Village Mini-Grid Clusters

An Innovative Clean-Energy Rural Electrification Project in Tanzania

Helios Social Enterprise Tanzania in partnership with UNEP

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Dr Russell Gilbert

helios
social enterprise

Summary

- The Project will provide electricity needs to 120 villages in rural Tanzania currently without the prospect of power.

- It will benefit:-
  - ~ 400,000 rural customers, of whom c. 60% will be connected to a Mini-Grid
  - ~ 2,500 local commercial enterprises and facilities such as grain mills, shops and tea houses, and
  - ~ 200 public loads (schools, clinics etc)

- The project will provide sustained benefits to rural communities by:-
  - improving quality of life by substituting existing consumption of kerosene, candles, mobile phone top-up etc at lower prices
  - boosting existing agriculture, forestry and fishing
  - stimulating new enterprises to generate income, and
  - providing improved education and health facilities

- The approach is phased, to demonstrate Helios SE's business approach and allow to learn from early lessons. It also allows for growth as local economies prosper, can be replicated and scaled-up across Tanzania and sub-Saharan Africa.

The Challenge

- 1.6 billion people live without electricity (1)
  - 33% of the world's population
  - 70% of those living in developing countries and c580m in Africa
  - most live in rural areas, and rely on "traditional biomass" for their daily needs

- Without access to cheap, reliable modern energy, the world's commitment to the "Millennium Development Goals" will not be met, with significant impact on food production, income generation, education, health and the quality of life in developing countries

- Migrating from traditional biomass, diesel or kerosene displaces CO_2 emissions and harmful particulates

- Current energy access efforts have not been able to meet the scale and significance of the challenge

(1) IEA (2009)

Introducing Helios

The Vision

- Helios Social Enterprise has been established to identify, build, own and operate rural energy access projects in sub-Saharan Africa.
- The focus is on village-based clean-energy Mini-Grids in order to maximise development impacts, as well as the welfare benefits, and assist countries follow an environmentally-sustainable development path.
- Helios SE is particularly keen to:-
  - ensure power is available for productive uses in rural areas so as to increase income-earning capacity and promote the rural economy.
  - demonstrate an innovative financially-sustainable business model that enables the private-sector to invest.

The People

- Helios SE is composed of a team of energy executives – each with over 30 years' international commercial experience – to bring business expertise, to lead the effort, and to deliver the results.
- As financing is secured, local staff will be identified in each village, and "Cluster" O&M teams will also be formed.

Partnership

- Helios has been selected by the **United Nations Environmental Programme** as its partner in Tanzania to develop Clean Energy Mini-Grids. This provides access to UNEP's experience developing Mini-Grids globally, and the project will be championed under the **UN's high-level Sustainable Energy for All initiative**.

Rural Village Mini-Grid – Key Features

Demand:

- Rural households predominantly have “Life-Line” needs of ~2-3 kWh / mo. for 3 LED lights, a radio and mobile phone charging.
- There is also suppressed demand from larger households (up to ~50 kWh/mo) resulting in an average residential demand of ~11 kWh/month.
- In addition, Helios SE is committed to the connection of public loads (schools and health clinics and street-lighting), commercial loads (shops, tea-houses, tailors, barbers etc), and for the mid-day period, mechanical tasks (milling, welding, oil-pressing etc).

Supply:

- Rural demand can best be met by solar PV equipment , to minimise operating costs, with batteries (currently lead-acid) for storage.
- Distribution by a 3-phase 400V network (“Mini-Grid”) distributed to a 1-1.5 km radius on wooden poles.
- A 40p kWp (70 kWp) village-scale array needs ~250m^2 (~450m^2) of solar panels, which are supported 3 meters above ground level.

  (NB: this has the added advantage that the structure can also used as a community asset such as a covered market or to collect water).

Photograph courtesy of University of Southampton ‘E4D’ Project

- An ‘Energy Kiosk’ charges batteries for households too far from the Mini-Grid to connect.

Rural Village Mini-Grid - continued

Metering and Control System:

- 'Smart' pre-pay meters will be employed to avoid billing costs and prevent arrears.
- Meters capable of regulating customer off-take are becoming available at reasonable cost.
- This capability can be used to optimise power storage and protect the storage batteries.

Tariffs:

- Electricity will be sold in "bundles" in a similar fashion to mobile phones.
- A "Life-Line" bundle of 3kWh of energy is expected to retail at a rate lower than current Life-Line spend of $4.75[2] - $18.00[3] per month on energy needs (kerosene, candles, and battery charging). This is capable of operating 3 LED lamps, a small radio and charging a mobile phone.
- Larger 'bundles' would be available for medium and larger households.
- Commercial and public loads would be charged on a kWh basis.
- A minimal or zero connection charge will be levied to maximise customers ability to connect and increase up-take.

Operations and Revenue Collection:

- Helios will employ one or two of its own staff within each village to provide customer support and monitor the equipment. The Cluster will be supported by a Regional office with technical, marketing and finance staff.
- Pre-payment for bundles will be by mobile phone (M-Pesa system) or coupons can be sold from the Energy Kiosk
- Large SME, public or significant 'Anchor' loads will also pre-pay.

