



Concept Document for Utility Formation and Energy Supply

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1. Introduction

The lack of adequate infrastructure development throughout the African continent has made it evident that designing a Continental Energy (Electrification) Program has become of utmost importance.

In the past, and at present, the implementation of solar home systems (SHS) has consistently been the only option available to service this model, particularly within the rural areas. The refinement of technology in this market has certainly assisted this electrification process within the African context.

MaxEnergy incorporating a Specialized Solar Systems' DC Micro-Grid system and the payment methods used to manage these installations is certainly an option to consider, particularly in the deepest rural context or high-density squatter camps.

Within the last 12 months it has become clear that the need for a more formalised infrastructure network of energy must be applied; since additional energy supplied into national grids, even with the introduction of PV or other means of energy supply, will not necessarily supply the needs so desperately required.

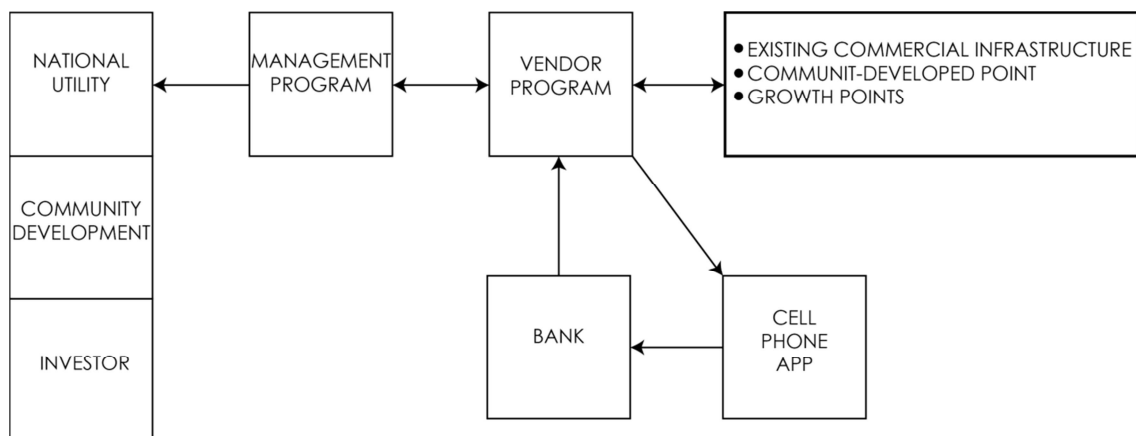
The challenge set before us was to deliver complete energy infrastructure at low capital cost, high delivery speed, with full remote management control that could be transferred to the owners (be that the grid supplier, community or investors in this infrastructure). Having the experience of electrifying houses (up to 30 000 homes in the past 10 years) and developing full remote management within these installations, we have now developed the Central Micro-Grid as described in this document.

This Central Micro-Grid aligns itself with all design criteria as needed in Africa. Having evaluated and monitored different methods applied throughout the continent, it has become abundantly clear that the knowledge required to apply electrification throughout the continent entails those of experts in the social dynamics of the potential customer, software knowledge to manage these customers, and engineering knowledge to develop the system. The versatility of such a system allows for both DC supply for essential load for basic electrification, e.g. lighting, (due to energy efficiency principles) and AC supply for non-essential items. It also allows for infrastructure development of DC streetlights @ 7W each. This surely could only be achieved by an African for Africa.

2. Utility Formation

The Central Micro-Grid has versatility in the collection of funds design. The collection of funds must be adapted to the communities within which the systems are installed. It would not be possible to apply one rule for all people. Cultures within countries need to be considered and secure payment methods need to be adapted to accommodate our diverse continent.

For ease of understanding the following back bone is offered within our Central Micro-Grid Energy Unit.



