395.625	kWp		0.00	INR Zero Only
1.04	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for third year	395.625	kWp		0.00	INR Zero Only
1.05	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for fourth year	395.625	kWp		0.00	INR Zero Only
1.06	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for fifth year	395.625	kWp		0.00	INR Zero Only
2	<b>LOCATION-Government College for Women</b>					
2.01	Design, Manufacturing, Supply, Erection, Testing & Commissioning of Roof top Solar PV system as per the scope of work & technical specifications	82.875	kWp		0.00	INR Zero Only
2.02	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for first year	82.875	kWp		0.00	INR Zero Only
2.03	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for second year	82.875	kWp		0.00	INR Zero Only
2.04	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for third year	82.875	kWp		0.00	INR Zero Only

2.05	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for fourth year	82.875	kWp		0.00	INR Zero Only
2.06	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for fifth year	82.875	kWp		0.00	INR Zero Only
3	<b>LOCATION-Government Central High School, Attakulangara</b>					
3.01	Design, Manufacturing, Supply, Erection, Testing & Commissioning of Roof top Solar PV system as per the scope of work & technical specifications	3.90	kWp		0.00	INR Zero Only
3.02	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for first year	3.90	kWp		0.00	INR Zero Only
3.03	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for second year	3.90	kWp		0.00	INR Zero Only
3.04	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for third year	3.90	kWp		0.00	INR Zero Only
3.05	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for fourth year	3.90	kWp		0.00	INR Zero Only
3.06	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for fifth year	3.90	kWp		0.00	INR Zero Only
4	<b>LOCATION-Kerala University Library</b>					
4.01	Design, Manufacturing, Supply, Erection, Testing & Commissioning of Roof top Solar PV system as per the scope of work & technical specifications	85.475	kWp		0.00	INR Zero Only
4.02	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for first year	85.475	kWp		0.00	INR Zero Only
4.03	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for second year	85.475	kWp		0.00	INR Zero Only
4.04	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for third year	85.475	kWp		0.00	INR Zero Only
4.05	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for fourth year	85.475	kWp		0.00	INR Zero Only
4.06	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for fifth year	85.475	kWp		0.00	INR Zero Only
5	<b>LOCATION-State Central Library</b>					
5.01	Design, Manufacturing, Supply, Erection, Testing & Commissioning of Roof top Solar PV system as per the scope of work & technical specifications	39.65	kWp		0.00	INR Zero Only
5.02	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for first year	39.65	kWp		0.00	INR Zero Only
5.03	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for second year	39.65	kWp		0.00	INR Zero Only
5.04	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for third year	39.65	kWp		0.00	INR Zero Only

5.05	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for fourth year	39.65	kWp		0.00	INR Zero Only
5.06	Operation & maintenance including cost of replacement of all the parts after commissioning of Roof top Solar PV system as per the scope of work & technical specifications O&M to be quoted for fifth year	39.65	kWp		0.00	INR Zero Only
<b>Total in Figures</b>					<b>0.00</b>	INR Zero Only
<b>Quoted Rate in Words</b>		<b>INR Zero Only</b>				



# City to switch to smart energy management

Roof-mounted PV solar power plants to be installed at Legislative Assembly Complex, Central Library, Kerala University Library, Govt Women's College

DILEEP V KUMAR @T'Puram

THE city will soon shift to smart energy management by installing roof-mounted photovoltaic (PV) solar power plants at Kerala Legislative Assembly Complex, State Central Library, Kerala University Library, Government College for Women, Vazhuthacaud, and Government Central High School, Attakulangara. It is learnt that the Smart City Thiruvananthapuram Limited (SCTL) and the city corporation might announce the successful bidder for 'providing design, supply, installation, erection, testing and commissioning, operation and maintenance' of grid-tied roof-

mounted PV solar power plant on various buildings in the corporation limits by next week.

"The tender that we invited in this regard was quoted by eight bidders and of these, we finalised two bidders. The one who quoted the lowest has been awarded the work. The announcement of the contractor and the award of work will be made next week," said V K Prasanth, Mayor, Thiruvananthapuram Corporation.

