



CREEC

CENTRE FOR RESEARCH IN ENERGY AND ENERGY CONSERVATION

Test Catalogue

**Solar Photovoltaic
&
Energy Efficiency**



Contact:

Moses Kakooza

+256 777887688

mkakooza@creec.or.ug

www.creec.or.ug

Published 01/2014

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The Centre for Research in Energy and Energy Conservation

The Centre for Research in Energy and Energy Conservation (CREEC) is a not-for-profit organization for research, training and consultancy, located at and working closely together with the College of Engineering, Design, Art and Technology within Makerere University. The centre is registered as a company limited by guarantee and not having a share capital.

The centre aims at application and adaptation of technologies to the specific Ugandan and local environment with an emphasis on systems with components that can be locally manufactured. For capacity building and knowledge transfer purposes, CREEC endeavours to include students in the centre's projects whenever possible.

CREEC's work in solar photovoltaic mainly aims on supporting the Ugandan solar market to increase the use of solar technology in the country. The activities include testing services, trainings, feasibility studies, implementation of projects and awareness campaigns.

Solar Photovoltaic Testing Services

The Ugandan solar market offers many low quality products. For the customers the quality of these systems is often hard to identify. Products failing because of low quality create high warranty costs for companies on the one hand and disappointment and mistrust of customers on the other hand. To improve the quality of products on the solar market, CREEC has set up its solar laboratory, equipped with state of the art equipment to test all kind of solar equipment. The laboratory gives solar companies the possibility to test products locally before selling them to ensure a high quality of their products.

In solar laboratories a variety of technical details can be measured, but in daily use products have to withstand many more challenges which cannot be simulated in a laboratory. To create a platform for companies to test their products under real Ugandan field conditions, CREEC has established a field laboratory to complement its testing services. CREEC's field laboratory is one of the first of its type in Africa and allows not only to analyse wear and tear or failure of products but also to study customers behaviours and preferences. With CREEC's testing infrastructure and the mature users, field tests can be carried out in a fast and reliable way.

Solar Laboratory Testing

You want to add a new LED light to your product range but you are not sure about its quality?

Let CREEC support you in making this decision by testing light output, energy efficiency and long term behaviour of the LED light.

One of your solar installations is underperforming or has problems in use?

Checking the panels with the panel analyser or monitoring power generation and consumption can be the keys to success in troubleshooting.

Since some time you have unexpected high failure rates for a battery type, wondering if the quality of the battery or the usage behaviour of customers is the reason?

Let CREEC help you find the reason by testing capacity, resistance and lifecycles of the batteries.

CREEC`s testing equipment allows amongst others to analyse solar photovoltaic panels, test the efficiency and quality of lights or to analyse whole solar systems by long term power measurements.

