REVISION HISTORY			
REV	**Description of Change**	**Authors**	**Effective Date**
0	Release	Nelson Tashobya	10.09.2018

DOCUMENT SIGN-OFF		
Name	**Role**	**Signed**
Rajesh Chengta	Head of Operations (Uganda)	
Chris Jonck	Head of Power Solutions (EMEA)	
Priscilla Kigumba	Capital Projects (Uganda)	
Lois Birungi	Operations (Uganda)	

DOCUMENT DISTRIBUTION	
Name	**Role**
Rajesh Chengta	Head of Operation (Uganda)
Chris Jonck	Head of Power Solutions (EMEA)
Priscilla Kigumba	Head of Projects (Uganda)
Nick Johl	Power Solutions (EMEA)

REFERENCE DOCUMENTS	
Document Number	**Document Title**

Documents referenced in this procedure are applicable to the extent specified herein.

1. SITE DETAILS

Region:	
Main Contractor:	
Sub - Contractor:	

Site Name:		**Site ID:**	
Latitude:			
Longitude:			
Date of ATP:			
UMEME Capacity Circuit Breaker (A):		**Generator Capacity (kVA Prime):**	

Site Description:	**Upgrade**	**Share: Third Party**	**New**	**Other (Specify Below):**

2. FOREWORD

2.1 The ATP (Acceptance Test Procedure) is to be completed for a final acceptance for a new installation of INCELL LIB batteries in delta cabinets.

2.2 Read through the whole ATP before starting the tests.

2.3 The person responsible for conducting the acceptance test shall have been trained and certified on INCELL LIB batteries and shall have been informed that tests are to be performed under the general control of a qualified person when connecting to a Utility supply.

2.4 All test and measurement equipment are to be calibrated.

2.5 The following documents are necessary for completing the ATP:

- Power System Installation Document
- Power System Commissioning Document
- Installed Battery Datasheet
- Master Configuration Sheet showing high level bill of materials, site power configuration

2.6 The following test equipment and software are required for completing the ATP:

- Clamp Meter
- Torque wrench
- Philips screw driver
- Laptop PC with Window OS
- Ethernet cable
- A-B USB cable (printer cable)
- RS485-USB Converter cable (for logging into INCELL batteries)
- Infrared thermometer
- Earth resistance tester
- Touch-up paint and applicator
- BSM software for logging into INCELL batteries.

2.7 The completion of the ATP is the responsibility of the contractor. Upon completion of the work and the checklist portion of the work specified, the ATP must be handed over to the relevant ATC Representative for review and approval (sign-off).

2.8 If any observations/non-compliances are found, the observations/non-compliances must FIRST BE CLEARED as per the agreement between the contractor and ATC. Upon rectification, both parties must be informed, and proof must be presented, either by documentation, inspection and/or photographic evidence.

2.9 Once the rectifications to any observations have been cleared and accepted, the relevant section of the ATP must be signed off by all parties.

3. INVENTORY

DC System Controller	S/N		MAC	
	SW Version		CFG	

	Type/Brand	Model No.	Serial No/s.		
Rectifier Chassis					
Rectifier Modules					
Aircon 1		Model No.		Serial No.	
Aircon 2		Model No.		Serial No.	

	Type/Brand	Model No.	Serial No.
Generator Controller			
Generator Run Hours		Indoor or Outdoor Set	Indoor / Outdoor

	Type/Brand	Model No.	Serial No.
AVR Controller			
AVR Capacity		Output	Single Phase / Three Phase (120° phase angle)

Number of Battery Trays	Battery/Tray Parameters[1]			
Tray	Tray Serial Number	Tray State of Health (SOH%)	Tray State of Charge (SOC%)	Tray Voltage at Commissioning
Tray 1 (48V)				
Tray 2 (48V)				
Tray 3 (48V)				
Tray 4 (48V)				
Tray 5 (48V)				
Tray 6 (48V)				
Tray 7 (48V)				

[1] To record tray parameters, log into the master battery, and take screenshots – which must be attached to the ATP. Without these pictures, the ATP will be rejected.