Online Management Utility System

Specialized Solar Systems' Online Management Utility System provides the following functionality:

1. Remote system control via GSM technologies of DB Boxes which includes switching of systems
 - ▶ Warning
 - ▶ Off
 - ▶ On
 - ▶ Automation of these functions
2. Comprehensive record keeping and administration of data
 - ▶ Client records

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- ▶ System records and accurate stock allocation via GPS
 - ▶ Payment and account history
 - ▶ Detailed audit trailing
 - ▶ Detailed reporting

3. Various debiting methods monthly include

- ▶ Definable month based contract payment packages
- ▶ Definable Pay-As-You-Go payment packages
- ▶ Automation of these functions

4. Tiered, multi-user security and access control

- ▶ All user system interaction is logged to an audit trail
- ▶ Users can be assigned privileges on all framework functions

5. POS/payment/receipting

- ▶ Logging of payments and cashing up
- ▶ Remote vendor management framework

Vendor Program

The SSS Vendor application has the following functions:

- ▶ As an accessible payment point for end-users.
- ▶ Has a separate framework using an API.
- ▶ Vendors are managed via wallet funding system.
- ▶ POS transactional receipt printing with account history at the location of payment.
- ▶ Detailed record keeping and logging.
- ▶ Updating of client/system records functionality.

3. Payment Methods

Pay-As-You-Go (PAYG)

PAYG payment packages are made up of payment bundles where the end-user pays in advance for energy usage and is not billed if the unit is powered OFF. For example, available options could be:

R10 = 3days | R25 = 10days | R60 = 30days | R150 = 100days | R 450 = 365days

Once a payment is made, the system calculates the expiry date and the system is switched ON if OFF or on WARNING. The unit will send WARNING 48 hours prior to the package expiry date if no more funds are available. The PAYG system has the ability to automatically allocate funds if defined criteria are met. The minimal number of days is 3.

Contract Payment Package

The Contract Payment Package is a fixed monthly billing system. These packages are defined in the setup and debits every month on a certain day. If funds are not available, the unit switches to WARNING on the debiting date, followed by switching the system OFF 48 hours thereafter. If payment is made, the unit will switch ON. This payment package has the ability to apply a reconnection fee.

Collection Process

Once the payment method or methods have been selected the collection method is then followed. This collection process is a multilayer service function, maintaining the activation, or deactivation, of each customer as programmed. This remote management function has been developed by Specialized Solar Systems over the past 10 years and is versatile enough to function with various communication platforms, such as Wi-Fi, Ethernet, GPRS or GSM.

The programming and cost collection principle would normally be formulated on mandate by the original investor. Detail within this proposal will define capital return cost over specified time duration in relation to the volume of energy supplied per customer, calculating the individual collection cost. Maintenance or service training cost (with potential growth allowed for) will be added to the initial capital return cost, and therefore not only allows affordability to the individuals but also sustainability to the hardware.

The utility is now formed.

4. Hardware Design

The method of energy supply is determined by the scoping of the customer base. Various options are available in the design portfolio.

DE-CENTRALISED ENERGY METHOD (MICRO-GRID)

This is when the energy is generated and stored at the recipient's house and managed remotely from the utility. This method could be supplied in the form of AC or DC.

SUB-CENTRALISED ENERGY METHOD (MICRO-GRID)

This method involves the energy being stored at a sub-centralised point, supplying up to 6 houses. The energy is generated and stored at this sub-centralised point and remotely controlled from a central utility. The sub-centralised method could be supplied in the form of AC (alternating current) or DC (direct current).

CENTRALISED SUPPLY METHOD (MICRO MINI -GRID)

This method can also allow the supply of AC or DC to the consumer, as well a combination of the two (DC for essential loads at a reduced cost, and AC for luxury loads). Both forms of supply can be monitored, metered and controlled.

Depending on the load requirement of the individual houses (please see attached examples) the centralised Micro-Grid could supply between 14 and 43 houses from one unit.

This unit has two configuration options. Option one can be considered as a 10 year supply project and option two as a 20 year supply project. The duration of this supply is differentiated by the storage cells.

The ZBM option (as per document attached) is a 20 year supply method.

Additional to the energy system detailed above, the following will need to be accounted for:

- ▶ Installation
- ▶ Transport
- ▶ Commission

Possible maintenance contract expense (Community, Utility or Governmental):

- ▶ Network establishment costs to houses
- ▶ Cable to the individual homes (overhead or underground)
- ▶ House “ready box” for earth leakage and 2 x 15A plugs and lights
- ▶ kWh pre-paid meter if so required in house

5. Scope of Works

5.1 LOAD ESTIMATES

Load Curve 1

NO	LOAD	HOUR OF USAGE	WATTAGE	KWH	KWP
4	LIGHTS	8	3	96	12
1	SPOTLIGHT	14	2.4	36	2.4
1	CELLPHONE				
	CHARGER	24	4	4	4
1	TV	8	90	720	90
1	FRIDGE	24	33	800	80
	<u>SUB TOTAL</u>	78	130	1656	188.4
	<u>TOTAL</u>			1656	188.4

