The Energy Centre Model - An Approach to Village Scale Energy Supply

Lessons from Piloting the Model in a Kenyan Village

Innovating Energy Access for Remote Areas: Discovering Untapped Resources.
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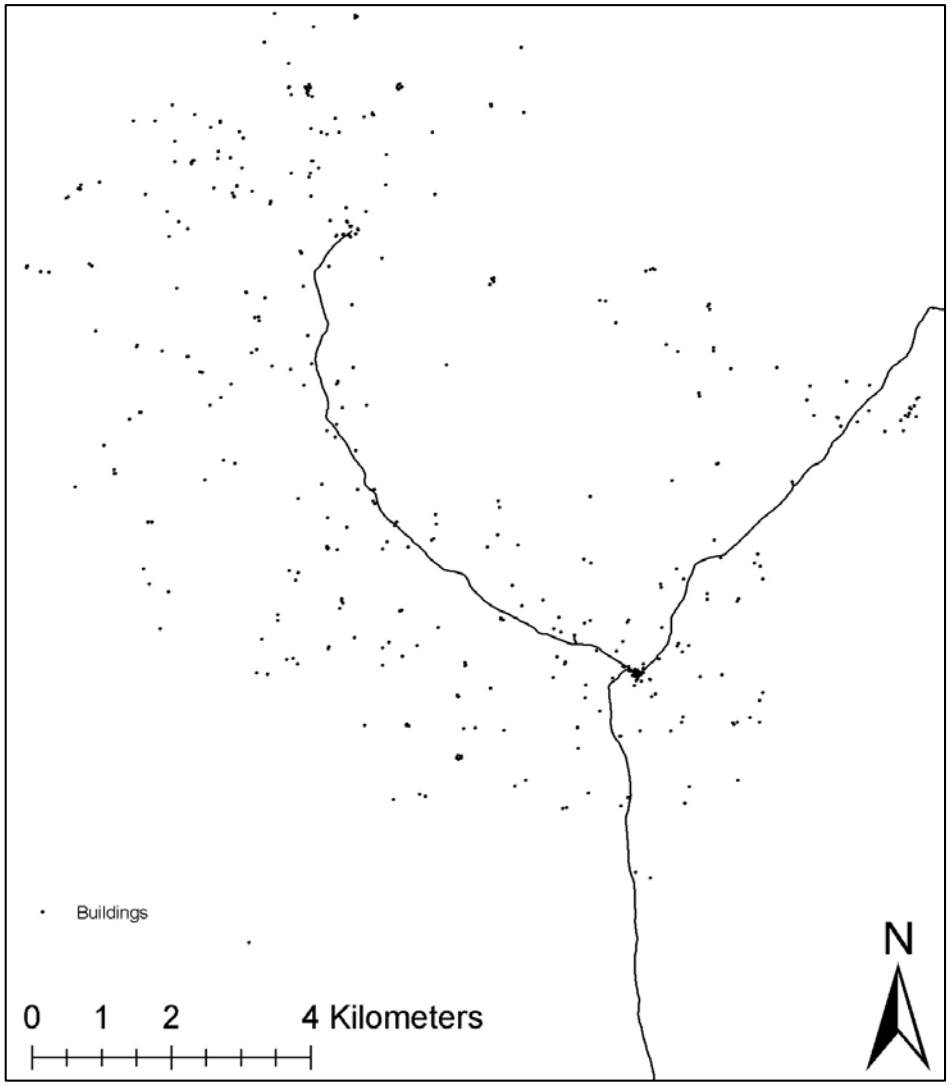
camco

Why an Energy Center Model?

- Pop. density 9HH/km^2.
- Kerosene and dry cell batteries main sources of lighting
- Average HH expenditure on lighting - 3€/month
- Average expenditure on phone charging - 1€/month.
- 250km from the capital & no regular public transport within the sub-location
- Representative of Kenya's arid and semi-arid lands (ASALs); 88% of the country inhabited by 25% of Kenya's population



System Design Overview (2.16kW)

CHARGING CENTRE

PHONE CHARGING

Capacity

30 phones/day

System

PV Array - 240Wp

(80Wp × 3)

Battery – 100Ah

Charge controller – 30A

Inverter – 350Wp

LANTERN CHARGING

Capacity

120 lanterns/day

System

PV Array - 600Wp

(50Wp × 12)

