



## FINAL ACCEPTANCE AND COMPLIANCE TESTS SOLAR PV SYSTEMS NAMIBIA S4H GP 600497

<b>Site Name or ID:</b> Okaukamasheshe Health Clinic	<b>Inspection date:</b> 13.12.2017
<b>GSOL Representative:</b> Mr. Michael Moses	<b>Note:</b> <b>Grid-connected System (public power)</b>

### **FAC Test Description:**

- The main objective of the Final Acceptance Test is to assure the purchaser that all the components of the System are installed in right quantity, and the System met the relevant requirements.
- The Final Acceptance Test is successfully performed when the FAC requirements for a system included in the relevant purchase order are met, the FAC are performed successfully and no severity level 1(service affecting) or no severity level 2 (non-service affecting) defects remain in the system.
- The punch list shall list all defects ranked as severity level 1 or 2 defects identified during the respective final acceptance test, if any. All level 1 defects shall be remedied by contractor prior to final acceptance. All level 2 defects can be remedied by contractor during 4 weeks after signing FAC.

### **Severity Level 1 Defects:**

Severity Level 1 defects or service affecting defects are all defects that can contribute to FAC failure.

### **Severity Level 2 Defects:**

Severity Level 2 defects or non-service affecting defects are all defects that cannot contribute to FAC failure and should be marked on the document for clearance after the FAC visit. After FAC all severity level 2 defects should be cleared during 4 weeks. The same punch/snag list should be used to verify that all snags identified at FAC are cleared.

### **Severity Level 1 Defects List:**

- Power System not operational (system not supplying power to equipment)
- Power System functioning but not functioning in battery mode.
- Solar chargers not functioning (not supplying DC to the battery or some modules not operational)
- Inverters not functioning (not supplying AC load or some modules not operational)
- Mains mode not functional (not supplying AC load when mains is available, PV panels disconnected and battery discharged)
- Batteries not functional.
- PV panels not functional.
- Delivery not complete.

### **Severity Level 2 Defects List:**

- All other snags identified on site as per the table on page 3.



BILL OF QUANTITY / COMPONENT	PART NUMBER	QUANTITY	CHECKED (GSOL)	APPROVED (CUSTOMER)
Victron Quattro 48/8k/110-100/100	QUA488020000	1	✓	✓
Victron SmartSolar MPPT 250//100-TR	SCC125110210	1	✓	✓
Victron Lynx Distributor	LYN060102000	1	✓	✓
Victron Lynx Power In	LYN020102000	1	✓	✓
Victron Lynx Shunt VE.Can	LYN040102100	1	✓	✓
Victron Color Control GX	BPP000300100R	1	✓	✓
BAE Cell 6 PVV 900 PPOL horizontal	2089017	24	✓	✓
EGing Solar 250Watt Poly, Alu panel	02250P05	24	✓	✓
Circuit breaker B 16A 1 pole	2622758039	2	✓	✓
Circuit breaker C 32A 1 pole	2122721414	2	✓	✓
Outdoor cabinet for batteries and inverter w/cooling	SBC-DK	1	✓	✓



SEVERITY LEVEL 1 SNAGS – SERVICE AFFECTING SNAGS:	PASS	FAIL	CLEARED
Power System operational? Supplying power to equipment	X		✓
Power System tested in hybrid mode, stable in all modes: generator/mains, solar and battery (not related to generator issues)	X		✓
All Solar chargers functional? Charging batteries when solar energy available.	X		✓
All Inverters functional? Supplying load to AC equipment.	X		✓
All Solar panels functional?	X		✓
Battery operation to be verified?	X		✓
Delivery complete?	X		✓
SEVERITY LEVEL 2 SNAGS –NON - SERVICE AFFECTING SNAGS:	PASS	FAIL	CLEARED
Installation is as per agreed layout design.	X		✓
The visual inspection of equipment is free from any damage.	X		✓
All connections ( <b>cabling and coopers</b> ) correct gauge and securely terminated.	X		✓
Solar structure properly mounted on the roof or ground.	X		✓
All solar panels firmly fixed on roof or ground structure.	X		✓
All equipment labeled.	X		✓
No alarms present on power system.	X		✓
System log files to be verified.	X		✓
System Voltage Calibration and readings to be checked & verified.	X		✓
Load & Battery Current Calibration to be checked & verified	X		✓
Battery Breaker to be tested & verified.	X		✓
Load Breakers to be tested & verified.	X		✓
Battery rack properly installed	X		✓
Batteries free from damages and acid leakages properly installed on rack.	X		✓
Check earth connections to Power system and Solar panels	X		✓
Staff training performed.	X		✓