According to Sanoop Gopikrishna, general manager, SCTL, once the work is

awarded, the contractor will have to complete the works within six months and they will also be entrusted with its maintenance for five years.

"A feasibility study was conducted before the selection of the buildings. In the selection process, we considered various factors including a building's structure, its age, and others. The buildings will have an on-grid solar system and we estimate that a total of 600 kW electricity will be generated from it," said Sanoop.

He said in the second phase, there is a plan to install roof-mounted PV solar power plant at Kerala Fire and Rescue Services Headquarters, Travancore Devaswom Board's head office and Recruitment Board and KSRTC Bus Terminal Complex, Thampanoor. The initial study is in progress at these places.

## The sunny side of things

Roof-mounted solar project is one of the major components of the smart city programme

Except Government Central High School, Attakulangara, all others will have high-tension (HT) line

The school that will have a low-tension (LT) line will have a zero-bill once the roof-mounted solar power plant becomes operational

In the case of the rest, it is estimated that their electricity charge will come down by 20 to 25 per cent

The other locations identified for the roof-mounted solar power plant project were Kerala Fire and Rescue Services Headquarters, Travancore Devaswom Board's Head Office and Recruitment Board and KSRTC Bus Terminal Complex, Thampanoor

SCTL and the corporation may announce the successful bidder for 'providing design, supply, installation, erection, testing and commissioning, operation and maintenance' of grid-tied roof-mounted PV solar power plant on various buildings



**“**We considered factors such as a building's structure, its age, and others. The buildings will have an on-grid solar system and we estimate that a total of 600 kW electricity will be generated

Sanoop Gopikrishna, SCTL general manager

## Project to make T'Puram a solar city yet to see light

DILEEP V KUMAR @T'Puram

### Five spots identified

As per master plan, five locations were identified for solar city scheme - Mascot Hotel, Medical College Hospital's in-patient building, PWD office building, Putharikandam Maidanam, and Gandhi Park.

THE Thiruvananthapuram city is set to get roof-mounted photovoltaic (PV) solar power plants at selected buildings. But a project to make the city a solar/green city through the Development of Solar City Programme of the Ministry of New and Renewable Energy (MNRE) is yet to take off.

Though a master plan for the development of Thiruvananthapuram as a solar city was prepared in 2015, it is learnt that no progress has been made thereafter.

The programme 'Development of Solar Cities' is to encourage urban local bodies to prepare a road map for making their cities a renewable energy one with the support of MNRE. From Kerala, corporations of Thiruvananthapuram and Kochi

**“**From the state, corporations of Thiruvananthapuram and Kochi were selected for the MNRE's project. While Kochi's project report was approved, the one submitted by Thiruvananthapuram was returned for modifications

— An officer of the Department of Urban Affairs

were selected for the project.

"From the state, these two corporations were selected for the MNRE's project. While Kochi's project report was approved, the one submitted by Thiruvananthapuram was returned for modifications," said an officer of the Department of Urban Affairs. According to the officer, nothing has moved after that.

Whereas in Kochi, a solar city

coordination cell was formed and renewable energy projects to mitigate fossil fuel consumption in the city was also rolled out.