Junction Box – 12

TERI Lanterns – 120

BATTERY CHARGING

Capacity

20 batteries/day

System

PV Array - 240Wp

(120Wp × 2)

DC Generator – 2

Powa-pack 5 – 40 (3.3Ah)

MULTIPURPOSE ROOM

TV/VIDEO Show System

Capacity

LCD TV (100W), decoder, Home theatre system

System

PV Array - 320Wp (80Wp × 4)

Battery – 400Ah (200Ah × 2)

Charge controller – 30A

Inverter – 800Wp

OFFICE & STORE

CENTRE LIGHTING SYSTEM

Capacity

9 lights

System

PV Array - 160Wp (80Wp × 2)

Battery – 200Ah

Charge controller – 30A

IT CENTRE

IT SYSTEM

Capacity

All-in-One Laser Jet Printer (700W) & 2 laptop computers

System

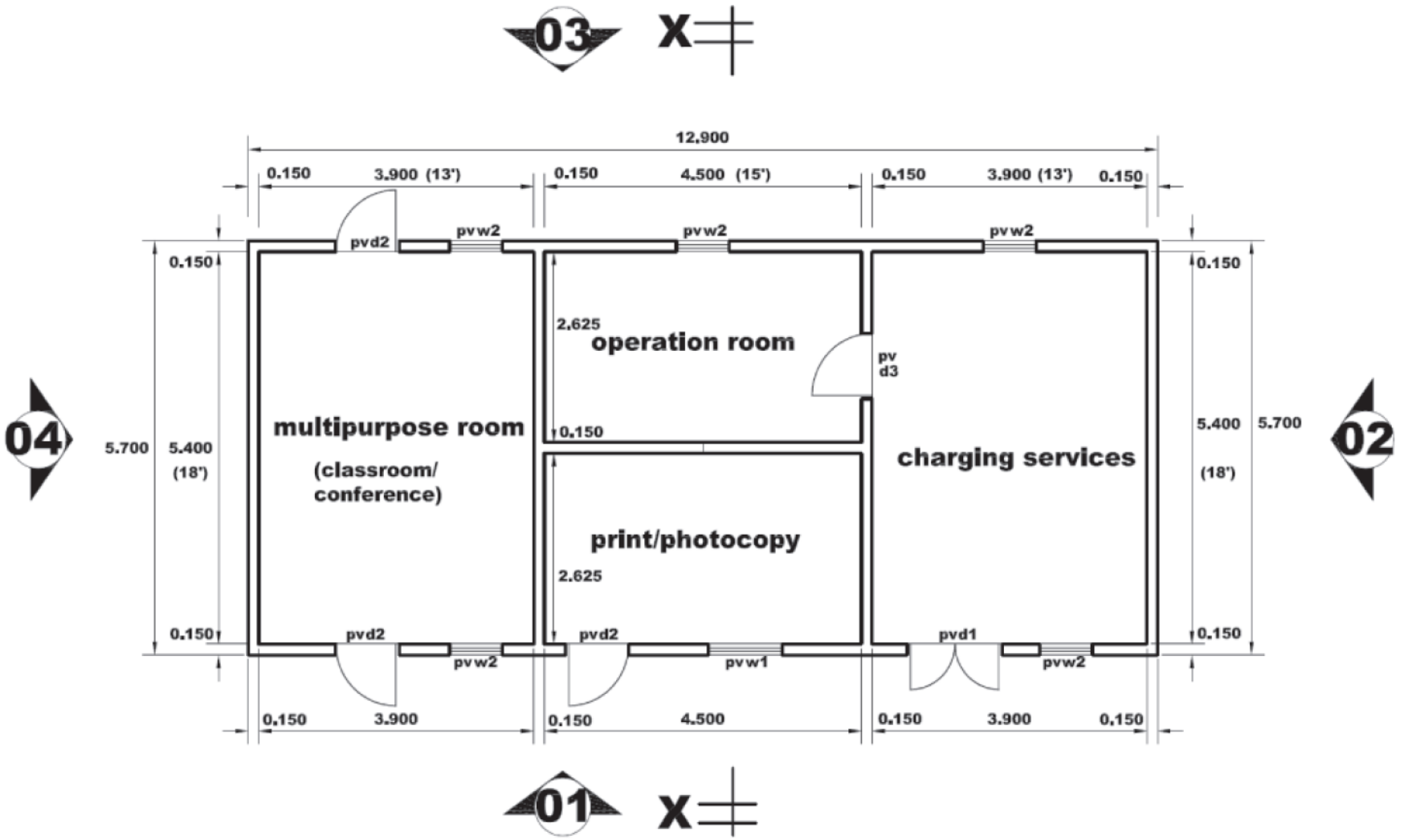
PV Array - 600Wp (120Wp × 5)