DESCRIPTION	VALUE	COMMENTS
Min. AC Load during FAC visit:	1,37kW	
Max. AC Load during FAC visit:	1,47kW	
Current from Solar chargers:	1A	Can go from 0 to 100A (System on grid)
Battery voltage:	55,2V	
Generator Rating:	N/A	Grid connected.
Equipment Room Temperature at FAC visit:	32°C	Cabinet set to 26 °C
Battery voltage to switch on Mains:	49V	Grid connected.
AC Current available from mains:	32A	Limited by programming and breaker

SNAGS LIST – TO BE CLEARED	RESPONSIBLE	CLEARED
Installation Complete – no pending installation related action.		

**FAC Summary:**

FAC APPROVED BY:	Name:	Signature:
Site Representative	DR. MUSA SAHANI	
GSOL Representative	MICHAEL MOSES	
UNDP Representative	Mediam Lopez	
UNDP/PSU Representative	Blessing Kabasa	



Annexes







### System Test Report

#### 1. General Data

Project Nr.: 10264  
 Customer: UNDP (GP600497 Namibia)  
 System ID: 2017MP100061  
 Q.C. Passed:  Yes  No  
 Signature: *[Handwritten Signature]*

GSOL ENERGY GLOBAL A/S  
  
 2017MP100061  
 www.gsolenenergy.com

#### 2. System information

Inverter  
 No. of Inverters: 1  
 Voltage (L-N): 230 VAC  
 DC Cable dimension: 25 mm<sup>2</sup>  
 AC-Out Cable dim.: 2x6 mm<sup>2</sup>  
 AC-In Cable dim.: 2x6 mm<sup>2</sup>  
 Max DC Amp: 210  
 Firmware version: 2653-413  
 Inverter type & size: V. Quattro 8kVA  
 1-phase or  3-phase  
 DC fuse: 200 A  
 AC relay/junction Amp:  
 Max AC Amp /phase: 34  
 AC OVP - cut  
 Charger  
 No. of chargers: 1  
 DC Cable dimension: 25 mm<sup>2</sup>  
 Firmware version: 2.04  
 Charger type: MPPT 250/100-TR  
 DC fuse: 125A  DC OVP DENHguard  
 DC Coupling  Distributor  Power-In  Lynx Ve.Can Max DC Amp:  
 AC Coupling  Type GEG AC Amp size: 32A  
 Type Multicuster  
 Battery Battery bank voltage: 48 V Ah per cluster: 729 C10  
 PV Inverter No. of PV-Inverters:  
 AC Cable dimension:  
 Grid Feedback allowed:  Yes  No  
 Firmware version:  
 Grounding  New Grounding rod  Existing Grounding rod Cable dim. 6 mm<sup>2</sup>  
 Monitoring  Battery monitor  Color Monitor  Other 2.11 Monitor ID: 45ad097cca

#### 3. System testing - Installation

Fixation  All elements firmly installed  Bolts used at: INVERTER  
 Cabling  Cables laid with respect to bending radius (max 5 x diameter) and orientation  
 Cable fixators at every 30 cm max  
 Marking Cable polarity marked:  Red/Black  Cable marking system  
 AC-in / AC-out marked LABEL RED/BLACK  
 Battery connection marked

#### 4. System testing - Function

Inverter  All lights showing Normal operation AC test level: 2000 W  
 Listed system voltage and phase verified  
 Inverter Program  UPS / Prioritise Grid Voltage (L-N): 230 VAC  
 Custom trigger for cyclic operation  
 AC-In Power trigger lvl: W Battery trigger lvl: Udc  
 AC-In Power block lvl: W Battery block lvl: Udc  
 Trigger parameters verified  
 PV inverter Frequency shifting  
 Grid Feedback activated?  No  Yes from Chargers  Yes from PV inverters  
 NOTES: System tested with 500Wp per charger

System charging  By Chargers  By Grid/Genset  By PV inverter  
 Safety Battery Breaker functional  Yes  No  
 System Grounding  Grounding ok  
 Monitor Color Monitor:  All devises showing  Activated on Web-portal  
 Two-way com enabled  
 Battery Monitor:  Battery Ah set