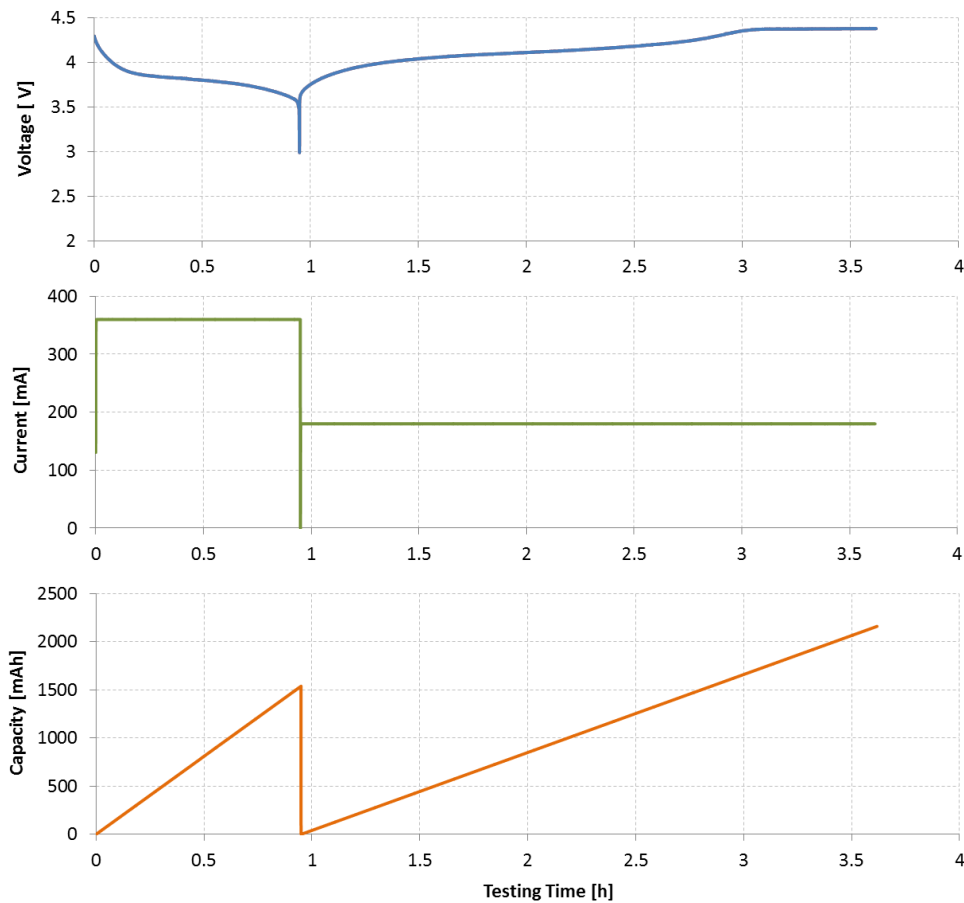
The solar laboratory set up according to Lighting Africa standards under consultancy of the Fraunhofer Institute for Solar Energy Systems is now a member of the Global Off-Grid Lighting Association (GOGLA) as successor of Lighting Africa.

CREEC is also in a dialogue with Uganda National Bureau of Standards (UNBS) to be able to test solar equipment and components on behalf of UNBS soon.

Below there are some of CREEC`s equipment and testing possibilities listed. The mentioned tests and prices are samples for local companies. They can vary depending on conditions and testing details.

Battery Testing System CADEX C8000

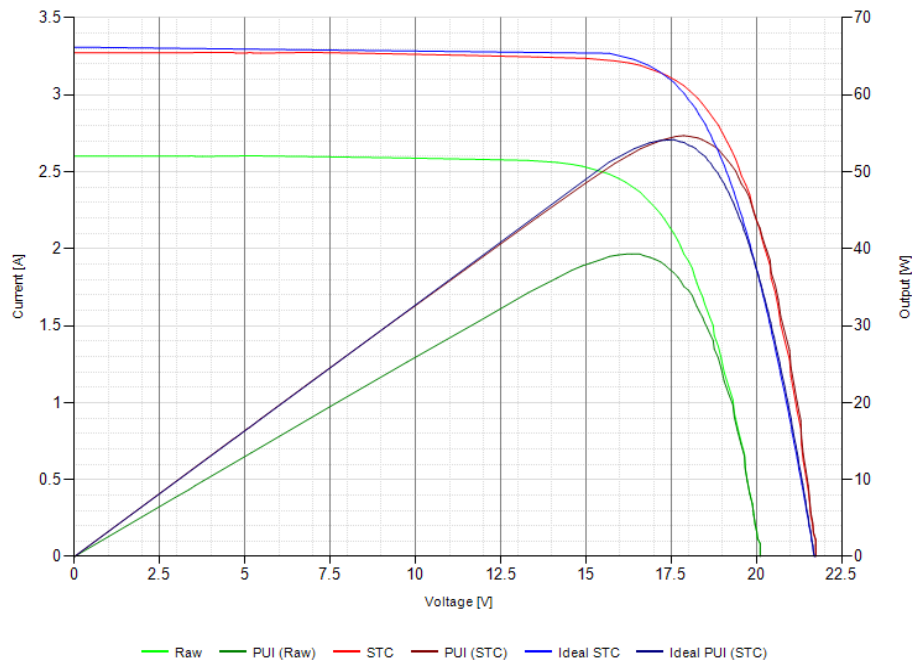
Testing Services for Batteries (Ni-, Li-, SLA-based from 50mAh - 1000Ah)	Price
Boost or exercise a battery	35 USD
Test battery resistance	35 USD
Measure self-discharge rate of batteries	60 USD
Test of battery capacity	45 USD
Determine runtime of battery with simulated load	120 USD
Lifecycle test of battery (1 month, destructive)	240 USD



