

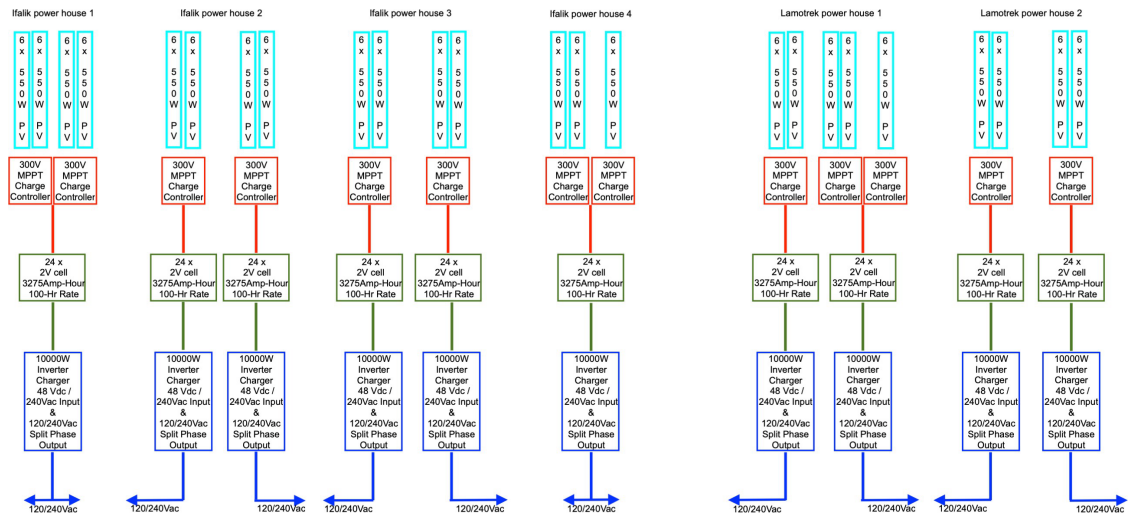
## **Annex 1**

### **Ifalik and Lamotrek Solar PV Minigrid Projects**

### **Technical Specifications and Bill of Quantity**

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1 - Basic Drawing

## **2 - PV Panels**

550W Certified solar module. Utility applications.

- PID resistant
- Resistance to salt mist corrosion

Extreme Weather Resilience

- Up to 5,400 Pa front load & 2,400 Pa back load
- Tested load to UL 61730
- Dia. 25mm Hailstone tests at the speed of 24m/s

### **ELECTRICAL SPECIFICATION**

Power Output Pmax	Wp	550
Module Efficiency	%	21.21
Tolerance	%	0/+3%
Short Circuit Current Isc	A	13.99
Open Circuit Voltage Voc	V	49.80
Rated Current Imp	A	13.11
Rated Voltage Vmp	V	41.95
Fuse Rating	A	30A
System Voltage	V	1,500

### **TEMPERATURE COEFFICIENTS**

Normal Operating Cell Temperature (NOCT)	45°C ( $\pm 2\%$ )
Temperature Coefficient of Pmax	-0.350%/°C
Temperature Coefficient of Voc	-0.270%/°C
Temperature Coefficient of Isc	0.048%/°C

### **OPERATING CONDITIONS**

Maximum System Voltage	1,500Vdc
Operating Temperature Range	-40°F to 185°F (-40°C to +85°C)
Maximum Series Fuse Rating	30A
Fire Safety Classification UL	Type 29

Frame Anodized

Junction Box Protection class IP68 with bypass-diodes

### **CERTIFICATIONS AND TESTS**

IEC 61215, 61730, 61701

UL 61730

### **3 - MPPT Charge Controllers**

#### 300V MPPT Charge Controller

- 100A output for up to 6kW of charging
- 300VDC open-circuit voltage limit
- enables 2-string configuration
- Programmable auxiliary control output for smart load controls
- Integrated arc fault circuit detection and interruption for optimized systems
- CEC weighted efficiency greater than 97%

Highly Accelerated Life Testing (HALT).

Outdoor-rated enclosure keeps dust and moisture from damaging internal components.

Arc and ground fault protection and rapid shutdown capacitor discharge

128 days of built-in data storage, smart programming wizards, can monitor, command and control from one location.

