

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

Engineering Works

South African National Space Agency (SANSA)

Schedule 1: Preliminaries and General

Section 1: Fixed, Value & Time-Related Charges

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 1: FIXED, VALUE, TIME-RELATED CHARGES					
NOTE		General					
		Allowance for measurements to be taken on site before materials are ordered. The contractor will not order off the bill of quantities but measure on site before ordering and order according to measurements on site.					
		Each line item under this section covers fixed, value and time related charges.					
1.1		Compliance with Conditions of Contract					
		Allow for complying with all clauses as per tender documentation, including all Special and General conditions of Contract and Labour requirements, and for providing all works and services for which no specific items are listed in the Bills of Quantities.	Sum	1			
1.2		Site Establishment					
		Site establishment and for providing a site office, tools store, adequate and suitable water, sanitary and first aid services, telecommunication services and A4-A3 printing/scanning/faxing facilities, power supply, water etc.	Sum	1			
1.3		Supervision and Management					
		Site administration and for attending all inspections and site meetings.	Sum	1			
1.4		Plant & Equipment Storage, Insurance and Security					
		Provide for storage of plant and equipment on site including protection and security thereof and of stored and installed materials. In addition, for obtaining and providing all sureties and insurances called for in terms of this contract. NB: Materials storage is allowed for elsewhere in the BOQ.	Sum	1			
1.5		Notices and Fees					
		Allow for co-ordination with other contractors, giving notice to Eskom and the Electrical Contractor and paying all required fees.	Sum	1			
1.6		Manufacturer's Workshop Drawings					
		Provision of workshop drawings and technical information including data sheets and schematic drawings for approval	Sum	1			
1.7		Switching Cost					
Total Carried Forward							

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						R	c
<b>Brought Forward</b>							
		Liaising with Supply Authority for isolation and disconnections, from supply points. Connection and reconnection to Supply Authority supply points.	Sum	0			
1.8		<p><b>As-Built Information</b></p> <p>Supply five full sets of as-built drawings to show the exact positions of cables, cable joints, road crossings, etc. as well as instruction manuals &amp; spare parts catalogues to spec. These as-built drawings must be handed to the Engineer on completion of the contract.</p>					
a		Hand sketched drawings	Sum	1			
b		CAD produced drawings	Sum	1			
1.9		<b>O&amp;M Manuals, Catalogues and Reports</b>					
		Preparation of O&M manuals and commissioning reports.	Sum	1			
1.10		<b>Surveying</b>					
		Surveying and setting out of pole, plinth positions, cable routes, benchmarks and coordinates.	Sum	1			
1.11		<b>Site De-establishment</b>					
		Site de-establishment and breakdown.	Sum	1			
1.12		<b>OHS Requirements</b>					
		Safety File including approval, PPE, Safety Harnesses, Site Inductions, Medicals etc.	Sum	1			
1.13		<b>Training and Handover</b>					
		After successful final testing and commissioning of complete installation, allow for training of end-user personnel and handover complete project to client.	Sum	1			
1.14		<b>Guarantees</b>					
		Allow for a guarantee for a defects liability period of 12 months against defects in components.	Sum	1			
1.14		<b>Warranty</b>					
		Allow for a warranty for a defects liability period of 36 months against defects in components and installation workmanship.	Sum	1			
1.15		<b>Samples, Factory Acceptance Test</b>					
<b>Total Carried Forward</b>							

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## Section 1: Fixed, Value &amp; Time-Related Charges

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
		Allow for selection and presentation of samples to the Engineer. Materials should only be purchased after obtaining approval from the Engineer. Incorrect materials will be replaced with correct materials.					
		Allow for Factory Acceptance Testing (FAT) for newly manufactured and packaged equipment by the vendor prior to shipping to ensure the equipment meets its intended purpose. This shall include transportation and accommodation of the Consulting Engineer's Representative.	Sum	1			
1.16		Existing Materials and Equipment					
		Allow for removal of existing equipment and materials to be re-used and installation decommissioning. Submit an inventory of removed equipment and materials identifying reusable and non-reusable.	Sum				
1.17		System Checking, Troubleshooting & Firmware Upgrade					
		Allow for routine checking of all plants once a month for a period of 12 months after final completion.					
		A written report shall be submitted to the client.					
		Facilitate firmware upgrade and troubleshooting as and when required.	Mnth	12			
Total Carried Forward To Summary							

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**Schedule 1: Preliminaries and General**

**Section 2: Unscheduled Work and Variations**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 2: UNSCHEDULED WORK AND VARIATIONS					
NOTE		<p>GENERAL:</p> <p>Rates for any unscheduled work shall not exceed the following given rates:</p> <ol style="list-style-type: none"> <li>1. Mark-up on supplier's quotation on any unscheduled material item ≤ 15%.</li> <li>2. Profit &amp; attendance on subcontractor's quotation on any unscheduled work item ≤ 5%.</li> <li>3. Site Foreman ≤ R650 per day work.</li> <li>4. Artisan ≤ R450 per day work.</li> <li>5. Skilled Labourer ≤ R300 per day work.</li> <li>6. Unskilled Labourer ≤ R200 per day work.</li> </ol>					
A		MARK-UP ON SUPPLIER'S QUOTATION ON ANY UNSCHEDULED MATERIAL ITEM					
i		Percentage mark-up.	%			Rate Only	
B		DAYWORK RATES FOR MEASURING ANY UNSCHEDULED WORK					
i		Site Foreman	Daywk			Rate Only	
ii		Artisan	Daywk			Rate Only	
iii		Skilled labourer	Daywk			Rate Only	
iii		Unskilled labourer	Daywk			Rate Only	
Total Carried Forward To Summary							

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**Schedule 1: Preliminaries and General****SUMMARY OF SECTIONS**

SECTION	DESCRIPTION	AMOUNT (RAND)
1	Section 1: Fixed, Value & Time-Related Charges	.....
2	Section 2: Unscheduled Work and Variations	.....
Total Carried Forward To Summary Of Schedules		_____

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Schedule 2: Plant 1, 2 & 3

Section 1: PV Modules & Accessories

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	C
		SECTION 1: PV MODULES & ACCESSORIES					
		Complete Supply and installation: Photovoltaic Solar System					
		Rates shall include supply, delivery, storage, installation, accessories, and supports. Installation to be in accordance with specifications, SANS standards for complete project up to the satisfaction of the Engineer(s).					
		Note: All material shall be IEC and/or SABS compliant.					
1.1		Photovoltaic Modules					
		Supply and install photovoltaic modules as detailed and specified below, and in accordance with standard quality specification for electrical material and equipment.					
1.1.1		PV modules 555W Super High Power Mono PERC HiKU with MC4-EVO2 and F30 Frame.  Preferable Manufacture(s): Canadian Solar or JA Solar or longi or equivalent which shall be subject to Engineer's approval.					
a		Supply	No.	900			
b		Install	No.	900			
1.1.2		PV modules 595W n-type Bifacial Double Glass Half-Cell MBB Traceable LB MC4.  Preferable Manufacture(s): Canadian Solar or JA Solar or longi or equivalent which shall be subject to Engineer's approval.					
a		Supply	No.	1		Rate Only	
b		Install	No.	1		Rate Only	
Total Carried Forward To Summary							