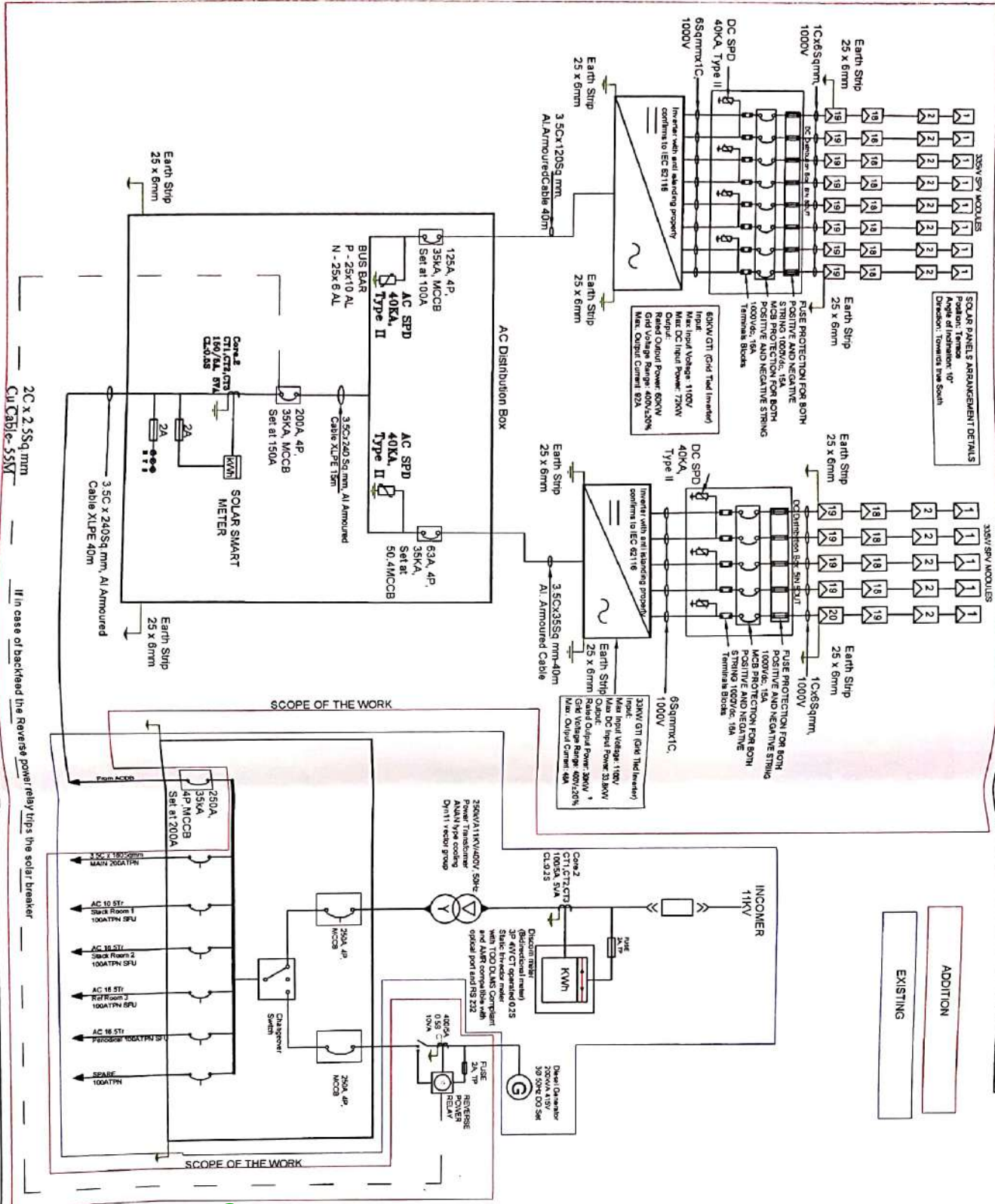
As per the master plan, five locations were identified for the solar city scheme - Mascot Hotel, Medical College Hospital's in-patient building, PWD Office building, Putharikandam Maidanam, and Gandhi Park. Also, the total indicative budget of the solar city was estimated at ₹1,297 crore.

The master plan highlights that as residential, public and commercial buildings consume a large amount of energy mostly for lighting, appliances, and others, there was a need to improve energy efficiency and conserve energy through the concept of solar city.

When asked about this Mayor V K Prasanth said, "We had incorporated the solar city concept in our smart city project and it will be launched soon."