4. GENERAL CHECK

		Pass Type "a"	Fail Type "r"	N/A
4.1	Is the DC System installed in the correct location as per the site layout drawing and connected as per the site circuit diagram?			
4.2	Has the power equipment been connected to the AC supply using a 3 phase 4 wire SWA cable with separate earth (minimum cable size is 16mm^2 for all conductors)			
4.3	Have all cables been installed out of sight and routed to the respective distribution boards with the appropriate glands (SWA cable to use CCG, DC cables to use compression glands)?			
4.4	Verify the **number** of Cabinets, Battery trays and Rectifier modules installed are correct, according to ATC Project Managers Master Configuration Sheet and mover order details.			
4.5	Check for any damage to equipment and cabinet doors. Ensure no missing bolts, nuts or rivets. Repair any scratches (fix with touch up paint) to exposed metal parts.			
4.6	Check all cable entries at the base of the cabinets are sealed with silicon sealant to ensure IP levels are maintained.			
4.7	Check Aircon drip tube (if supplied) is extended to lead drips off the plinth/sleepers/equipment room.			
4.8	Are all Aircon/s temperature set points set to 30°C?			
4.9	Are all empty rectifier module slot(s) / magazines covered with the supplied cover plate/s? **Note:** N/A if all slots are populated.			
4.10	Check that Earthing for the cabinet is bonded correctly using earth paste (external) for termination. **Note:** the earth must be concealed where possible and protected against mechanical damage.			
4.11	Check that all internal metal conductive parts are electrically continuous with the earthing (bonded to earth).			
4.12	Check battery temp sensor/s is/are positioned in the middle of the battery compartment and not wedged between two batteries. For LIB batteries, place the sensor on the second battery from the top.			
4.13	Check PWM (Pulse Width Modulation) fan control board to ensure the jumper settings are correct, as per manufacturer guidelines.			
4.14	Check that Power compartment internal temp sensor is positioned in front of the exhaust/air outlet.			
4.15	Is there a Cat 5. Cable installed between Rectifier and Galooli unit. Ensure that the cable is working by verifying with Galooli/NOC that communication with the DC system is established.			
4.16	Is there a pair of 1mm^2 flexible power cables at -48VDC for powering the Galooli RMS unit installed, labelled and connected to the FAUX CB and Main '+' positive busbar with the correct terminations? **Note:** verify 12V at the output of the DC to DC converter.			
4.17	Is the Galooli converter unit bonded to main earthing terminal using a 4mm^2 flexible earth cable?			
4.18	Check AC & DC cables are not parallel in the same wireways, correct labelling (+ & -), same size and length of battering cables are used.			
4.19	Check if all power cables are tie-wrapped and reticulated neatly to the side of the cabinet.			
4.20	Check all circuit breakers that are connected to loads are appropriately marked.			
4.21	Check all circuit breaker terminals which have load/supply cables connected for loose connections.			
4.22	Are Alarm cables securely tied at both Galooli and Delta alarm point, cables are not left dangling, hanging or loose.			
4.23	Are all onsite crimping of ferrules, lugs and connectors at DCDB and Rectifier done to East Africa wiring standards with all strands crimped correctly? **Note:** all flexible welding cables (particularly DC cables) are terminated using the correct size and appropriate lugs.			
4.24	Check if all cut-offs, burs and left-over debris have been removed from the cabinet.			
4.25	Check all glands both used and unused are sealed completely from the external /ambient air.			