#### 5. Comments / Written notes



## FINAL ACCEPTANCE AND COMPLIANCE TESTS SOLAR PV SYSTEMS NAMIBIA S4H GP 600497

<b>Site Name or ID:</b> Kalkrand Health Clinic	<b>Inspection date:</b> 14.12.2017
<b>GSOL Representative:</b> Mr. Oscar Ditlevsen	<b>Note:</b> <b>Grid connected System (public power)</b>

### **FAC Test Description:**

- The main objective of the Final Acceptance Test is to assure the purchaser that all the components of the System are installed in right quantity, and the System met the relevant requirements.
- The Final Acceptance Test is successfully performed when the FAC requirements for a system included in the relevant purchase order are met, the FAC are performed successfully and no severity level 1(service affecting) or no severity level 2 (non-service affecting) defects remain in the system.
- The punch list shall list all defects ranked as severity level 1 or 2 defects identified during the respective final acceptance test, if any. All level 1 defects shall be remedied by contractor prior to final acceptance. All level 2 defects can be remedied by contractor during 4 weeks after signing FAC.

### **Severity Level 1 Defects:**

Severity Level 1 defects or service affecting defects are all defects that can contribute to FAC failure.

### **Severity Level 2 Defects:**

Severity Level 2 defects or non-service affecting defects are all defects that cannot contribute to FAC failure and should be marked on the document for clearance after the FAC visit. After FAC all severity level 2 defects should be cleared during 4 weeks. The same punch/snag list should be used to verify that all snags identified at FAC are cleared.

### **Severity Level 1 Defects List:**

- Power System not operational (system not supplying power to equipment)
- Power System functioning but not functioning in battery mode.
- Solar chargers not functioning (not supplying DC to the battery or some modules not operational)
- Inverters not functioning (not supplying AC load or some modules not operational)
- Mains mode not functional (not supplying AC load when mains is available, PV panels disconnected and battery discharged)
- Batteries not functional.
- PV panels not functional.
- Delivery not complete.

### **Severity Level 2 Defects List:**

- All other snags identified on site as per the table on page 3.





BILL OF QUANTITY / COMPONENT	PART NUMBER	QUANTITY	CHECKED (GSOL)	APPROVED (CUSTOMER)
Victron Quattro 48/8k/110-100/100	QUA488020000	1	X	✓
Victron SmartSolar MPPT 250//100-TR	SCC125110210	1	X	✓
Victron Lynx Distributor	LYN060102000	1	X	✓
Victron Lynx Power In	LYN020102000	1	X	✓
Victron Lynx Shunt VE.Can	LYN040102100	1	X	✓
Victron Color Control GX	BPP000300100R	1	X	✓
BAE Cell 6 PVV 900 PPOL horizontal batteries	2089017	24	X	✓
EGing Solar 250Watt Poly, Alu panel	02250P05	24	X	✓
Circuit breaker B 16A 1 pole	2622758039	2	X	✓
Circuit breaker C 32A 1 pole	2122721414	2	X	✓
Outdoor cabinet for batteries and inverter w/cooling	SBC-DK	1	X	✓



SEVERITY LEVEL 1 SNAGS – SERVICE AFFECTING SNAGS:	PASS	FAIL	CLEARED
Power System operational? Supplying power to equipment	X		✓
Power System tested in hybrid mode, stable in all modes: generator/mains, solar and battery (not related to generator issues)	X		✓
All Solar chargers functional? Charging batteries when solar energy available.	X		✓
All Inverters functional? Supplying load to AC equipment.	X		✓
All Solar panels functional?	X		✓
Battery operation to be verified?	X		✓
Delivery complete?	X		✓
SEVERITY LEVEL 2 SNAGS –NON - SERVICE AFFECTING SNAGS:	PASS	FAIL	CLEARED
Installation is as per agreed layout design.	X		✓
The visual inspection of equipment is free from any damage.	X		✓
All connections ( <b>cabling and coopers</b> ) correct gauge and securely terminated.	X		✓
Solar structure properly mounted on the roof or ground.	X		✓
All solar panels firmly fixed on roof or ground structure.	X		✓
All equipment labeled.	X		✓
No alarms present on power system.	X		✓
System log files to be verified.	X		✓
System Voltage Calibration and readings to be checked & verified.	X		✓
Load & Battery Current Calibration to be checked & verified	X		✓
Battery Breaker to be tested & verified.	X		✓
Load Breakers to be tested & verified.	X		✓
Battery rack properly installed	X		✓
Batteries free from damages and acid leakages properly installed on rack.	X		✓
Check earth connections to Power system and Solar panels	X		✓
Staff training performed.	X		✓