Load Curve 2

NO	LOAD	HOUR OF USAGE	WATTAGE	KWH	KWP
6	INTERNAL LIGHTS	8	3	144	18
2	EXTERNAL LIGHTS	14	2.4	66	4.8
1	CELLPHONE	24	4	4	4
1	LAPTOP	2	60	60	60
1	FRIDGE	24	33	800	33
1	TV	8	90	720	90
1	STOVE	2	600	1200	600
	<u>SUB TOTAL</u>	82	790	2994	805
	<u>TOTAL</u>			2994	805

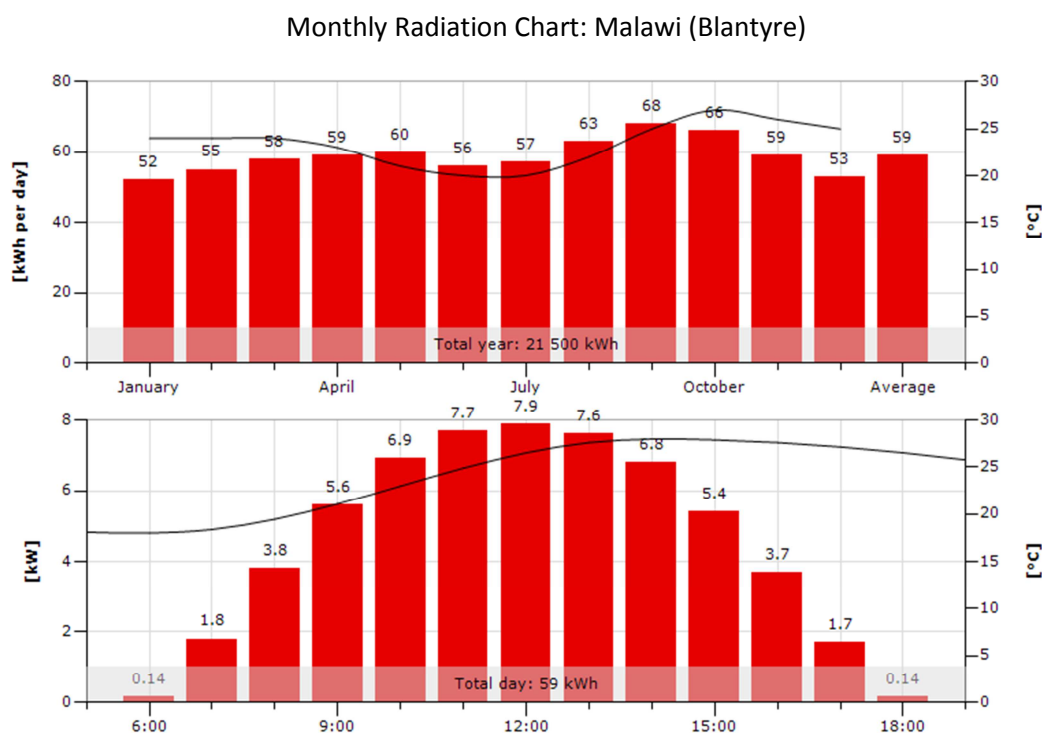
Load Curve 3

NO	LOAD	HOUR OF USAGE	WATTAGE	KWH	KWP
3	INTERNAL LIGHTS	8	3	72	9
1	EXTERNAL	14	2.4	33.6	2.4
1	CELLPHONE	24	4	4	4
1	ECO STOVE	2	600	1200	600
	<u>SUB TOTAL</u>	48	607	1276	613
	<u>TOTAL</u>			1276	613

Various other load curves could be formulated.

5.2 SUN RADIATION CHART

The sun radiation per area would need to be calculated. Please see example below.



Daily Radiation Chart for 12kWp of Generation.

3 PROCESS TO PROCEED

- Understand, adapt and approve the design principle.
- Understand the utility formation and develop a fixed mandate from the investor.
- Program the collection method and verify the collection continuity.
- Concept approval with mandate in order to proceed, this includes site verification and customer confirmation.
- Site inspection for reticulation of electrical network.
- Data capturing of all role players including customer liaison and database creation.
- Customer acceptance of concept.
- Approval of final layout and time schedule for delivery.
- Full diagram, technical specifications and designs.
- Appointment with contract.