SCOPE OF THE WORK



**STRINGING DETAILS**

SI No	Inverter Type	No of Modules in series	Total No of strings	Total No of Modules	Vmp Min per String	Voc Max per String
Inverter 1	60KW	19	8	152	718.3V	883.5V
Inverter 2	33KW	20	4	76	718.3V	883.5V
			1	20	754V	930V
<b>Total</b>			<b>1</b>	<b>248</b>		<b>0</b>

ADDITION  
EXISTING

Government of Kerala - 0-  
Department of Electrical Inspectorate  
As 15 1976, 2005 Certified Department  
Office of the Deputy Chief Electrical Inspector  
Forth Floor, Corporation Building, Palayam, Vixra Bazar  
PO, Thiruvananthapuram-695013

Drawing Number: 242/17  
Date: 29-09-2024

Subject to the conditions mentioned in the cover with Date BS-402333/20/EIT dated 29-09-2024. This is Scheme Approval only. Separate Sanction for Execution shall be obtained From The Electrical Inspector.

SIGNATURE OF CLIENT  
**PRINCIPAL**  
**GOVT. COLLEGE FOR WOMEN**  
**THIRUVANANTHAPURAM-14**

SIGNATURE OF SUPERVISOR  
**Suresh Kumar. S**  
**SB - 5616**

SIGNATURE OF CONTRACTOR  
**Mahesh Kumar. NS**  
Powertech Electrical & Engineers  
N Grade Electrical Contractors  
License No. CA-381  
Pangappara, Thiruvananthapuram - 81

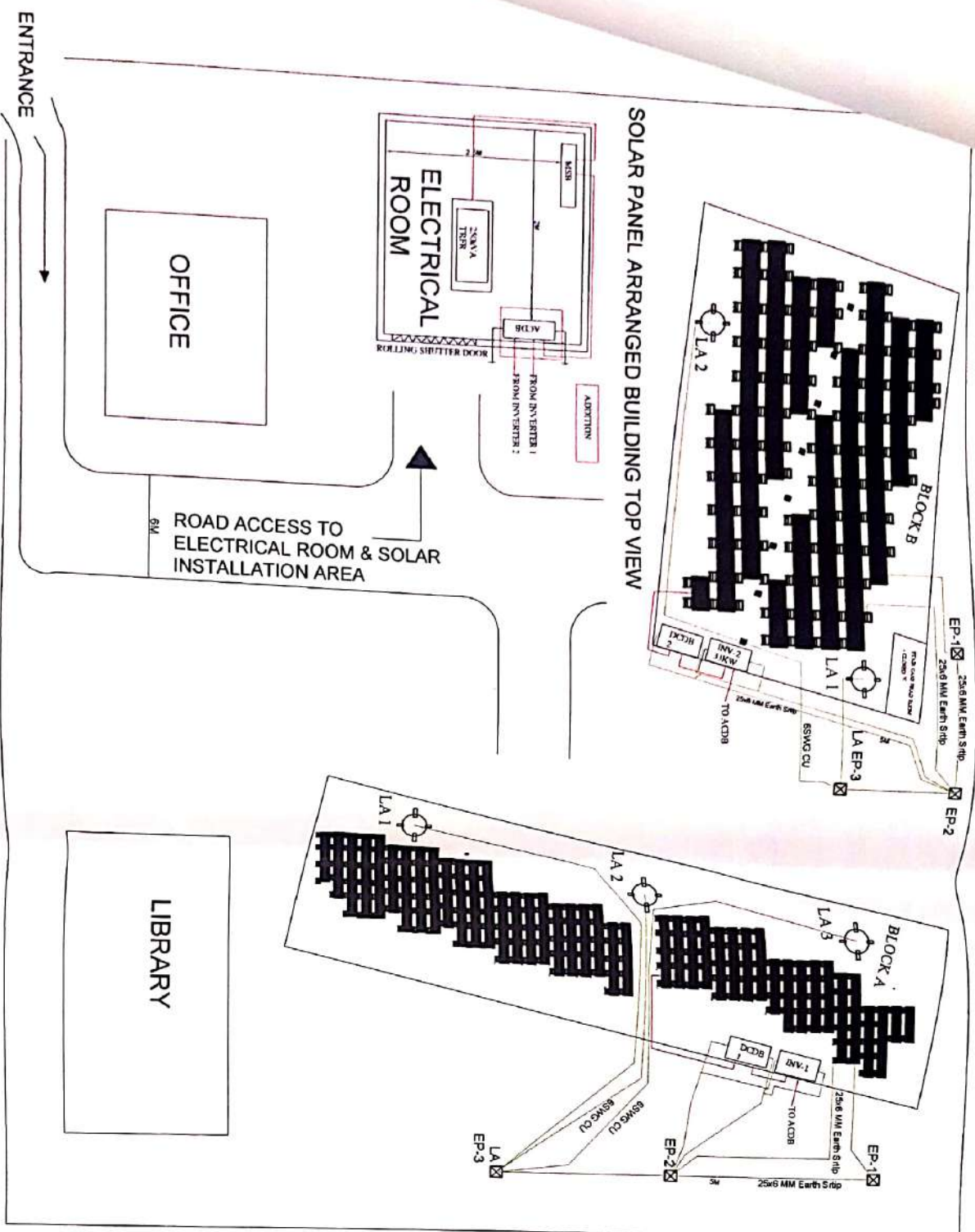
**Power Tech Electricals & Engineer**  
(A Class Electrical Contractor)  
CA No. 381,  
Bhavani Nivas, Pangappara, Karyavatom P  
Thiruvananthapuram-81, Mob: 974466662