#### Specifications

Nominal Battery System Voltage:	24VDC / 36VDC / 48VDC
Maximum Continuous Output Current:	100A
Maximum Input Current (Short-Circuit):	64A
Maximum Array (STC Nameplate):	3500W / 5250W / 7000W
(charging output limited to 100A at battery voltage)	
Maximum PV System Voltage:	300VDC
Operating Input Voltage Range:	30 to 290VDC
Standby Power Consumption:	~2.5W
Power Conversion Efficiency:	24V: 96% 48V: 97%
Peak Efficiency:	24V: 97.5% 48V: 98.8%
CEC Weighted Efficiency:	48V: 97.3%
Charging Regulation:	Three-stage
Voltage Regulation Set Points:	Absorption, float and equalization
Low Power Consumption Mode:	configurable to maximize energy savings based on voltage, time, and current limits
Equalization Charging:	Programmable time intervals, voltage set point and duration, automatic termination when completed
Battery Temperature Compensation:	Adjustable from 2mV/cell/°C to 6mV/cell/°C
Voltage Step-Down Capability:	Down convert from any acceptable array voltage to any battery voltage (example: 72VDC array to 24VDC battery)
Programmable Auxiliary Control Output:	12VDC output signal which can be programmed for different control applications (maximum of 0.25ADC)
Status Display:	LED indicators
Remote Display and Controller:	compatible
Network Cabling:	network system using RJ-45 modular connectors
Data Logging:	128 days
Operating Temperature Range:	Ambient, -25° to 60°C (-13° to 140°F), output power reduced above 25°C
Ingress Protection Rating:	IP54
Enclosure Type:	3R
Certifications:	UL 1741, CSA C22.2 No. 107.1, IEC 62109-1
Charging Range (Output):	20 to 68VDC

Built-in and field replaceable arc fault circuit detection and interruption (AFCI), GFCI, and cooling fan

#### **4 - Display and Controller module for above MPPT Charge Controllers**

##### System Display and Controller

- Monitor, command and control
- User interface and menu structure to program, manage and monitor system
- System configuration wizard
- Built-in clock and calendar function
- Up to 1 year of data logging

Designed for UL 1741 SA compliance, system display and controller to program and monitor complete system.

The controller keeps the user interface and integrated system configuration wizard to make system setup and programming quick and seamless. Ability to set unique multi-level user passwords, possible to secure critical system settings from unintended changes while allowing open access to necessary functions. All settings are stored in on-board memory to eliminate the need to reprogram in the event of a system shutdown or battery replacement. Expandable SD card memory increases data logging capacity as well as making it easy to upgrade units in the field.

##### Controller Specifications

Display:	graphical display
System Access:	operation hot keys, user programmable soft keys
Status Indicators:	LED indicators
Navigational Controls:	navigational keys
Setpoint Adjustment:	Sensitive scroll wheel
Interconnect Cabling:	CAT5 network cable with RJ-45 modular jack
Set Point and Data Memory:	RAM
Clock/Calendar:	On-board real time clock with battery backup
Operating Temperature Range:	0 to 50°C
Environmental Rating:	Indoor Type 1 (IP 30)

## **5 - Inverters Chargers**

10000 Watt Pure Sine Inverter Charger 48 Vdc / 240Vac Input & 120/240Vac Split Phase Output

### Specifications

#### Inverter Output Specifications:

Continuous Output Power: 10000 Watts  
Surge Rating: 30000 Watts (20 Seconds)  
Output Waveform: Pure Sine/Same as input (Bypass Mode)  
100-110-120Vac / 220-230-240Vac  
Nominal Efficiency: >88% (Peak)  
Line Mode Efficiency: >95%  
Output Frequency: 60Hz +/- 0.3Hz  
Typical Transfer Time: 10ms (Max)  
THD: < 10% DC  
Ambient operating temperature: 14°F to 122°F (-10°C to 50°C)

#### Input Specifications

Nominal Input Voltage: 48.0Vdc  
Low Battery Alarm: 42.0Vdc-44.0Vdc  
Low battery Trip: 40.0Vdc-42.0Vdc  
High Voltage Alarm: 64.0Vdc  
Low battery Voltage Restart: 62.0Vdc  
Idle Consumption: 150 Watts  
Power Saver Mode Idle Consumption: 35 Watts

#### Charger Specifications

Output voltage: Depends on battery Type  
Charger Rate: 100A

## **6 - Batteries**

Renewable Power battery Specifications :

2 VOLT LOW MAINTENANCE FLA

Voltage	2
Amp-Hour Capacity	
20-Hr Rate	2500
100-Hr Rate	3275

Storage kWh calculated using a Depth-of-Discharge (DoD) of 50%, or 1.94 VPC

kWh 20-Hr	4.85
kWh 100-Hr	6.35

Fortified Steel Module Design

Battery's steel tray

Element Protector

prevents premature failure from missing short-circuit and prevents separator damage during cell inspection.