Measuring values of capacity test, NiMH Battery, 1800 mAh, 3.6 V

Photovoltaic Panel Characteristics Analyzer TRI-KA

Testing Services for Photovoltaic Panel	Price
Measurement of PV Panel characteristics	60 USD
On site analysing of PV Panel array (Kampala)	300 USD

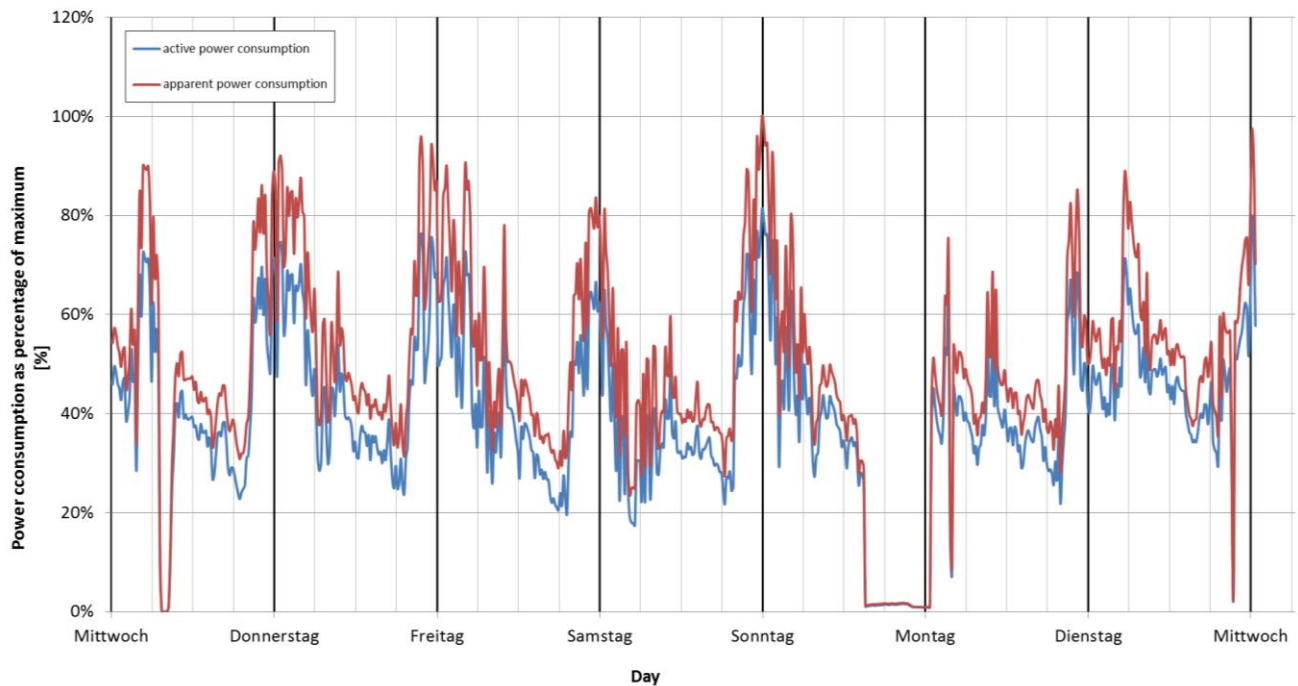


Temperature = measured	41.8 °C	ISC Raw = 2.608 A	UMPP Raw = 16.17 V
		ISC STC = 3.28 A	UMPP STC = 17.87 V
		ISC NOM = 3.31 A	UMPP NOM = 17.4 V
Irradiation = measured	795 W/m ²	IMPP Raw = 2.432 A	P Raw = 39.33 W
		IMPP STC = 3.06 A	P STC = 54.7 W
		IMPP NOM = 3.11 A	P NOM = 54 W
Inclination = measured	32 °	UOC Raw = 20.16 V	FF Raw = 0.75
		UOC STC = 21.8 V	FF STC = 0.76
		UOC NOM = 21.7 V	FF NOM = 0.75