DESCRIPTION	VALUE	COMMENTS
Min. AC Load during FAC visit:	0,2 kW	
Max. AC Load during FAC visit:	1,2 kW	Clinic A/C unit and cabinet cooling active
Current from Solar chargers:	62 A	Can go from 0 to 100A
Battery voltage:	55V	
Generator Rating:	N/A	No genset present
Equipment Room Temperature at FAC visit:	30 °C	Cabinet set to 26 °C
Battery voltage to switch on Mains:	49 V	
AC Current available from mains:	32 A	Limited by programming and breaker

SNAGS LIST – TO BE CLEARED	RESPONSIBLE	CLEARED
Installation Complete – no pending installation related action.		

**FAC Approval/Signatures:**

FAC APPROVED BY:	Name:	Signature:
Site Representative	Willetta Njorais (Nurse)	<i>[Handwritten Signature]</i>
GSOL Representative	Oscar Ditlevsen	<i>[Handwritten Signature]</i>
UNDP	Merian Lopez	<i>[Handwritten Signature]</i>
UNDP/PSU Representative	Blessing Kabasa	<i>[Handwritten Signature]</i>



Annexes







System Test Report

1. General Data

Project Nr.: 10187
Customer: UNDP (GP600497 Namibia)
System ID: 2017MP100069
Q.C. Passed: [X] Yes [ ] No
Signature: [Handwritten Signature]

GSOL ENERGY GLOBAL A/S
Barcode: 2017MP100069
www.gsolenergy.com

2. System Information

Inverter: No. of inverters: 1, Voltage (L-N): 230 VAC, DC Cable dimension: 25 mm2, AC-Out Cable dim.: 2x6 mm2, AC-In Cable dim.: 2x6 mm2, Max DC Amp: 210, Firmware version: 2653-413, Inverter type & size: V. Quattro 8kVA, DC fuse: 200 A, AC relay/junction Amp: 34, Max AC Amp /phase: 34, AC OVP - out: [X]
Charger: No. of chargers: 1, DC Cable dimension: 25 mm2, Firmware version: 2.04, Charger type: MPPT 250/100-TR, DC fuse: 125A, DC OVP: DENHguard
DC Coupling: [X] Distributor, [X] Power-In, [X] Lynx Ve.Can, Max DC Amp: 32A
AC Coupling: [X] Type GEG, [ ] Type Multicluster
Battery: Battery bank voltage: 48 V, Ah per cluster: 729 C10, Inverter type & size: 1
PV Inverter: [ ]
Grounding: [X] New Grounding rod, [ ] Existing Grounding rod, Cable dim.: 6 mm2
Monitoring: [ ] Battery monitor, [X] Color Monitor, [ ] Other, Monitor ID: 45cab697ccc

3. System testing - Installation

Fixation: [X] All elements firmly installed, [X] Bolts used at: INVERTER
Cabling: [X] Cables laid with respect to bending radius (max 5 x diameter) and orientation, [X] Cable fixators at every 30 cm max
Marking: Cable polarity marked: [X] Red/Black, [ ] Cable marking system, [X] AC-in / AC-out marked, [X] Battery connection marked, LABEL RED/BLACK

4. System testing - Function

Inverter: [X] All lights showing Normal operation, AC test level: 2000 W, [X] Listed system voltage and phase verified
Inverter Program: [X] UPS / Prioritise Grid, Voltage (L-N): 230 VAC, [ ] Custom trigger for cyclic operation
AC-In Power trigger lvl: W, Battery trigger lvl: Udc, AC-In Power block lvl: W, Battery block lvl: Udc
[X] Trigger parameters verified, [ ] PV inverter Frequency shifting
Grid Feedback activated?: [X] No, [ ] Yes from Chargers, [ ] Yes from PV inverters
NOTES: System tested with 500Wp per charger
System charging: [X] By Chargers, [X] By Grid/Genset, [ ] By PV inverter
Safety: Battery Breaker functional: [X] Yes, [ ] No
System Grounding: [X] Grounding ok
Monitor: Color Monitor: [X] All devises showing, [ ] Activated on Web-portal, [X] Two-way com enabled, Battery Monitor: [X] Battery Ah set

5. Comments / Written notes