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Schedule 2: Plant 1, 2 & 3

Section 2: Distribution Boards

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 2: DISTRIBUTION BOARDS					
		Rates shall include supply, delivery, storage, installation, accessories, supports. Installation to be in accordance with specifications, SANS standards for complete project up to the satisfaction of the Engineer(s).					
		Note: All material shall be SABS approved.					
		Distribution boards as detailed and specified on the wiring diagram, standard quality specification for general electrical installations and standard quality specification for electrical material and equipment complete with the wiring, circuit breakers, isolators, Earth leakages, dummies, and all other necessary accessories.					
2.1		DC Protection Panels					
2.1.1		DC Combiner Box (DCCB1)					
a		Supply	No.	1			
b		Install	No.	1			
2.1.2		DC Combiner Box (DCCB2) & (DCCB3)					
a		Supply	No.	2			
b		Install	No.	2			
2.1.3		Battery Fuse Box (DCFB1)					
a		Supply	No.	1			
b		Install	No.	1			
2.1.4		Battery Fuse Box (DCFB2) & (DCFB3)					
a		Supply	No.	2			
b		Install	No.	2			
2.2		AC Protection Panels					
2.2.1		Mains Distribution Board (DB1)					
a		Supply	No.	1			
b		Install	No.	1			
2.2.2		AC Protection Box (ACPB1) c/w built-in automatic changeover switch/automatic transfer switch as per specifications					
a		Supply	No.	1			
b		Install	No.	1			
Total Carried Forward							

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Section 2: Distribution Boards

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
<b>Brought Forward</b>							
2.2.3		AC Protection Box (ACPB2) & (ACPB3) c/w built-in automatic changeover switch/automatic transfer switch as per specifications					
a		Supply	No.	2			
b		Install	No.	2			
2.2.4		Modify LV Section of Minisub as per drawing and specification including the following switchgear					
2.2.4.1		Supply and install new steel escutcheon removable panel covers which are appropriately cut out to fit all protective devices perfectly. Cover shall be equipped with standard locking pins.					
a		Supply	No.	4			
b		Install	No.	4			
2.2.4.2		Supply and install new clip trays, DIN rails suitable for mounting new circuit breakers. Breakers shall be of uniform make.					
a		Supply	No.	4			
b		Install	No.	4			
2.2.4.3		Supply and install insulated 630A 400V, 15kA solid Copper Busbars complete with 3 phases + Neutral + Protective Earth and punched holes as per specification.					
a		Supply	No.	2			
b		Install	No.	2			
d		Supply and install the following protective devices as per drawing No. 12501-PV-SLD11.  NB: Minimum fault level current rating shall be 15kA. Circuit breakers shall be of the same manufacture throughout the DB.					
i)		630A TP+N 15kA MCCB					
a		Supply	No.	4			
b		Install	No.	4			
i)		425A TP+N 15kA MCCB					
a		Supply	No.	4			
b		Install	No.	4			
ii)		3P+N surge protection unit Class 1+2					
<b>Total Carried Forward</b>							

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**Section 2: Distribution Boards**

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
<b>Brought Forward</b>							
a		Supply	No.	2			
b		Install	No.	2			
iii)		1000/5 Round Split Core Current Transformer Class 0.5 with high measuring accuracy c/w with conductors.				Rate Only	
a		Supply	No.	2			
b		Install	No.	2			
iv)		Single-phase/3-phase anti-islanding Voltage- and Frequency-Relay with integrated Vector-Shift-Relay				Rate Only	
a		Supply	No.	2			
b		Install	No.	2			
<b>Total Carried Forward To Summary</b>							

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Section 3: Wireways

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 3: WIREWAYS					
		General statement on rates: Rates shall include supply, delivery, storage, installation. Installation to be in accordance with specifications, SANS standards for complete project up to the satisfaction of the Engineer(s).					
		Note: All material shall be SABS approved.					
3.1		CONDUITS					
		In addition to the general statement on rates above, rates for conduit shall also include all accessories such as couplers, adapters, bends, round elbows, tees, end caps, saddles, fixers, adhesives, etc., excepting junction/outlet boxes. Where chasing of brickwork or concrete media is required the rates shall be inclusive. Where drilling through brickwork and/or concrete media of up to 300 mm deep for 10 - 25 mm Ø conduit is required, the rate shall be inclusive.					
		Conduit surface mount in ceiling void or applicable area:					
3.1.1		20 mm Ø PVC.					
a		Supply	m		260		
b		Install	m		260		
3.1.2		25 mm Ø PVC.					
a		Supply	m		260		
b		Install	m		260		
3.1.3		20 mm Ø light duty galvanized steel.					
a		Supply	m		1,600		
b		Install	m		1,600		
3.1.4		25 mm Ø light duty galvanized steel.	m				
a		Supply	m		260		
b		Install	m		260		
3.1.5		20 mm Ø PVC flexible conduit (sprague).					
a		Supply	m		500		
b		Install	m		500		
3.2		CONDUIT BOXES					
		Supply and install conduit boxes complete with all accessories including conduit adaptors:					
Total Carried Forward							

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ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
<b>Brought Forward</b>							
		Outlet boxes excluding covers:					
3.2.1		PVC 60 mm round box, 25 mm deep for 20 mm Ø conduit including covers.					
a		Supply	No.	24			
b		Install	No.	24			
3.2.2		Galvanized steel 60 mm round box, 25 mm deep junction box for 20 mm Ø conduit including cover.					
a		Supply	No.	12			
b		Install	No.	12			
3.2.3		Galvanized steel 60 mm round box, 25 mm deep junction box for 25 mm Ø conduit including covers.					
a		Supply	No.	9			
b		Install	No.	9			
3.3		<b>DRAW BOXES</b>					
		Supply and install draw box. Draw box shall be mild steel front access with standard lockable latch type door handles. Body to be coloured "White" powder coating complete with all accessories and sheet metal and all frames, sub-frames.					
3.3.1		Surface wall mount 450 mm long x 300 mm wide x 125 mm deep distribution/junction/draw box.					
a		Supply	No.	9			
b		Install	No.	9			
3.3.2		Surface mount extension box, 100 mm x 100 mm x 50 mm galv steel painted white.					
a		Supply	No.	18			
b		Install	No.	18			
3.3.3		Surface mount extension box, 100 mm x 50 mm x 50 mm galv steel painted white.					
a		Supply	No.	9			
b		Install	No.	9			
3.4		<b>WIRING TRUNKING</b>					
<b>Total Carried Forward</b>							