Measurement of a Kyocera 34 Wp crystalline solar panel

Power Analyzer HT PQA824

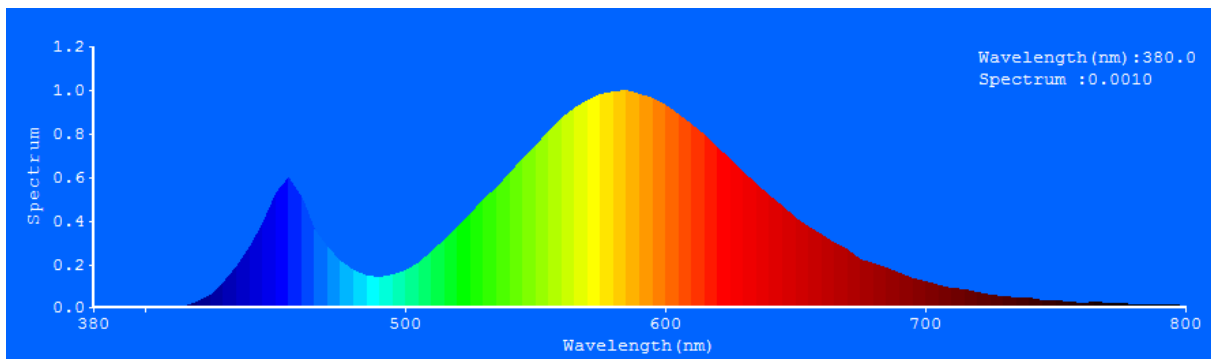
Testing Services for Energy Monitoring	Price
Measurement of power consumption/ generation for 1 day (Kampala)	250 USD
Measurement of power consumption/ generation for 1 week (Kampala)	530 USD



One week load measurement of an industrial company

Everfine Integrating Sphere with Spectrophotocalorimeter PMS80 and Photometer Box with Testo 545 Illuminancemeter

Testing Services for Illuminance	Price
Measurement of light output and power consumption of lights	60 USD
Long term lumen degradation test of lights (3 month)	300 USD



Electrical Parameters		Photo Parameters	
Voltage	12 V	Luminous Flux	286.41 lm
Current	0.41 A	Efficacy	85.75 lm/W
Power	4.9 W		

Measurement of light output, 5 W, 12 V CFL lamp

Pico PV Laboratory Testing

Testing Services for Pico PV	Price
Product check derived from Lighting Africa Test procedures	330 USD
Product test according to Lighting Africa Test procedures	500 USD

Field Laboratory Testing

In 2012 CREEC established a Solar Energy Kiosk in a rural area in Uganda. The kiosk operates as a business and offers energy bound services such as solar lamp rental, phone charging and computer services. At maximum capacity the kiosk can rent out 60 solar lamps and charge 65 phones a day.

The Energy Kiosk is also used as a platform for field testing, using the advantages of the well running business. On the one hand, field tests can be carried out quite fast with comparatively little effort because of the existing infrastructure. On the other hand, test results of high data quality can be expected due to the established testing structures and mature customers, experienced in giving feedback in questionnaires. The survey gathers information about users' perception of the products, benefits and challenges associated with the use, opinions about features of products and many others. The durability and quality of products is monitored as well and malfunctioning or broken products are returned to the CREEC solar lab for evaluation.

This testing service addresses on the one hand manufacturers to give support in product development and prototype testing, on the other hand companies who want to ensure high quality before adding new products to their product ranges.

Already the first field laboratory test run with Lighting Africa certified high quality solar lamps confirmed the demand for field testing. Even the high quality solar lamps showed in average default rates of 22 % within the first half year, often simple problems which could have been sorted out easily, if previous field tests would have been carried out.

Field tests are very product specific and highly customer orientated. Therefore standardized test schemes and prices cannot be provided. Testing procedures for specific products will be developed according to the expectations of the customer.