**CLIENT**  
M/s Government College for Women, CV Ramana P  
Road, Thiruvandapur, P.O. Vazhuthickal, Thiruvananthapuram  
Kerala-695014

**PROJECT**  
Installation of 1 no 63 6000V Solar and connect  
electrics at the premises of M/s. Government Coll  
for Women, CV Ramana Pillar Road, Thiruvandapur, P.O.  
Vazhuthickal, Thiruvananthapuram, Kerala-695014.

**TITLE**  
Schematic of Solar Panel

**CHECKED** NSNRK Approval NSR  
**SCALE** NTS Date 20/09/24  
**DRAWING NO.** I.C.-PT/RS/09/19 Sheet No. 1/3



**NOTE**

- SOLAR PANELS BLOCK A & 69 PANELS BLOCK B
- CABLE ROUTE
- DISTANCE BETWEEN FACILITIES 5M
- FOR PANEL ARRANGING EP2 FOR STRUCTURE EARTHING & EP3 FOR LA EARTHING

Government of Kerala  
 Department of Electrical Inspection  
 No. JS 15200, 2005 Central Department  
 Office of the District Chief Electrical Inspector  
 Putha Floor, Corporation of Thiruvananthapuram,  
 PO Thiruvananthapuram, Kerala 695003

for the Electrical Inspector  
 B-540253320/ET dated 29-09-2020.  
 Separate Sanction for Empanelment shall be obtained  
 from the Electrical Inspector