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Section 3: Wireways

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
<b>Brought Forward</b>							
		Supply and install pregalvanized steel wiring trunking complete with accessories such as support fixtures, suspension fixtures, fittings, bends, stop ends, covers, junction units, internal angles, etc. but excluding wiring.  Hangers for trunking shall be spaced at maximum distance of 1.5 meter apart.					
3.4.1		76 x 63 mm (P8000) wiring duct c/w cover.					
a		Supply	m	15			
b		Install	m	15			
3.4.2		127 mm x 76 mm, 0.8 mm thick (P9000) wiring trunking with cover plates.					
a		Supply	m	30			
b		Install	m	30			
3.4.3		41 mm x 41 mm, 0.8 mm thick (P2000) wiring trunking with cover plates.					
a		Supply	m	70			
b		Install	m	70			
		Supply and install PVC wiring trunking compact mini complete with accessories such as internal angles, stop ends, bends, covers etc. but excluding wiring.					
3.4.4		25 x 16 mm (YT/2) wiring duct and c/w cover.					
a		Supply	m	150			
b		Install	m	150			
3.4.5		40 x 16 mm (YT/4) wiring duct and c/w cover.					
a		Supply	m	200			
b		Install	m	200			
3.5		CABLE TRAYS					
		Supply and install medium duty hot dip galvanized welded wire mesh cable tray complete with all accessories including bends, junction units, suspension fixtures, elbows, splices, fittings, fastners, etc:					
3.5.1		50 mm wide, 50 mm high cable tray.					
a		Supply	m	90			
b		Install	m	90			
<b>Total Carried Forward</b>							

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ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
<b>Brought Forward</b>							
3.5.2		50 mm wide, 90 deg bend (R160mm).					
a		Supply	No.	6			
b		Install	No.	6			
3.5.3		50 mm wide, tee "T" (R160mm).					
a		Supply	No.	3			
b		Install	No.	3			
3.5.4		300 mm wide, 50 mm high cable tray.					
a		Supply	m	30			
b		Install	m	30			
3.5.5		300 mm wide, 90 deg bend (R160mm).					
a		Supply	No.	9			
b		Install	No.	9			
3.5.6		300 mm wide, tee "T" (R160mm).					
a		Supply	No.	6			
b		Install	No.	6			
3.6		SUNDRIES					
		Supply and install blank covers c/w screws;					
3.6.1		Blank steel cover plate (White) for 100 mm x 50 mm conduit box.					
a		Supply	No.	3			
b		Install	No.	3			
3.6.2		Blank steel cover plate (White) for 100 mm x 100 mm conduit box.					
a		Supply	No.	3			
b		Install	No.	3			
3.6.3		PVC cover for 60 mm round, 25 mm deep, for 25 mm Ø junction box.					
a		Supply	No.	20			
b		Install	No.	20			
<b>Total Carried Forward To Summary</b>							

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Section 4: Earth Works: Excavation & Trenching

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 4: EARTHWORKS: EXCAVATION & TRENCHING					
		Rates shall include supply, delivery, storage, installation, accessories, supports. Installation to be in accordance with specifications, SANS standards for complete project up to the satisfaction of the Engineer(s).					
		Note: All material shall be SABS approved.					
4.1		UNDERGROUND SCANNING					
a		GPR, GeoScan, Utility Locating for all sites.					
		Contractor to present GPR scanner to Engineer for approval and issue a scanning report upon completion of scanning the ground.	Sum	1			
b		Analysis data and report.	No.	1			
4.2		CONSTRUCT CABLE TRENCHES					
		Excavate, normal backfill compacted to 85% MMDD for 450-600 mm wide x 700-1100 mm deep measured in linear length.					
		Rate shall include lifting finished surfaces such as paving, kerbs, grass etc. and reinstatement to original state or better. Rate shall also be inclusive of re-instatement and compaction of excavated materials.					
		All sleeves shall be laid on a 150 mm thick bedding of sifted river sand as well as a covering of an equal thickness of the same material where required.					
		Trenches shall be excavated to following minimum depths below the finished ground level irrespective of the size of sleeve installed; i) 1000 mm for medium voltage (MV) cables ii) 700 mm for low voltage (LV) cables iii) 900mm for fibre cables					
4.2.1		Excavation for cable trenches					
a		In earth (65%)	m <sup>3</sup>	150			
b		In soft rock (30%)	m <sup>3</sup>	5			
c		On hard rock (5%)	m <sup>3</sup>	1			
d		Excavations where services are adjacent to a trench in soft rock	m <sup>3</sup>	4			
e		Excavation done by hand to expose services	m <sup>3</sup>	5			
4.2.2		Backfilling with					
Total Carried Forward							

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Section 4: Earth Works: Excavation & Trenching

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
<b>Brought Forward</b>							
a		Excavated material	m <sup>3</sup>	150			
		Approved material (Red Soil Bedding)					
b		Supply	m <sup>3</sup>	22			
c		Install	m <sup>3</sup>	22			
4.2.3		Danger Tape					
4.2.3.1		PVC danger warning tape installed 300 mm above cable.					
a		Supply	m	250			
b		Install	m	250			
4.3		ROAD CUTTING					
4.3.1		Road surface excavation (micro groove) width 30 mm, depth 100 mm.					
		Workload including but not limited to: Using cutting machine cut road material,dig road surface,fix up bottom of trench,place dregs at the side of trench properly. Prepare road materials, according to the original standard to recover the road surface, including materials.					
		Paving shall be lifted and not cut.					
a		Concrete surface	m	1			
b		Asphalt	m	5			
c		Paving	m	1			
4.3.2		Conventional road crossing (Saw Cut) width 450 mm, depth 100 mm.					
		Workload including but not limited to: Using saw to cut road material,dig road surface,fix up bottom of trench,place dregs at the side of trench properly. Prepare road materials, according to the original standard to recover the road surface, including materials.					
		Paving shall be lifted and not cut.					
a		Concrete surface	m	1			
b		Asphalt	m	1			
c		Paving	m	1			
4.4		CABLE SLEEVES					
<b>Total Carried Forward</b>							

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Section 4: Earth Works: Excavation & Trenching

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
<b>Brought Forward</b>							
4.4.1		Supply and install 110 mm Ø HDPE sleeves (Code Name Kabelflex - Black) or similar in excavated trenches including sealing of sleeve ends, couplings, bends, tees, etc..  Note: Excavation is measured separately.					
a		Supply	m	10			
b		Install	m	10			
4.4.2		Supply and install 110 mm Ø HDPE sleeves (Code Name Kabelflex - Green) or similar in excavated trenches including sealing of sleeve ends, couplings, bends, tees, etc..  Note: Excavation is measured separately.					
a		Supply	m	0			
b		Install	m	0			
4.4.3		Supply and install 50 mm Ø HDPE sleeves (Code Name Kabelflex - Black) or similar in excavated trenches including sealing of sleeve ends, couplings, bends, tees, etc..  Note: Excavation is measured separately.					
a		Supply	m	150			
b		Install	m	150			
4.4.4		Supply and install 50 mm Ø HDPE sleeves (Code Name Kabelflex - Green) or similar in excavated trenches including sealing of sleeve ends, couplings, bends, tees, etc..  Note: Excavation is measured separately.					
a		Supply	m	10			
b		Install	m	10			
4.5		INSPECTION PIT  800mm x 800mm x 600mm manhole as per specification including, steel metal covers, farme, determination of correct coordinates.					
a		Supply	No.	1			
b		Install	No.	1			
4.6		EARTHWORKS - SITE CLEARANCE  Ground preparation for vegetation suppression					
<b>Total Carried Forward</b>							