4.26	What type/Brand_____ and Class _____ of OVP (Surge arrestor) is installed on the DC System AC Distribution rail (at the top)? And are all OVP's functional? **Note:** the OVP must have a minimal earth cable cross sectional area of 6mm2.			
4.27	Check that Grid connected sites have an upstream OVP Class 1 and 2 combination unit on the line side of the generator ATS panel. The earth cable connected to the OVP earth terminal must be at least the same size as the phase conductor cables.			
4.28	General view of installation.	**Good**	**Ok**	**Bad**

5. BATTERY INSTALLATION CHECK

		Pass Type "a"	**Fail** Type "r"	**N/A**
5.1	Check all battery terminal connections are fixed as per the manufacturers recommended settings.			
5.2	Check that all terminals of unused battery cables are properly isolated (heat shrink and cable tie).			
5.3	Are all batteries and battery strings labelled and installed as per labelling sequence? **Note:** battery string circuit breaker numbers must correspond to string designations.			
5.4	Are all batteries marked with a serial number that has been recorded (above)?			
5.5	Confirm that all battery cables are the same length and diameter?			
5.6	Check all inter-battery ethernet cables to ensure they are properly terminated and well fixed. Ascertain there are no communication faults on any of the trays. The status of the communication must be confirmed again after placing and locking of security plate. Ensure the last battery at the bottom has a stopper.			
5.7	Download default and measurement logs to confirm that the settings have been done right			
5.8	Is the cabinet locking mechanism secure and properly fastened?			
5.9	Is the security plate bonded by a $4mm^2$ flexible cable earth connected to earth bar?			
5.10	Are the Incell batteries physically integrated with Galooli? Confirm that LIBs are visible on ZON			
5.11	Are the battery addresses set properly, starting with address 1 for the lowermost battery of the system?			

6. FUNCTIONALITY TESTING

		Pass Type "a"	**Fail** Type "r"	**N/A**
6.1. COOLING				
6.1.1	Is Aircon 1 cooling properly? Verify Aircon cooling ability from NOC with cabinet doors closed for at least 10 minutes, range 20°C -33°C. Record current temperature from controller. **Tbatt 1**_____°C			
6.1.2	Are power compartment fans working correctly, cooling properly? Record current internal temperature from controller. **Tint**_____°C			
6.1.3	Simulate PWM fan control by increasing temperature on internal temp sensor in the power compartment. As the temperature rises the fan speed should start to increase.			
6.1.4	Trigger an emergency ventilation activation by increasing temperature on the battery temp sensor in the battery compartment. When the temperature rises above 37°C the emergency fan will activate. **Note:** allow the temperature to re-stabilize once the emergency fan has activated and ensure the cooling returns to normal (Aircon cooling) with de-activation of the emergency fan once the temperature is below 30°C.			
6.2. GENERATOR ON/OFF TESTS- IF THERE IS GRID AT SITE, YOU MUST DISCONNECT GRID SUPPLY BEFORE CARRYING OUT THIS TEST				
6.2.1	Test the generator remote on/off signal by simulating a generator start. Navigate to **Control > RS Latch** and trigger a **Gen Man. Start.** **Note:** ensure that the RS latch signal is Reset before commencing with further testing.			

6.3. DELAYED GENERATOR START (Grid connected sites)				
Action required: *Turn the Mains/Grid circuit breaker off at the incoming U Supply distribution board.*				
6.3.1	The DC system will use the batteries as the primary source until the bus voltage drops to DG triggering level @ 50.5V. Check that the generator does **not** start immediately.			
Action required: do not turn the mains breaker back on yet. Let the batteries continue to supply power to connected load.				
6.4. HYBRID CYCLING				
6.4.1	Test the generator hybrid charge cycle by simulating a generator start. Navigate to **Control > RS Latch** and trigger a **Gen On (US).** The generator should enter its start sequence.			
6.4.2	Check that the Generator controller is running through its startup sequence i.e. Startup Delay (200s), Safety on Delay (10s) **Note**: the warm up time is critical to allow the generator to properly heat up before taking high load and must be adjusted if not correctly set.			
6.4.3	Check that the generator contactor in the ATS engages to supply AC power to the DC System / rectifier.			
6.4.4	Check that the rectifier charging modules all turn on and rectifier communications is ON **Note**: ensure that all rectifier modules communication LED's are lit (COM LED).			
6.4.5	Check that the rectifiers ramp up current gradually, so as not to overburden the generator with step loading.			
6.4.6	Check that the battery charging current does not exceed the preset value.			
6.4.7	Check that the system charging voltage (bus voltage) starts to rise gradually.			
6.4.8	Check that the generator phases are balanced, and the generator is carrying the load. **Note:** optimal generator loading/efficiency is 64% of the total kVA capacity.			
6.4.9	Test the generator hybrid off/discharge cycle by simulating a generator stop. Navigate to **Control > RS Latch** and reset the **Gen On (U)** latch. The generator should enter its stop/cooldown period.			
6.4.10	Confirm the number of working rectifier modules at site			