Drawing Number  
 242271

SIGNATURE OF CLIENT

**PRINCIPAL**  
**GOVT. COLLEGE FOR WOMEN**  
 THIRUVANANTHAPURAM-81

SIGNATURE OF SUPERVISOR

**Suresh Kumar S**  
 SB - 5616

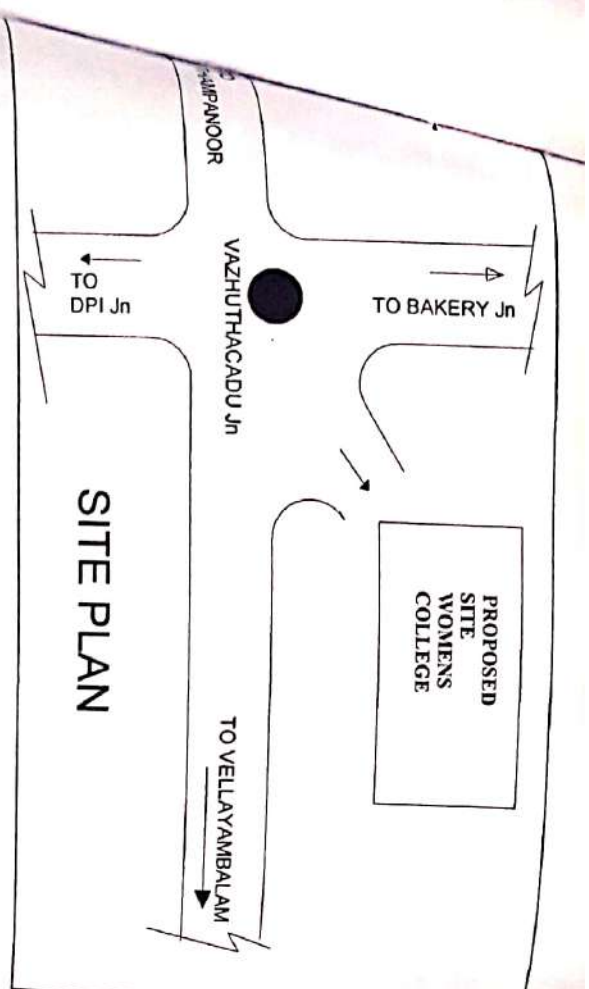
SIGNATURE OF CONTRACTOR

**Mahesh Kumar N S**  
 Powertech Electrical & Engineers  
 A Grade Electrical Contractors  
 License No. CA-381  
 pangappara, thiruvananthapuram - 81

**Power Tech Electricals & Engineers**  
 (A Class Electrical Contractor)  
 CA No. 381,

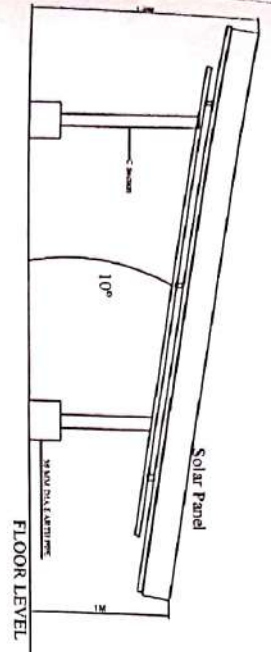
Bhavani Nivas, Pangappara, Karyavattom P.O.  
 Thiruvananthapuram-81, Mob: 9744666655

CLIENT	M/s Government College for Women, CV Raman Pillai Road Thiruvand, P.O. Vazhuthacand, Thiruvananthapuram Kerala 695014
PROJECT	Installation of 1 no 33.080KW Solar and connected electric at the premises of M/s. Government College for Women, CV Raman Pillai Road Thiruvand, P.O. Vazhuthacand, Thiruvananthapuram, Kerala 695014
TITLE	SOLAR ARRANGEMENTS
CHECKED	NSRK Approved NSRK
SCALE	NTS Date 20/06/2020
DRAWING NO.	TC-PT/RS/09/19 Sheet No. 2/3