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ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
<b>Brought Forward</b>							
		Rate shall include lifting finished surfaces such as paving, kerbs, grass etc. and reinstatement to imported soil only. Rate shall also be inclusive of re-instatement and compaction of excavated materials.					
4.6.1		Remove 150mm layer of top soil					
a		Supply	m <sup>2</sup>	0			
b		Install	m <sup>2</sup>	4,500			
4.6.2		Extra over all excavations for carting away. Surplus material from excavations and/or stock piles on site to a dumping site to be located by the contractor					
a		Supply	m <sup>2</sup>	900			
b		Install	m <sup>2</sup>	900			
4.7		<b>FILLING IN</b>					
4.7.1		Filling with 19mm crushstone supplied by the contractor, including spreading and levelling Around and in between array tables etc					
a		Supply	m <sup>3</sup>	200			
b		Install	m <sup>3</sup>	200			
4.8		<b>SOIL POISONING</b>					
4.8.1		Weed poisoning excavated surfaces					
a		Supply	m <sup>2</sup>	4,500			
b		Install	m <sup>2</sup>	4,500			
4.9		<b>WATERPROOFING</b>					
4.9.1		One layer of 250 micron green polyethylene waterproofsheeting To excavated areas.					
a		Supply	m <sup>2</sup>	4,500			
b		Install	m <sup>2</sup>	4,500			
4.6		<b>SUNDRIES</b>					
4.6.1		Provide 5.0 mm dia. drawwire for electronic services sleeves.					
a		Supply	m	200			
b		Install	m	200			
<b>Total Carried Forward To Summary</b>							

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

Engineering Works

South African National Space Agency (SANSA)

Schedule 2: Plant 1, 2 & 3

Section 5: Cabling

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 5: CABLING					
		Rates shall include supply, delivery, storage, installation, accessories, supports. Installation to be in accordance with specifications, SANS standards for complete project up to the satisfaction of the Engineer(s).					
		Note: All material shall be SABS approved.					
5.1		DC STRING CABLE					
		Supply, deliver, install and connect max DC voltage - 1800V DC reticulation cables, bare Copper earth conductors, installed in trenches, sleeves, cable ladders or cable trays.					
		Rate shall be inclusive of cable terminations, including all fastening materials, glands, shrouds, lugs and the connection of the cable lugs to the specified terminal equipment and connectors.					
5.1.1		6 mm <sup>2</sup> , Red single-core Class 5 flexible tinned copper conductor, suited for photovoltaic and solar system with crosslinked polymer insulation and halogen free sheath.					
a		Supply	m	4,500			
b		Install	m	4,500			
5.1.2		6 mm <sup>2</sup> , Black single-core Class 5 flexible tinned copper conductor, suited for photovoltaic and solar system with crosslinked polymer insulation and halogen free sheath.					
a		Supply	m	4,500			
b		Install	m	4,500			
5.1.3		6 mm <sup>2</sup> , bare Copper earth wire.					
a		Supply	m	1,200			
b		Install	m	1,200			
5.2		CONNECTORS					
		Supply and install Snap-in lock, Female Connector and Male Connector, rated current for 35 A to 45A (for 4 and 6mm <sup>2</sup> cable), 1000 - 1500 V IP Rating: IP65 / IP68.					
5.2.1		MC4 connector twin pack kit.					
Total Carried Forward							

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

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South African National Space Agency (SANSA)

Schedule 2: Plant 1, 2 & 3

Section 5: Cabling

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
<b>Brought Forward</b>							
a		Supply	No.	100			
b		Install	No.	100			
		Supply and install Snap-in lock, Pre Terminated Cables with Female Connector and Male Connector, rated current for 35 A to 45A (for 4 and 6mm <sup>2</sup> cable), 1000 - 1500 V IP Rating: IP65 / IP68.					
5.2.2		MC4 Pre terminated cable 2m (1 Pack).					
a		Supply	No.	60			
b		Install	No.	60			
5.3		DC BATTERY CABLE					
		Supply, deliver, install and connect max DC voltage - 1800V DC reticulation cables, bare Copper earth conductors, installed in trenches, sleeves, cable ladders or cable trays.					
		Rate shall be inclusive of cable terminations, including all fastening materials, glands, shrouds, lugs and the connection of the cable lugs to the specified terminal equipment and connectors.					
5.3.1		Type D8					
5.3.1.1		95 mm <sup>2</sup> , Red single-core Class 5 flexible tinned DC Permoweld Double Insulated Battery Cable copper conductor, with crosslinked polymer insulation and halogen free sheath.					
a		Supply	No.	60			
b		Install	No.	60			
5.3.2		Type D10					
		Connect 600V/1000V reticulation cables, bare Copper earth conductors installed in the ground, trenches, sleeves, cable ladders or cable trays, etc.					
5.3.2.1		240 mm <sup>2</sup> , single-core PVC/PVC/PVC Copper cable.					
a		Supply	m	60			
b		Install	m	60			
5.3.2.2		150 mm <sup>2</sup> , bare Copper earth wire.					
<b>Total Carried Forward</b>							

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Schedule 2: Plant 1, 2 & 3

Section 5: Cabling

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
<b>Brought Forward</b>							
a		Supply	m	60			
b		Install	m	60			
5.3.2.3		Cable termination of cable and BCEW complete with glands, shrouds, lugs, connections and commissioning.					
a		Supply	No.	6			
b		Install	No.	6			
5.4		GP WIRING CONDUCTOR					
		Supply, deliver and install PVC insulated Copper conductors in required colours, drawn into conduit, trucking, power skirting, etc.					
5.4.1		2.5 mm <sup>2</sup> .					
a		Supply	No.	300			
b		Install	No.	300			
5.4.2		4.0 mm <sup>2</sup> .					
a		Supply	No.	300			
b		Install	No.	300			
		Supply, deliver and install PVC insulated stranded green/yellow wire drawn into conduit (appropriate PVC insulated Cu. wire earthing shall be used in power skirting and/or trunking):					
5.4.3		2.5 mm <sup>2</sup> .					
a		Supply	No.	300			
b		Install	No.	300			
5.4		AC RETICULATION CABLE					
		Connect 600V/1000V reticulation cables, bare Copper earth conductors installed in the ground, trenches, sleeves, cable ladders or cable trays, etc.					
		Type C8					
5.4.1		240 mm <sup>2</sup> , 4-core PVC/PVC/PVC Copper cable.					
a		Supply	m	120			
b		Install	m	120			
5.4.2		150 mm <sup>2</sup> , bare Copper earth wire.					
a		Supply	m	120			
<b>Total Carried Forward</b>							