1) ESMAP; NRECA Social Impact Assessment for Kilombero Valley, Tanzania ; SunTransfer Gerrmany (providers of SHSs

The First Cluster – Geita Region, Tanzania

- ‘Clusters’ of 10-12 villages can be operated by a small Regional team providing technical and customer support
- First Cluster is to be located in the Geita Region, south of Lake Victoria in North West Tanzania.
- The area is rural, with 77% of the area’s GDP and jobs from agriculture(1). Further income is derived from livestock, forestry and, to a lesser extent, artisanal fishing.
- The First Cluster will provide energy access for 11 communities with a population of some 36,000.

(1) mainly small-scale production of food crops such as maize, paddy, cassava, beans, groundnuts, sorghum and sweet potatoes, and cash crops such as cotton, pineapples and tobacco.

Stakeholder Support

National:

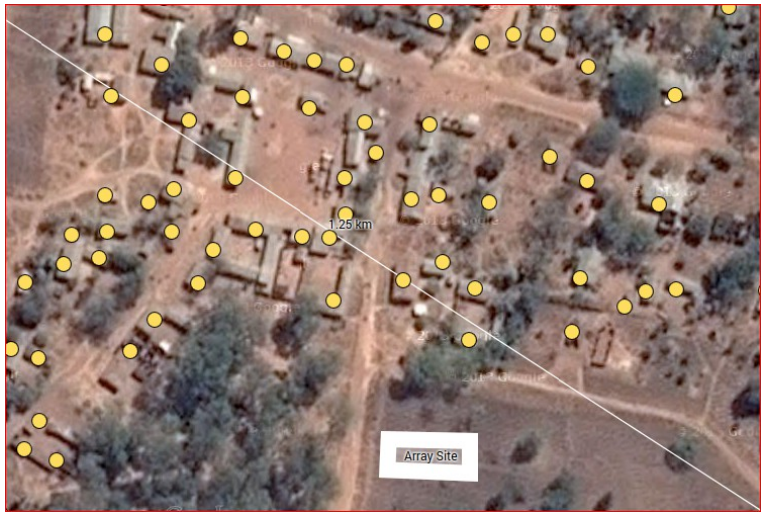
- Discussions have been held with the Rural Energy Agency of Tanzania and the sector ministry, Ministry of Energy and Mines (MEM).
- Helios SE is now working with MEM to ensure that funding applications meet their needs, and to receive the requisite formal Letter of Support from MEM and the Vice-President's Office.
- Meetings with MEM in April 2015 resulted in shared-lessons and minor modifications to the technical design to increase the ability to provide solar-generated electricity for mechanical tasks.

Regional:

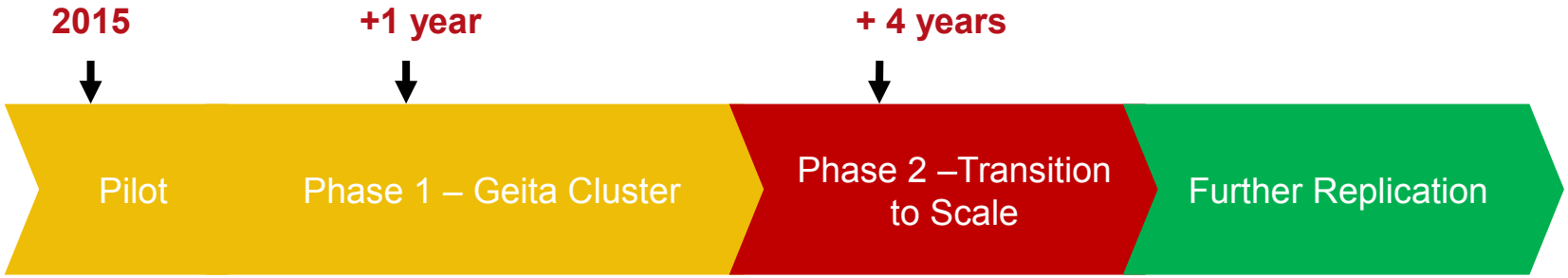
- Helios SE has met the Commissioner and the Administrative Secretary of Geita Region (the first Cluster) to obtain support and prioritise activities.

Village:

- Helios SE has met with district officers and village leaders to confirm the selection of Senga as the Pilot village.



Implementing the Vision ....



Scale	1 Village	1 Cluster	12 Clusters	>12 clusters >1 Country
Outreach / ODA	UNEP	Global promotion and mobilisation of international ODA finance (UNEP)		
Implementation	Helios SE	Helios SE using EPC contracts		
Local Operations Country MD			1	1+
Country Office	1	1	5	5+
Cluster Office	2	5	50	50+
Village Operators	2-3	20	240	240+

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www.heliosse.com

Leonard Mususa | Leonard.mususa@heliosse.com | +255 754 784 704

Russell Gilbert | russell.gilbert@heliosse.com | +44 799 067 4525