**SITE PLAN**

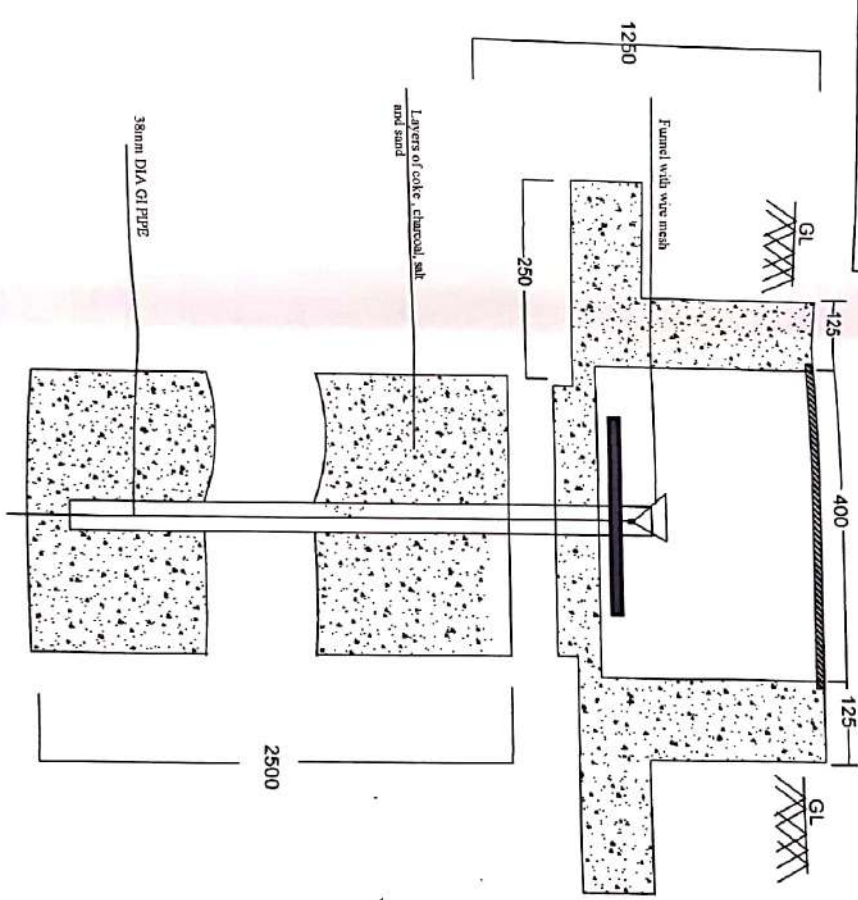
**NOTE:**  
 1. Size and type of electrode 38 MM Dia  
 2. Distance between two earth electrodes-5M  
 3. Clearance of earth electrodes from the wall-1.5M conductor  
 4. Earthing as per I S 3043/87  
 5. A minimum clearance of 1M provided in front of Solar AC DB, Inverter DCDBs, etc



**NOTE**  
 PANEL SIZE : 1957X990X40 MM  
 PANEL CAPACITY : 335W  
 PANEL WEIGHT : 21.5 KG  
 TOTAL NO OF PANEL : 248  
 TOTAL CAPACITY : 83,080 KW



Sectional View of Solar Panel



Government of Kerala - 2 -  
 Department of Electrical Inspectorate  
 An IS 15700: 2005 Certified Department  
 Office of the Deputy Chief Electrical Inspector  
 Fourth Floor, Corporation Building, Palisayam, Vilas Bhasara  
 PO, Thiruvananthapuram, 695033

for the Electrical Inspector  
 2425/24  
 Drawing Number

Subject to the conditions mentioned in the Letter with Date  
 BS-001531/20/ET dated 29-09-2020.  
 This is Scheme - Approval only  
 Separate Sanction for Execution shall be obtained  
 from the Electrical Inspector

SIGNATURE OF CLIENT

SIGNATURE OF SUPERVISOR

Suresh Kumar. S  
 SB - 5516

SIGNATURE OF CONTRACTOR

M. Vishu Kumar. N S  
 PowerTech Electrical & Engineers  
 'A' Grade Electrical Contractors  
 License No. CA-381  
 Pangappara, Thiruvananthapuram - 81

CONTRACTOR

**Power Tech Electricals & Engineers**  
 (A Class Electrical Contractor)  
 CA No. 381,

Bhavani Nivas, Pangappara, Karyavattom P.O.  
 Thiruvananthapuram-81, Mob: 9744666635

CLIENT

M/s. Government College for Women, CV Raman Pillai  
 Road, Thycad, P.O. Vazhuthicad, Thiruvananthapuram,  
 Kerala 695014  
 PROJECT  
 Installation of 1 no 83.080KW Solar and connected  
 electric at the premises of M/s. Government College for  
 Women, CV Raman Pillai Road, Thycad, P.O.  
 Vazhuthicad, Thiruvananthapuram, Kerala 695014

TITLE  
 EARTHING AND SITE PLAN

Amambhu M I			
CHECKED	NSMK	Approved	NSMK
SCALE	NTS	Date	20-06-2020
DRAWING NO.	IC - P/T/RS/09/19	Sheet No.	3/3