Plate Protection

complete active material retention for longevity.

secondary layer of active material retention.

third layer of insulation against missing and short-circuits.

final layer of insulation from direct plate-to-plate contact and missing.

Battery Cover

permanent, leak-free seal between the cell container and cover.

allows for positive plate growth without cover leakage and eliminates cell cover distortion.

Plate Construction

integrated features for superior electrical performance and longevity.

withstand the rigors of deep cycling service and high-rate discharge.

designed for less internal resistance and maximum active material retention to deliver premium battery life.

manufactured with premium lead-oxide to exact specifications, applied uniformly and temperature-cured

optimal product performance and life.

## **7 - Underground lines**

### **7.1 Cable 1**

#### **CU 2000V XLPE Insulation. RHH/RHW-2 PV**

Single Conductor Photovoltaic (Type PV) Power Cable 2000 Volt Copper Conductor XLPE Insulation. **Sizes 4/0AWG, 2AWG, 4AWG.** Heat, Moisture, Sunlight Resistant RoHS. 90°C

#### CONSTRUCTION:

1. Conductor: Stranded bare copper per ASTM B3 and ASTM B8 or ASTM B787
2. Insulation: Cross Linked Polyethylene (XLPE).

#### APPLICATIONS AND FEATURES:

2000 Volt power cables suited for use in wet and dry areas, conduits, ducts, troughs, trays, direct burial, aerial supported by a messenger, and where superior electrical properties are desired. Cables capable of operating continuously at the conductor temperature not in excess of 90°C for normal operation in wet and dry locations, 130°C for emergency overload, and 250°C for short circuit conditions.

#### SPECIFICATIONS:

ASTM B3 Soft or Annealed Copper Wire  
ASTM B8 Concentric-Lay-Stranded Copper Conductors  
ASTM B787 19 Wire Combination Unilay-Stranded Copper Conductors  
UL 44 Thermoset-Insulated Wires and Cables  
UL 4703 Standard for Photovoltaic Wire

### **7.2 Cable 2**

#### **Bare Copper Solid, Compressed Class B and C Sizes 4/0AWG, 2AWG, 4AWG**

#### CONSTRUCTION:

Conductor: Bare copper solid or compressed class B or C per ASTM B3 and ASTM B8

#### SPECIFICATIONS:

- ASTM B3 Soft or Annealed Copper Wire
- ASTM B8 Concentric-Lay-Stranded Copper Conductors



**8 - BILL OF QUANTITIES**

IFALIK & LAMOTREK						
Description	Qty Ifalik	Qty Lamotrek	Total	Unit	Total	Unit
<b>Solar system equipment</b>						
PV Panels kWp	90	54	144	550W	79	kWp
300V MPPT Charge Controller	8	5	13	7000W	91	kW
Display and Controller module for above MPPT Charge Controller	4	4	8	Module	8	Module
10000W Inverter Charger 48 Vdc / 240Vac Input & 120/240Vac Split Phase Output	6	4	10	Module	10	Module
Batteries 2V cell 3275Amp-Hour 100-Hr rate - 24 cells - 48Vdc banks	144	96	240	2V cell 3275Ah	32,750	Ah
<b>Micro-grids</b>						
Underground lines - Cable 1 - Size 4/0AWG	spool must be lighter than 4,000 lbs <b>(5,300ft max per spool)</b>				34,600	ft
Underground lines - Cable 1 - Size 2AWG	spool must be lighter than 4,000 lbs				12,400	ft
Underground lines - Cable 1 - Size 4AWG	spool must be lighter than 4,000 lbs <b>(23,800ft max per spool)</b>				32,400	ft
Underground lines - Cable 2 - Size 4/0AWG	spool must be lighter than 4,000 lbs <b>(6,100ft max per spool)</b>				17,300	ft
Underground lines - Cable 2 - Size 2AWG	spool must be lighter than 4,000 lbs				6,200	ft
Underground lines - Cable 2 - Size 4AWG	spool must be lighter than 4,000 lbs				16,200	ft