Battery – 600Ah (200Ah × 3)

Charge controller – 60A

Inverter – 800Wp

System Design Overview



The Energy Centre Model Design

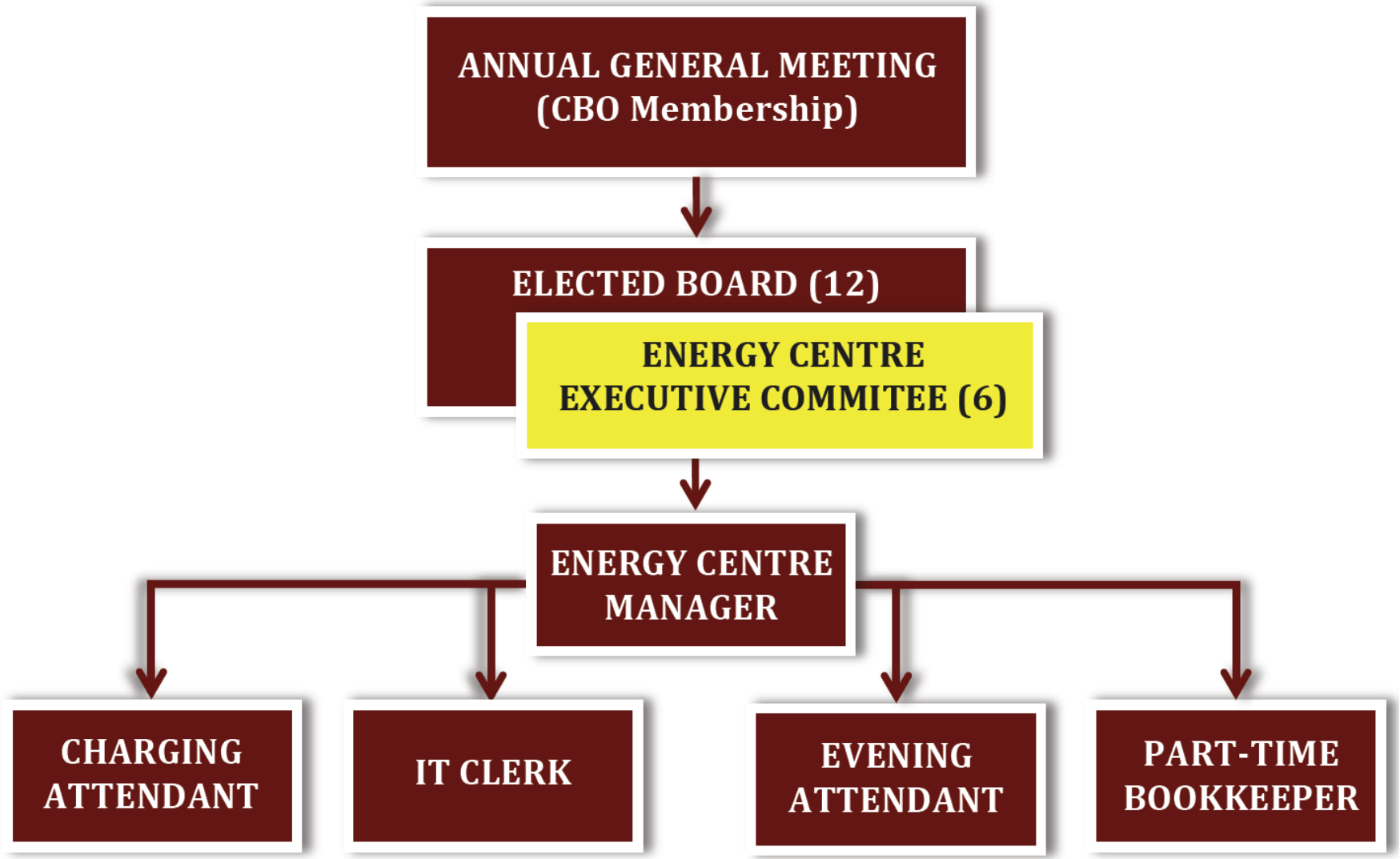
Capital Costs

	Item	Cost (KES)	Cost (Euro)
1	Building, construction and oversight costs	1,156,000	10,509
2	Furniture and fittings	90,000	818
3	Solar PV system equipment and installation costs (including lanterns and other accessories) at the energy centre and for agents	2,827,000	25,700
4	Appliances (e.g. laptop computer, laser-jet printer, TV, decoder, home theatre)	196,000	1,782
5	Start-up stationary and equipment (e.g. receipt books, counter books, cash boxes, folders, stapler, punch)	108,000	982
6	Retail outlet stock (40 lanterns & 40 powapacks)	301,000	2,736
	TOTAL COSTS	**4,678,000**	**42,527**

Institutional and Operational Framework

- The energy centre is operated and managed through a CBO
- The energy centre is registered with the local authority operated as a business entity
- Users are encouraged to become members to have a voice in how the energy centre is operated and managed e.g. to access lantern rental services, users are required to pay the CBO registration fees.
- CBO members elect from amongst themselves an EC responsible for overseeing the management of the energy centre. Their role is oversight and guidance, provided voluntarily.
- Day to day operations of the energy center are undertaken by staff, recruited from the local community and trained on O&M of the energy centre.
- The members of staff earn a monthly salary from the revenue generated from the services provided at the energy centre.

Institutional and Operational Framework



Institutional and Operational Framework

Day to day energy centre operations are undertaken by a team of locally employed and trained staff. The team is made up of:

- A **charging attendant** – responsible for the lantern charging and renting, battery charging, phone charging and retail shop operations
- A **IT attendant** – responsible for operations related to printing, photocopying, computer services, laptop charging as well as managing the TV/Video room
- A **part time bookkeeper** – Responsible for preparing weekly and monthly financial statements, preparing the pay roll and general preparation and filing of records, receipts, bank statements and reports for the annual external audit
- An **evening attendant** – responsible for fee collection from the TV/Video shows screened at night, night time security and general cleaning

Institutional and Operational Framework