7. MEASUREMENTS

7.1. GRID POWER (if applicable)				
Action required: use a multimeter/clamp-meter to measure the voltages from phase to phase, and phase to neutral from the incoming isolator on the DC system. Use a clamp meter to measure the drawn current from the supply at the Generator ATS grid input.				
7.1.1	Line Voltages in Volts	L1-L2 =	L2-L3 =	L3-L1 =
7.1.2	Phase Voltages in Volts	L1-N =	L2-N =	L3-N =
7.1.3	Phase Currents in Amps	L1 =	L2 =	L3 =
7.1.4	Voltage Neutral to Earth	N-E =		
7.2. GENERATOR POWER				
Action required: turn off the mains power (if applicable) and turn the generator on by manually starting it from the Deep-Sea panel. Use a multimeter/clamp-meter to measure the voltages from phase to phase, and phase to neutral from the incoming isolator on the DC system. Use a clamp meter to measure the drawn current from the alternator supply at the Generator ATS load output.				
7.2.1	Line Voltages in Volts	L1-L2 =	L2-L3 =	L3-L1 =
7.2.2	Phase Voltages in Volts	L1-N =	L2-N =	L3-N =
7.2.3	Phase Currents in Amps	L1 =	L2 =	L3 =

7.2.4	Voltage Neutral to Earth	N-E =		
7.3. ADDITIONAL MEASUREMENTS				
7.3.1	Record earthing value of Cabinet to ground.		Ω	
7.3.2	Record Generator battery voltage when Generator is at rest		V	

8. ALARM AND SIGNAL TESTING

PRE-REQUISITES:

- The system needs to be operating from an AC supply (Mains or Gen).
- All alarms are to be cleared before starting the test, the intrusion and Urgent alarm will remain on all other alarms must be cleared.

Actions required:

- *Check all the PFC contacts for continuity in the in-active state (all alarms are break-to-activate, all signals are close to activate).* ***Note:*** *PFC is Potential Free Contact*
- *Navigate to* ***Alarms > Maintenance***
- *Simulate the following alarms whilst ensuring that the PFC's change state from being either closed (make) to open (break) or open to closed as shown.*

Action: "Reset" the "UA (urgent) system alarm" as it should currently be active due to intrusion alarm which is grouped under Urgent Alarm.		**Pass** Type "a"	**Fail** Type "r"	**N/A**
8.1	Check that the alarm shows in the alarm list as Active. It will highlight the alarm in RED when active.			
8.2	Check that the continuity is returned over the PFC output terminals 1 and 2.			
Action: "Set" the "UA (non-urgent) system alarm"				
8.3	Check that the alarm shows in the alarm list as Active. It will highlight the alarm in RED when active.			
8.4	Check that the continuity is broken over the PFC output terminals 3 and 4.			
Action: "Reset" the "Intrusion alarm" as it should currently be active, due to cabinet door being open.				
8.5	Check that the alarm shows in the alarm list as Active. It will highlight the alarm in RED when active.			
8.6	Check that the continuity is returned over the PFC output terminals 5 and 6.			
Action: "Set" the "HW Failure alarm"				
8.7	Check that the alarm shows in the alarm list as Active. It will highlight the alarm in RED when active.			
8.8	Check that the continuity is broken over the PFC output terminals 7 and 8.			
Action: "Set" the "High Temp alarm"				
8.9	Check that the alarm shows in the alarm list as Active. It will highlight the alarm in RED when active.			
8.10	Check that the continuity is broken over the PFC output terminals 9 and 10.			
Action: "Set" the "MCB Fail alarm"				
8.11	Check that the alarm shows in the alarm list as Active. It will highlight the alarm in RED when active.			
8.12	Check that the continuity is broken over the PFC output terminals 11 and 12.			
Action: "Set" the "OVP Fail alarm"				