Below is a timetable that CREEC suggests for testing solar lamps. It foresees the test of 20 samples within two test periods of 1 month each, involving 40 customers.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Project scope												
Preparation												
Activity												
Availability of tested products												
Acquisition of support of the energy kiosk												
Development of questionnaire in cooperation with client												
1. on-site data collection												
Decision which customer gets product to test of one month												
Distribution of products												
Assessment of willingness to pay in comparison if other products												
Visits of end users to fill out questionnaires (on a weekly basis)												
Compiling questionnaires												
2. Analyzing												
Analyzing of questionnaires data												
Revision of questionnaire possible												
Putting data into easy understanding form												
Reporting												
Report writing and submission to client												
Administration												
Overheads (5%)												
Expenditures												
Transport for fieldwork												
Accommodation for field work												
DSA for CREEC staff												
Communication (CREEC / kiosk)												
Stationary												
Fixed fee for kiosk operator (per month)												
Contribution to kiosk to cater for income reduction during ongoing tests (per month)												
Additional kiosk staff												
Taxes for consultancy												

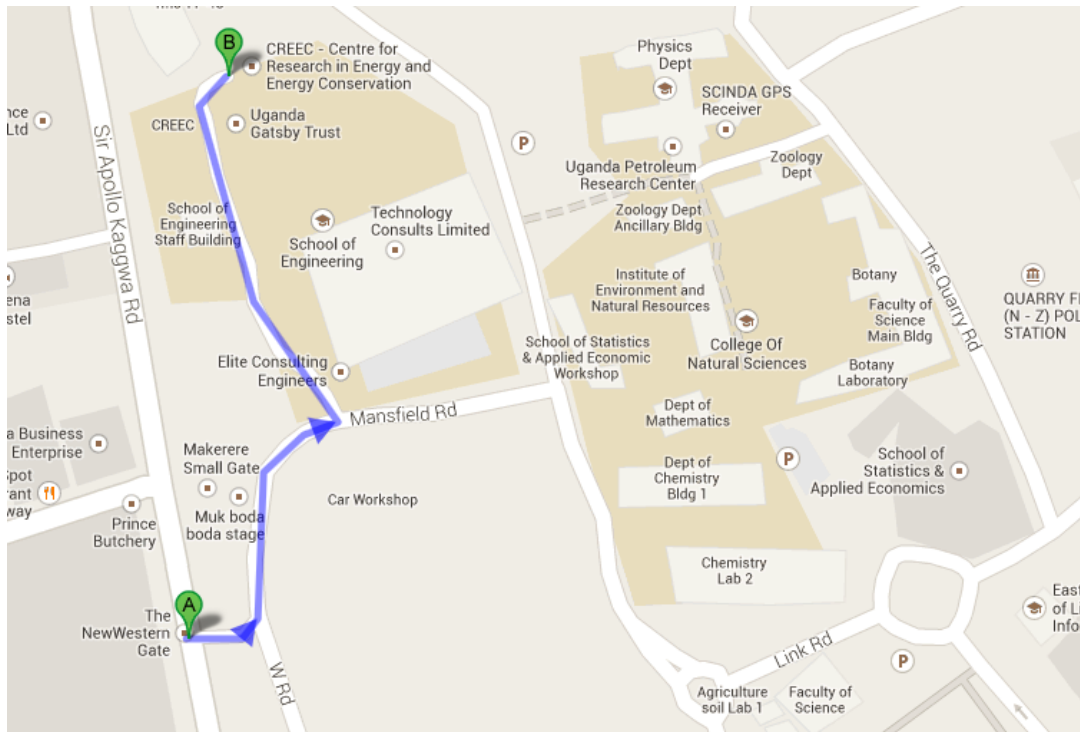
Timetable for solar lamp field test

Your Individual Test

We arouse your interest to test some of your products with us or to use our services and expertise in another way. Please contact us we are looking forward to designing a customized test for you.

You can contact us by Phone or E-Mail at every time. You are also highly welcome to visit us in our Solar Laboratory at Makerere University campus.

How to find CREEC



The easiest way to find CREEC is by heading to the Western Gate of Makerere University at Sir Apollo Kagwa Road. After entering the gate, you go left uphill for 200 m. You branch to the first road left before reaching the College of Engineering, Design, Art and Technology. After following this road for 200 m, passing a parking area and university buildings, you can see CREEC on your right handside a few metres uphill.