The **energy centre manager's** role is:

- Reporting to the EC of the CBO on the energy centre operations
- Consolidating energy centre records daily and preparing weekly reports and documentation for the bookkeeper
- Customer service i.e. handling complaints, queries and requests
- Monitoring operations and proposing operational changes to the executive committee of the board
- Collecting the daily revenue for the energy centre from the staff for safe keeping in the energy centre safe and depositing of the cash in the energy centre bank account after a given number of days, keeping records and documentation of cash deposits for the accountant and executive committee
- Budget preparation for monthly operational expenses for EC approval

This role is undertaken as an additional responsible of one of the staff

Concessional Model

To encourage sustainable operation, a concessional model is proposed. Under this model a concessional agreement is signed between the energy centre sponsor and the energy centre operator.

The key terms of the concession agreement are:

- The energy centre and the equipment remain the property of the sponsor or its chosen representative (i.e. ownership is not transferred)
- The operator is required to submit quarterly operational financial reports and an annual audit to the sponsor; to enable the sponsor to keep track of financial performance of the centre
- The centre operator is required to deposit, in a joint bank account, an agreed upon amount for the maintenance fund on a monthly basis from the monthly revenue generated. This is to ensure that sufficient funds are available for anticipated & unexpected maintenance/replacement requirements that will arise after 2-3 years.

If the operator fails to adhere to these terms, then the concession is terminated and the system relocated or reassigned.

How the Model Fared

- Regular visits have been made to the energy centre since its commissioning in March 2012, to brainstorm with the energy centre staff to identify challenges and opportunities and develop suitable strategies.

- Key Challenges:
  - Very low uptake of rental lanterns (8/120) during the first month of operation
  - Delay in returning of lanterns i.e. customers kept lanterns for an extra day resulting in lost revenue
  - Low retail sales for Powapacks and lanterns; an average of about one per month

- The energy centre introduced hair cutting as an additional service. This is powered with some of the surplus available from the system powering the TV and video system.