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

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Schedule 2: Plant 1, 2 & 3

Section 5: Cabling

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
<b>Brought Forward</b>							
b		Install	m	120			
5.4.3		Cable termination of cable and BCEW complete with glands, shrouds, lugs, connections and commissioning.					
a		Supply	No.	12			
b		Install	No.	12			
		Type C7					
5.4.1		185 mm <sup>2</sup> , 4-core PVC/PVC/SWA/PVC Copper cable.					
a		Supply	m	456			
b		Install	m	456			
5.4.2		95 mm <sup>2</sup> , bare Copper earth wire.					
a		Supply	m	456			
b		Install	m	456			
5.4.3		Cable termination of cable and BCEW complete with glands, shrouds, lugs, connections and commissioning.					
a		Supply	No.	20			
b		Install	No.	20			
		Type C6					
5.4.4		150 mm <sup>2</sup> , 4-core PVC/PVC/PVC Copper cable.					
a		Supply	m	60			
b		Install	m	60			
5.4.2		95 mm <sup>2</sup> , bare Copper earth wire.					
a		Supply	m	60			
b		Install	m	60			
5.4.3		Cable termination of cable and BCEW complete with glands, shrouds, lugs, connections and commissioning.					
a		Supply	No.	4			
b		Install	No.	4			
		Type C3					
5.4.1		70 mm <sup>2</sup> , 4-core PVC/PVC/PVC Copper cable.					
a		Supply	m	80			
<b>Total Carried Forward</b>							

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Section 5: Cabling

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
<b>Brought Forward</b>							
b		Install	m	80			
5.4.2		35 mm <sup>2</sup> , bare Copper earth wire.					
a		Supply	m	80			
b		Install	m	80			
5.4.3		Cable termination of cable and BCEW complete with glands, shrouds, lugs, connections and commissioning.					
a		Supply	No.	4			
b		Install	No.	4			
<b>Total Carried Forward To Summary</b>							

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

Engineering Works

South African National Space Agency (SANSA)

Schedule 2: Plant 1, 2 & 3

Section 6: Appliances

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 6: APPLIANCES					
		General statement on rates: Rates shall include supply, delivery, storage, installation. Installation to be in accordance with specifications, SANS standards for complete project up to the satisfaction of the Engineer(s).					
		Note: All material shall be SABS approved.					
		Appliances such as socket outlets, isolators, etc., shall be provided by the contractor for all rooms power points, electronics power points, ICT, mechanical power points and all other areas or services requiring power points unless otherwise stated.					
3.1		SOCKETS OUTLETS					
		Supply, deliver and install flush mounted socket outlets. The rate shall include all other accessories that shall make the installation operational including cover plates.					
3.1.1		250 V, 16 A, combination standard 3-pin 1 gang switched socket outlet and Euro/ZA 2-pin socket outlet for flush mount on 100mm x 100mm outlet box, c/w steel cover plate (white) suitable to accommodate SANS 164-1 & SANS 164-2 combination socket outlets as per SANS 10142-1 requirements.					
a		Supply	No.		18		
b		Install	No.		18		
3.2		ISOLATORS					
3.2.2		Supply, deliver and install flush mounted isolators. The rate shall include all other accessories that shall make the installation operational including cover plates.					
3.2.2.1		250 V, 20 A, single pole isolator for flush mount on 100mm x 100mm outlet weatherproof box, c/w steel cover plate (white).					
a		Supply	No.		6		
b		Install	No.		6		
3.3		MECHANICAL SWITCHES					
		Supply, deliver and install light switch complete with steel cover plate and all accessories:					
3.3.1		16 A 1 lever, 1-way flush mount switch for 100mm x 50mm outlet box, c/w cover plate.					
a		Supply	No.		3		
Total Carried Forward							

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South African National Space Agency (SANSA)

Schedule 2: Plant 1, 2 & 3

Section 6: Appliances

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
<b>Brought Forward</b>							
b		Install	No.	3			
3.3.2		16 A 1 lever, 2-way flush mount switch for 100mm x 50mm outlet box, c/w cover plate.					
a		Supply	No.	6			
b		Install	No.	6			
3.4		ELECTRONIC SWITCHES					
		Supply, deliver and install electronic switches complete with all accessories and as mounted:					
3.4.1		20 A photocell installed in outdoor rectangular bulkhead light fitting with clear diffuser and IP54.					
a		Supply	No.	3			
b		Install	No.	3			
3.4.2		250V, 20 A, 2-wire dual technology 360 degree occupancy sensor ultrasonic and passive infrared ceiling sensor of ~ 50 mm <sup>2</sup> coverage, occupancy delay time of 6-15 minutes c/w power supply unit and interconnections:					
a		Supply	No.	6			
b		Install	No.	6			
3.6		SUNDRIES					
3.6.1		Supply and install engraved labels on each light switch, SSO and isolator face plate, glued and screwed.					
a		Supply	No.	30			
b		Install	No.	30			
<b>Total Carried Forward To Summary</b>							

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

Engineering Works

South African National Space Agency (SANSA)

Schedule 2: Plant 1, 2 & 3

Section 7: Light Fixtures

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 7: LIGHT FIXTURES					
		General statement on rates: Rates shall include supply, delivery, storage, installation. Installation to be in accordance with specifications, SANS standards for complete project up to the satisfaction of the Engineer(s).					
		Note: All material shall be SABS approved.					
6.1		NORMAL LUMINAIRES					
6.1.1		Type A SANS approved 4ft surface mounted diffused luminaire. The luminaire shall consist of a powder coated sheet steel body with an impact resistant, UV stabilized, translucent polycarbonate diffuser and shall be designed to operate a 2x18W T8 LED lamps or 40W LED and have a minimum efficacy of 105lm/W as per the Standard Quality Specification for MoPW General Electrical Installations.					
a		Supply	No.	6			
b		Install	No.	6			
6.1.6		Type E SANS approved round bulkhead luminaire. The luminaire shall consist of a high- pressure die cast (black outside and white inside) Aluminium base, and trim ring with an impact resistant, UV stabilised, translucent polycarbonate diffuser and shall be designed to operate a 2x9W E27 LED lamps or 20W LED and have a minimum efficacy of 105 lm/w and IP65 rated as per Standard Quality Specification for MoPW General Electrical Installations.					
a		Supply	No.	12			
b		Install	No.	12			
Total Carried Forward To Summary							

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South African National Space Agency (SANSA)