8.13	Check that the alarm shows in the alarm list as Active. It will highlight the alarm in RED when active.			
8.14	Check that the continuity is broken over the PFC output terminals 13 and 14.			
Action: "Set" the "BLV alarm" (Battery low Voltage)				
8.15	Check that the alarm shows in the alarm list as Active. It will highlight the alarm in RED when active.			
8.16	Check that the continuity is broken over the PFC output terminals 15 and 16.			
*Action: Simulate a "Battery on discharge" signal by Navigating to **Configuration > Battery > System Voltage Supervision** and adjust the "**BoD**" voltage to just above the current bus voltage. The signal will then become active.*				
8.17	Check that the continuity is closed/returned over the PFC output terminals 17 and 18.			
*Action: adjust the "**BoD**" voltage back to default 50.2V. The signal will then de-activate.*				
Action: "Set" the "BM Failure Alarm" to simulate a Battery Midpoint failure.				
8.18	Check that the alarm shows in the alarm list as Active. It will highlight the alarm in RED when active.			
8.19	Check that the continuity is broken over the PFC output terminals 19 and 20.			
Action: "Set" the "Gen Fault Alarm"				
8.20	Check that the alarm shows in the alarm list as Active. It will highlight the alarm in RED when active.			
8.21	Check that the continuity is broken over the PFC output terminals 21 and 22.			
***Very Important - Action**: return all Alarms back to "Normal" operation to allow the alarms to flag when active.*				

9. PARAMETER SETTING CHECK[2]

If SW version of Orion is of lower version than 6.5, you must upgrade it before you proceed to the next steps in section 9 of this document.

		Pass Type "a"	Fail Type "r"	N/A
9.1	Is the Orion controller date/time and site name set correctly? (Attach picture)			
9.2	Is Float Voltage set to = **57.2V**			
9.3	Is temperature Compensation **DISABLED / Set to ZERO**			
9.4	Is Equalize Voltage set to = **DISABLED**			
9.5	Is Boost Voltage set to = **DISABLED**			
9.6	Is Battery Low Voltage (BLV) set to = **50.2 V**			
9.7	Is GEN on (U) set to = **50.5V**			
9.8	Is PLD set to = **49.14 V**			

[2] The LIB configuration/setup files MUST be loaded onto the rectifier controller before the LIBs are connected.

9.9	Is LVD set to = **46.9 V**			
9.10	Is Event Control Charge Voltage set to = **47.5?** **Activation Input:** ECC ON			
9.11	Is the Gen Off (U) set to -------**56.8V**			
9.12	Is PLD Hysteresis set to = **1.0V**			
9.13	Is LVD Hysteresis set to =**1.4V**			
9.14	Is Modbus Slave mapping 00 (74kB) loaded as the Modbus mapping file? **Note:** Save the file to PC to ensure the correct file size.			
9.15	Are the Remote Monitoring Modbus Slave Settings enabled with RTU mode protocol running and OK?			
9.16	Is the Modem Parameter set up as "TPE with Null Modem" and all settings confirmed as defaults?			
9.17	Is the Modbus Slave Parameter Slave ID set to 20 for "K2" Galooli Corona Galooli Corona unit?			
9.18	Are all RS Latch Triggers Reset?			
9.19	CFG Name on the controller:			
9.20	Is Uploaded/Activated Config CFG file "Updated" and synchronized?			