- Under consideration is the introduction of a basic computer training course. With 2 laptop computers, the centre has the capacity to provide practical computer training for at least 2 students a month.

Use of Agents

- Lantern charging and renting service has evolved from a purely centralized model operated from the energy centre to a decentralized model where these services are also provided in neighbouring villages through agents

- The centre currently has 5 agents located in other trading centres that are 10km or more from the energy centre.

- The lantern charging capacity of the energy centre and of the different agents is currently: Ikisaya – 56, Endau – 56, Kalwa – 20, Kathua – 20 and Yuiku – 20.

- The agents are typically existing shop-owners in these trading centres interested in generating additional income. These agents earn a commission of 20% on the lantern renting revenue they collect.

Use of Agents

- The major challenge with the agent approach is the inability to determine the actual revenue collected by the agents. Options are under consideration to address this are:
  - A fixed monthly amount payable by an agent to the centre be determined and any revenue generated over above this amount be retained by the agent as his/her income.
  - Implementing a system that could remotely monitor an agent's performance and that could also remotely control the agent's system.
- The logistics of remittance or collection of payments from agents is difficult in areas with limited inter-village public transport and poor or limited mobile network coverage.

Av. Monthly Revenues Oct-Dec 2012 and Apr-Jun 2013

Business Section	Services	Average daily users (Oct-Dec12)	Average Monthly Revenue (Oct-Dec12)	Monthly Revenue/ Section	Average daily users (Apr-Jun 13)	Average Monthly Revenue (Apr-Jun13)	Monthly Revenue/ Section
Charging Services	Lantern charging	26	7,930	13,563	40	11,940	21,373
	Mobile phone charging	9	5,513		31	9,433	
	Battery charging		120				
Agents	Lantern charging	55	16,390	16,390	52	15,690	16,687
	Mobile phone charging				3	997	
IT Services	Photocopying & Sale of Envelopes	15	4,622	9,292	16	4,800	6,003
	Typing and Printing	2	1,387		4	1,203	
	Laptop charging		3,283				
Retail Outlet	Lanterns		667	2,053	2	667	667
	Powapacks		1,387				
Multipurpose room	TV & Video Shows	7	2,165	2,432	13	3,917	4,083
	Room Hire		267			167	
Other Services	Hair cutting	3	912	912	7	1,960	1,960
Totals (KES)		**117**	**44,642**	**44,642**	**169**	**50,773**	**50,773**

Av. Monthly Expenditure Nov12-Jan2013 and Apr-Jun 2013

Energy Centre Expenses	Details	Projected Expenditure per month	Average Monthly Expenditure (Nov 12-Jan 13)	Average Monthly Expenditure (Apr-Jun 13)
Salaries	Manager	8,000		
	IT clerk	6,500	6,500	7,167
	Centre technician	6,500	6,500	
	Evening attendant	5,000	5,000	6,333
	Part time accountant	4,000	4,000	6,000
Other Staff Payments	Overtime (evening attendant)		999	745
Agents Commission	Commissions for lantern renting agents		3,289	1,851
Consumables	Printing paper	480		760
	Cartridges black	1,560	2,167	2,723
	DSTV monthly subscription	4,300	2,150	1,015
Petty Cash		4,000	2,296	3,142
Transport	Monitoring of agents		850	1,500
Business Permit	County Council Payments			440
Maintenance fund contribution	Estimated 500,000 needed after 2 years for battery replacement and other emergency maintenance requirements	21,300	13,600	12,333
Total expenditure, monthly (KES)		**61,640**	**46,735**	**44,010**

Discussion

- The significant upfront investment required for the energy centre and small margins make the model uninteresting for private sector investment.

- In its current form, the model would not attract businesses who could easily generate quicker and more substantial returns elsewhere

- Nevertheless, components of the model could be interesting for private sector investment. Revenue and expenditure trends from 18 months of operation indicate that the lantern renting and mobile phone charging services are by far the highest and most consistent source of revenue

- They represent 70% of all revenue generated by the energy centre and about 50% of the operation and maintenance costs.

- An analysis of investment costs also indicates that a model that targets only the provision of lantern renting and mobile phone charging services would require less than one third of the investment costs used