Schedule 2: Plant 1, 2 & 3

Section 8: Equipment

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 8: EQUIPMENT					
		Complete Supply and installation: Direct Current and AC Equipment					
		Rates shall include supply, delivery, storage, installation, accessories, and supports. Installation to be in accordance with specifications, SANS standards for complete project up to the satisfaction of the Engineer(s).					
		Note: All material shall be IEC and/or SABS compliant.					
2.1		Inverters					
		Supply, deliver, install and connect, a high power output, all-in-one hybrid inverter suitable for commercial and industrial applications. The unit shall have versatile work modes giving it suitability for off-grid, back-up, grid support and self-consumption energy systems. Unit shall have the following features"					
		- Up to 4 x units can be paralleled - Excellent and seamless transfer between on/off grid - Programmable work modes - Touchscreen LCD user interface - Generator remote control - HPS has Zero export function even when a Diesel Generator is connected					
2.1.1		100kW hybrid power system (HPS) 3-phase Inverter.  Preferrable Manufacture(s): Atess, Megarevo, GivEnergy or equivalent which shall be subject to Engineer's approval.					
a		Supply	No.	2			
b		Install	No.	2			
2.1.2		150kW hybrid power system (HPS) 3-phase Inverter.  Preferrable Manufacture(s): Atess, Megarevo, GivEnergy or equivalent which shall be subject to Engineer's approval.					
a		Supply	No.	2			
b		Install	No.	2			
2.2		Monitoring System					
Total Carried Forward							

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Section 8: Equipment

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT		
						R	c	
Brought Forward								
		Supply, deliver, install and connect, remote monitoring and control module datalogger for overall system monitoring, by collecting all system data and operation data from different units via Modbus RS485 and sends all this information to the manufacturer's Server via the internet. Unit shall have the following features" <ul style="list-style-type: none"><li>- Multi-function and of extreme high performance</li><li>- Local webserver for easy configuration</li><li>- Memory storage card built-in</li><li>- Two RS485 communication ports for monitoring the inverter and the battery separately</li><li>- 12 - 24V DC power supply input port has been added as an alternative to the AC unit supply</li><li>- USB (Type A) port availability for updating the module's firmware.</li><li>- Remote update of battery BMS and inverter firmware</li><li>- Full remote monitoring and control of system components.</li><li>- Supports external CT sensor to enable export power limitation</li><li>- Touchscreen LCD user interface</li><li>- Generator remote control</li><li>- HPS has Zero export function even when a Diesel Generator is connected</li></ul>						
a		Datalogger						
		Supply	No.		3			
		Install	No.		3			
2.4		Battery Storage						
		Supply, deliver, install and connect, a high quality Li-ion battery pack for all large commercial and industrial solar solutions. Unit shall have the following features" <ul style="list-style-type: none"><li>- CAN Bus</li><li>- Full battery management system and internal trip protection</li><li>- On and Off Buttons, State of Charge Display (0 to 100%), Error light, Error Reset Button, CAN adapter for Programming and data access with PC, main breaker.</li></ul>						
a		Commercial 200kWh nominal energy capacity, HV Lithium Ion Battery, 400Ah current capacity, max continuous charge & max discharge power of 200kW, 90% DoD at 180kWh, 80% DoD at 160kWh .  Prefarable Manufacture(s): Freedom One, GivEnergy or equivalent which shall be subject to Engineer's approval.						
		Supply	No.		3			
Total Carried Forward								

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Section 8: Equipment

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
		Install	No.	3			
3.3		Current Transformer Kit					
		Supply and install 50 / 60 Hz 500 A current transformer with the following properties; - Type: bar entrance - From 40 to 4000 A - Test Report - DIN rail fixing accessory - Sealable - ... / 5 A transformation ratio - 2,5 VA(Class 0,5) , 5 VA(Class 1) , 5 VA(Class 3) power					
a		ATESS 500A Current Transformer					
		Supply	sets	9			
		Install	sets	9			
Total Carried Forward To Summary							

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

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Section 9: Ground Mounting Structure and Container

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 9: GROUND MOUNTING STRUCTURE AND SHIPMENT CONTAINER					
		As specified in the Technical Specification, having verified the site conditions, supply and install the ground mounting system using the equipment listed below.					
		NOTE 1: Work to be coordinated with Architect/Civil Engineer.					
		Note: All material shall be IEC and/or SABS compliant.					
9.1		FOUNDATIONS STRUTS					
9.1.1		Supply and install 100mm x 75mm x 3mm S355 structural steel hot-dip galvanized (HDG) for foundation struts/column steel structure and module support structure cut into required height, c/w drilled holes for bolting, and rammed into the ground according to the structural drawings and specifications and/or Engineer instructions) to BS5950.					
a		Supply	m	1,000			
b		Install	m	1,000			
9.2		GIRDERS					
9.2.1		Supply and install 100mm x 75mm x 2.5mm S355 structural steel hot-dip galvanized (HDG) for girder steel structure and module support structure cut into required lengths, c/w drilled holes for bolting, and fixed to struts according to the structural drawings, specifications and/or Engineer instructions) to BS5950.					
a		Supply	m	600			
b		Install	m	600			
9.3		PURLINS/MOUNTING RAILS					
9.3.1		Supply and install 122.6 mm x 90 mm stainless steel purlin as per detail for module support structure cut into required lengths, c/w drilled holes for bolting, and fixed to girders according to the structural drawings, specifications and/or Engineer instructions) to BS5950					
a		Supply	m	2,800			
b		Install	m	2,800			
9.3.2		Suitably sized 200mm long cross rail connector.					
a		Supply	No.	100			
b		Install	No.	100			
Total Carried Forward							

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Section 9: Ground Mounting Structure and Container

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	C
<b>Brought Forward</b>							
9.3.3		End Cap - RIGHT/LEFT Grey (1 pair).					
		Supply	No.	160			
		Install	No.	160			
9.4		CLAMPS & CLIPS					
9.4.1		RS1 Universal End and Mid Clamp 30 - 50mm Silver ONE FOR ALL.					
a		Supply	No.	0			
b		Install	No.	0			
9.4.2		End Clamp+ 30 - 50mm Silver.					
a		Supply	No.	160			
b		Install	No.	160			
9.4.3		Middle Clamp+ 30 - 50mm Silver.					
a		Supply	No.	600			
b		Install	No.	600			
9.5		BOLTS					
9.5.1		Hanger bolt M10 x 200 - 81 Ø9,0/M10					
a		Supply	No.	0			
b		Install	No.	0			
9.5.2		Hexag. Bolt M6x20 & Hex. Flange nut M6, pack of 24.					
a		Supply	No.	70			
b		Install	No.	70			
9.6		PRE-CAST CONCRETE FOOTING/PLINTH					
9.6.1		Supply and install Concrete Footing to Structural Engineer's Detail with reinforcement for foundation struts/column steel structure inserted into the ground according to the structural drawings and specifications and/or Engineer instructions) to BS5950. It shall come complete with surface mount fixed base plate, M12 bolts and nuts.					
a		Supply	No.	10			
b		Install	No.	10			
9.7		SUNDRIES					
a		Consumables, fischer plugs, screws etc.	Sum	1			
<b>Total Carried Forward To Summary</b>							