10. C - MODULE DOCUMENTATION

				Procedure/Navigation	
10.1	Screenshot	Battery Management System (BMS)		BMS Home page	
10.2	Screenshot	Time and Date Screen		Configuration > Time and Date	
10.3	Screenshot	Float and Temp Centre Screen		Configuration > Battery > Float Charge	
10.4	Screenshot	Equalize Voltage Screen		Configuration > Battery > Equalize Charge > Edit	
10.5	Screenshot	Boost Voltage Screen		Configuration > Battery > Boost Charge > Edit	
10.6	Screenshot	Temp Comp Coefficient Slope		Configuration > Battery > Temp Compensation	
10.7	Screenshot	Battery Low Voltage (BLV)		Configuration > Signal Processing Engine > Event definition > Edit BLV	
10.8	Screenshot	BSM set point at Charge/Discharge mode		Configuration > Battery > Middle Point Measurement/Block Measurement	
10.9	Screenshot	PLD Status Screen		Configuration > Signal Processing Engine > Event definition > Edit PLD (U)	
10.10	Screenshot	LVD Status Screen		Configuration > Signal Processing Engine > Event definition > Edit LVD (U)	
10.11	Screenshot	Event Control Charge Voltage		Configuration > Battery > Event Control Charge	
10.12	Screenshot	Modbus Slave Settings		Configuration > System > Remote Monitoring > Modbus Slave	
10.13	Screenshot	Modem Settings		Configuration > System > Interface Setup > Modem	
10.14	Screenshot	BCL and Installed Cap Screen		Configuration > Battery > Strings Settings	

10.15	Screenshot	Gen Boost Charge Settings		Configuration > Battery > Boost Charge > Parameter Edit	
10.16	Screenshot	Gen Stop GEN off (U)		Configuration > Signal Processing Engine > Event definition> Edit GEN off (U)	
10.17	Screenshot	Rectifier Parameter Status		Configuration > Rectifier > Parameter	
10.18	Screenshot	Power Limitations		Configuration > Rectifier > Power Limitation by Event	
10.19	Screenshot	Current Alarm display		Home	
10.20	Screenshot	Activated Configuration (synchronized)		Configuration > System > Configuration Manager	
10.21	Log Files	Log Files		Configuration > System > File Manager (All Default and Measurement Logs)	
10.22	Site Photo	**Photos** (tick the adjacent box once picture is taken by pressing "a" in the cell)		Panoramic view of Site showing DC System cabinet/s.	
				DCDB (inside and outside), showing earthing.	
				DC Cabinet/s earth connections.	
				UMEME AC DB supply circuit breaker and supply cable terminations.	
				UMEME AC supply terminations on the Generator ATS Mains input.	
				Picture of the whole ATS panel (inside and out).	
				Deep-Sea/Generator Controller Display with voltages per phase.	
				Deep-Sea/Generator Controller Display with currents per phase.	
				Up-close of back of controller/Generator remote start cabling terminations.	
				Picture of the DC system input AC cable terminations.	
				Battery bank with shields off, showing interconnections, battery cable terminations and	
				Battery bank with shields on, showing earth.	
				Rectifier chassis showing: All circuit breakers, working rectifier modules and controller display.	
				Up-close of Alarm terminations in DC system and on Galooli alarm interface.	
				Up-close showing RS232 connection port on Galooli and DC system Orion controller.	
				Up-close of Orion controller Display.	

11. DC LOAD CIRCUIT BREAKER

Priority CB's									
1F1	1F2	1F3	1F4	1F5	1F ( )	1F ( )	1F( )		
63A									
Non-Priority CB's									
1F7	1F8	1F9	1F10	1F11	1F12	1F13	1F14	1F15	1F16

12. AC CIRCUIT BREAKERS AND CABLE

AC Supply cables including Earth and CB Feeding the DC System								
CB No of Pole(s)	Rating	Cable size	No of cores	Size N	Size L1	Size L2	Size L3	Size Earth

13. OBSERVATION/OUTSTANDING ITEMS

No	Description	ATC Rep	Date of Inspection	Revisit Remark

14. APPROVALS

ATC Quality Rep	ATC Maintenance (Regional Manager)	ATC Power Solution Rep	SMPMS Vendor

This is to certify that the necessary testing and commissioning has been successfully conducted to ensure that the above equipment is in accordance to ATC Installation requirements.