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Schedule 2: Plant 1, 2 & 3

Section 10: Network Communication & Control

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 10: NETWORK COMMUNICATION AND CONTROL					
		Rates shall include supply, delivery, installation and all accessories such as mounting screws etc.					
		Note: All material shall be SABS approved or IEC compliant.					
10.1		CABLE					
		The exact length of cable to be verified by the tenderer, and reported back to the Engineer. The tenderer accounts for the correctness of the distance he or she has given in here UTP cable.					
		UTP cable to connect sockets and panels. Crimping charges for both ends of cable for outlets are to be included.					
		CAT-5e Cable.					Rate Only
a		Supply	m	150			
b		Install	m	150			
10.2		CONNECTOR/PLUGS					
		RJ45 cat5e connector.					Rate Only
a		Supply	No.	6			
b		Install	No.	6			
10.3		SOCKET OUTLETS					
		RJ45 flush mount wall box outlets c/w PVC coverplate (White).					
a		Supply	No.	6			
b		Install	No.	6			
10.4		PATCH PANEL					
		16 Port LC ethernet patch panel with 16 ports populated, 1U					
a		Supply	No.	3			
b		Install	No.	3			
10.5		SWITCHES AND HUBS					
Total Carried Forward							

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Section 10: Network Communication & Control

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
		Stack mountable, scalable, high-performance Gigabit Ethernet switch offering support for IEEE 802.3AT compliant high-power PoE, flexible 10 Gigabit Ethernet options, dynamic IPv4 and IPv6 routing, 24 x 10/100 (PoE) + 2 x SFP + 2 x 10/100/1000, MDI/MDI-X RJ45 4 Combo SFP ports i.e, with (2) high-speed dedicated stacking ports and external RPS connector, Power over Ethernet (PoE), 48Gbpps switching capacity, 35.7 Mpps throughput capacity (64 byte packet size). AC 100-240 V (50-60 Hz)					
		Preferred OEM and Model: To match client existing infrastructure					
a		Supply	No.	3			
b		Install	No.	3			
10.6		RACK CABINETS					
		The tenderer to ensure that racks are supplied complete and fully assembled, wired neatly with cable ties, all wires tagged with unique numbers/identifiers.					
		4U height unit rack swing frame 600mm deep, complete, with:*					
		1No. 2-way fan, 1No. depth reducer					
		-power duct(s) equipped with sufficient mains outlets,					
		-flat shelf(s),					
		-blank panels,					
		-brush panels and entries,					
		-cage nut assemblies,					
		-base blank plate,					
		-cable and wire identifiers/markers.					
		-mounting rails,					
a		Supply	No.	3			
b		Install	No.	3			
10.7		POWER UNIT					
		6 Way Aluminium Moulded Rack Mount PDU					
a		Supply	No.	3			
b		Install	No.	3			
10.8		RADIO LINK					
Total Carried Forward							

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Section 10: Network Communication & Control

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	C
Brought Forward							
		High-Capacity Multipoint and Point to Point Gigabit 450 Mbps aggregate throughput radio link based on 802.11 ac Wave 2 operating in 5 GHz wireless space. Units shall have the following key features (refer to specification);  - Wide-band operation 4.9 to 6.05 GHz - Dynamic Spectrum Optimization or manual intervention - IPv6/IPv4 dual-stack management support - FIPS-197 128/256-bit AES encryption - LINKPlanner Support - Up to 27 dBm transmission power - Up to 164 dB system gain with Integrated antenna - Up to 250 km transmission range - IP66/67 rated metal enclosure  Preferred manufacture and Model: Cambium Networks, PTP 670					
10.8.1		Type PTP1					
a		Supply	No.	1			
b		Install	No.	1			
		Point to Point Gigabit aggregate throughput radio link based on 802.11 ac Wave 2 operating in 5 GHz wireless space. Units shall have the following key features (refer to specification);  - Wide-band operation 5.17 to 5.9 GHz - Up to 1.4 Gigabit per second - Two (2) independent radios 2x2:2 (each 2 streams), 4 streams total (4X4 MIMO) - Built in Live Spectrum analyzer - IPv6/IPv4 dual-stack management support - FIPS-197 128/256-bit AES encryption - LINKPlanner Support - cnMaestro Support - ARQ Support - Up to 26 dBm transmission power - Up to 173 dB system gain with Integrated antenna - Up to 200 km transmission range - IP66/67 rated metal enclosure  Preferred manufacture and Model: Cambium Networks, PTP 550					
10.8.2		Type PTP2					
a		Supply	No.	3			
b		Install	No.	3			
10.9		SURGE PROTECTION					
Total Carried Forward							

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

Engineering Works

South African National Space Agency (SANSA)

Schedule 2: Plant 1, 2 &amp; 3

## Section 10: Network Communication &amp; Control

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
		56 VDC Gigabit Ethernet Surge Suppressor. Preferred manufacture: Cambium Networks					
a		Supply	No.		3		
b		Install	No.		3		
Total Carried Forward To Summary							

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

Engineering Works

South African National Space Agency (SANSA)

Schedule 2: Plant 1, 2 & 3

Section 11: Earthing, Bonding & Lightning Protection

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 10: EARTHING, BONDING & LIGHTNING PROTECTION					
		As specified in the Technical Specification, having verified the site conditions, supply and install earthing and lightning protection system using the equipment listed below.					
		NOTE 1: Work to be undertaken by specialist contractor recommended by Principal Agent/Agent/Client.					
		Rates shall include supply, delivery, storage, installation. Installation to be in accordance with specifications, SANS standards for complete project up to the satisfaction of the Engineer(s).					
10.1		16 mm <sup>2</sup> , bare stranded Copper earth conductor.					
a		Supply	m	450			
b		Install	m	450			
10.2		16 mm <sup>2</sup> compression connectors.					
a		Supply	No.	36			
b		Install	No.	36			
10.3		Copper covered steel earth rods class 2, 1.5 m long, driven full length into ground complete with ground buried clamps.					
a		Supply	No.	36			
b		Install	No.	36			
10.4		500 mm long copper air terminals complete with fixing plates and fixing bolts for lightning protection to be installed at Engineer's instruction.					
a		Supply	No.	108			
b		Install	No.	108			
10.5		40mm stainless steel equipotential bonding clip inserted under the clamps between the module and the mounting rail.					
a		Supply	No.	840			
b		Install	No.	840			
10.6		Continuous 35 mm <sup>2</sup> round solid zinc coated copper conductor of 3 m long per point connected between perimeter bonding strip and to earth electrode, fixed to vertical steel column, including all fixing accessories and 1.5 m of 20 mm diameter galvanized steel conduit.					
Total Carried Forward							

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

Engineering Works

South African National Space Agency (SANSA)

Schedule 2: Plant 1, 2 &amp; 3

## Section 11: Earthing, Bonding &amp; Lightning Protection

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
Brought Forward							
a		Supply		No.	36		
b		Install		No.	36		
Total Carried Forward To Summary							

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

Engineering Works

South African National Space Agency (SANSA)

Schedule 2: Plant 1, 2 & 3

Section 12: Sea Freight Container

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 12: SEA FREIGHT CONTAINER					
		Complete supply, construction and installation: Containerized Solution					
		Supply, deliver, install, build, modify and connect, a complete sea freight shipping container solution to suit the equipment listed in this BOQ whic shall include:					
		- the battery battery energy storage system - Inverter/power converters - battery management system - DC combiner boxes - AC/DC protection boxes					
		The container shall be equipped with a complete fire suppression system, air conditioning and ventilation system, and integrated with global energy management system and be interfaced with solar PV system and existing generator sets through intelligent control/communication systems.					
12.1		SHIPPING CONTAINER					
		Sea Freight Container 12m Used - B Grade.					
		The rate shall be inclusive of - Container Off-site Build Customization according to layout. - Container On-site Build Customization according to layout. - Engineering design					
a		Supply	No.	3			
b		Install	No.	3			
12.2		CRANE TRUCK & LIFTING EQUIPMENT					
a		5-10T Crane truck c/w 10-20T mobile crane	hours	15			
12.3		FIRE PROTECTION					
		Fire Detection & Suppression System as per specification.					
a		Supply	set	3			
b		Install	set	3			
12.4		HVAC					
		Air conditioning and ventilation system consisting of 2 No. 12000BTU midwall split units and 3 No. roof mount extraction fans per container as per specification.					
Total Carried Forward							

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

Engineering Works

South African National Space Agency (SANSA)

Schedule 2: Plant 1, 2 & 3

Section 12: Sea Freight Container

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	C
<b>Brought Forward</b>							
a		Supply	set	3			
b		Install	set	3			
12.5		PLINTH					
		Supply and install 2500mm x 14000mm x 400mm concrete plinth of 30MPA constructed with rebars and including excavation, certified concrete mix test results and as per the structural drawings and specification.					
a		Supply	Sum	3			
b		Install	Sum	3			
12.6		SUNDRIES					
		Supply and install the following danger warning signage on metal plate as specified:					
12.6.1		Danger warning sign for "DANGER HIGH VOLTAGE". NB: Signage shall be approved by engineer.					
a		Supply	No.	6			
b		Install	No.	6			
12.6.2		Danger warning sign for "UNAUTHORISED ENTRANCE PROHIBITED". NB: Signage shall be approved by engineer.					
a		Supply	No.	6			
b		Install	No.	6			
<b>Total Carried Forward To Summary</b>							

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

Engineering Works

South African National Space Agency (SANSA)

Schedule 2: Plant 1, 2 & 3

Section 13: Testing and Commissioning

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	c
		SECTION 13: TESTING AND COMMISSIONING					
13.1		TESTING, COMMISSIONING, COCs FOR DISTRIBUTION BOARDS AND ALL POWER CIRCUITS					
		Test, commission and issue a COC for the complete installation for all new and modified circuits including earth conductors, switchgear, auxiliary equipment, fixed equipment, appliances, etc., in accordance with the SANS 0142-1 (2020) and OHS Act 1993 requirements per Distribution Board:					
13.1.1		In General Locations					
a		DC Combiner Box (DCCB1)	No.	1			
b		DC Combiner Box (DCCB2)	No.	1			
c		DC Combiner Box (DCCB3)	No.	1			
d		Battery Fuse Box (DCFB1)	No.	1			
e		Battery Fuse Box (DCFB2)	No.	1			
f		Battery Fuse Box (DCFB3)	No.	1			
g		Mains Distribution Board (DB1)	No.	1			
h		AC Protection Box (ACPB1)	No.	1			
i		AC Protection Box (ACPB2)	No.	1			
j		AC Protection Box (ACPB3)	No.	1			
k		LV Section of Minisub 1	No.	1			
l		LV Section of Minisub 2	No.	1			
13.2		TESTING AND COMMISSIONING FOR PHOTOVOLTAIC SYSTEM					
13.2.1		Pre and Post Installation PV Tests					
a		Solar irradiance measurement with Pyranometer and issue a report.	Sum	1			
b		Soiling Monitoring and issue a report.	Sum	1			
b		Modules and issue a report.	Sum	1			
13.3		TESTING AND COMMISSIONING OF NETWORK COMMUNICATION AND CONTROL SYSTEM					
a		Device/cable labeling, commissioning and testing of the complete system installation	Sum	1			
13.4		SYSTEM CONFIGURATION, SET UP AND INTEGRATION					
Total Carried Forward							

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

Engineering Works

South African National Space Agency (SANSA)

Schedule 2: Plant 1, 2 & 3

Section 13: Testing and Commissioning

ITEM NO	PAYMENT	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	
						R	C
<b>Brought Forward</b>							
a		Configuring, setting up and integrating the networking infrastructure, controllers, inverters, battery management system (BMS) etc.	Sum	1			
13.5		<b>TESTING AND COMMISSIONING FOR EARTHING AND LIGHTNING INSTALLATION</b>  Test and commission the complete earthing and lightning protection for all tables covered under this contract.  Important to demonstrate the following tests; i. Continuity of earth and lightning conductors. ii. Earth rod resistance test iii. Soil Resistivity Test  NB: Tests are not limited to the scope above and shall <u>ONLY</u> be conducted in the presence of the engineer or his representative to remain valid.					
a		Test complete installation for all tables and structures	Sum	1			
13.5		<b>TESTING AND COMMISSIONING FOR GROUND MOUNT STRUCTURE</b>  Test, commission and issue certification of the complete ground mount structure for all tables covered under this contract.  Important to demonstrate the following tests; i. Vertical Uplift Test ii. Horizontal Pressure Test  NB: Tests are not limited to the scope above and shall <u>ONLY</u> be conducted in the presence of the engineer or his representative to remain valid.					
a		Test complete installation for all tables and structures	Sum	1			
<b>Total Carried Forward To Summary</b>							

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

Engineering Works

South African National Space Agency (SANSA)

Schedule 2: Plant 1, 2 &amp; 3

**SUMMARY OF SECTIONS**

SECTION	DESCRIPTION	AMOUNT (RAND)
1	Section 1: PV Modules & Accessories	.....
2	Section 2: Distribution Boards	.....
3	Section 3: Wireways	.....
4	Section 4: Earth Works: Excavation & Trenching	.....
5	Section 5: Cabling	.....
6	Section 6: Appliances	.....
7	Section 7: Light Fixtures	.....
8	Section 8: Equipment	.....
9	Section 9: Ground Mounting Structure and Container	.....
10	Section 10: Network Communication & Control	.....
11	Section 11: Earthing, Bonding & Lightning Protection	.....
12	Section 12: Sea Freight Container	.....
13	Section 13: Testing and Commissioning	.....
Total Carried Forward To Summary Of Schedules		_____

**1 MW Solar Photovoltaic PV Plant in Krugersdorp - Phase 1**

Engineering Works

South African National Space Agency (SANSA)

**SUMMARY OF SCHEDULES**

SCHEDULE	DESCRIPTION	AMOUNT (RAND)
1	Schedule 1: Preliminaries and General	.....
2	Schedule 2: Plant 1, 2 & 3	.....
	<b>SUBTOTAL</b>	.....
3	Add 15% VAT	.....
Total Carried Forward To Summary Of Contracts		.....