Household Electricity Access in Displacement Settings: Mini-grids in Kenya
Full project title: Support to UNHCR in the implementation of the Global Compact on Refugees (GCR)

Project Component: Energy Solutions for Displacement Settings (ESDS) - Kenya

Commissioned by: German Federal Ministry for Economic Cooperation and Development (BMZ)

Locality: Turkana West Sub-County

Partner: Kenyan Ministry of Energy, Turkana County Government (TCG) and UNHCR

Duration: July 2019 – October 2022
ESDS Project Intervention Areas

Policy, Coordination and Capacity Development:
• Development of Turkana County Energy Sector Plan
• Partner’s capacity development

Greening infrastructure: UNHCR and Partner Organisation:
• Technical advisory for development of energy delivery business models through market-based approaches

High tier electricity access for refugee and host communities
• Advisory service on sustainable energy business models and financing instruments for private sector and end-users
• Promoting access to energy for households and productive users
Established in June 2015 to ease congestion at Kakuma Refugee Camp

Occupies an area of 15 km² divided in 3 Villages

Population: 40,846

Households: 7,961

Figure 1 - Panorama view of Kalobeyei settlement. Credit: Mwangi Kirubi/USAID
Project Area: Kalobeyei Host Community Town

Figure 2 - Panorama view of Kalobeyei host community town. Credit: Renewvia

- Occupies a settlement area of about 2 km²
- Population: 1,000
- Households: 195
## Mini-Grids Results-Based- Financing (RBF) Facility

<table>
<thead>
<tr>
<th>Project</th>
<th>Technology</th>
<th>Implemented by</th>
<th>Duration</th>
</tr>
</thead>
</table>
RBF Implementation Structure

1. **Preparation Phase**
   - RBF Beneficiary (Project Developers)
   - Business Plan/Proposal
     - Submits to Pi
   - Checks & Approves BP
     - No
     - Yes
       - RBF Incentive Contract
       - RBF Contract/Grant Agreement
   - Awareness Creation

2. **Implementation Phase**
   - Project Implementation
   - RESULTS
     - Disbursement
     - Spot Checks
     - Verifies Results
   - Monitors Implementation
   - External Audit
   - Recommendation and Technical Assistance
Challenges & Opportunities of Electricity Access in Kakuma/Kalobeyei

Power generation system

Power distribution board
Challenges & Opportunities of Electricity Access in Kakuma/Kalobeyei

- **Challenges:** Unregulated, risky and expensive electricity.
- **Opportunity for private sector (also local).**

Power distribution network
RBF Incentive Structure (special for displacement setting)

1. Power plant and distribution system commissioning incentive (premium paid on CAPEX) – 30% of total incentives

2. Connections made (premium paid per household connected and maintained for at least 3 months) – 70% of total incentives

- Incentives capped at 50% of project CAPEX; except for Kalobeyei Refugee Settlement and Host Community town mini-grids - @82% subsidy in order to achieve national utility tariff rates. [leave no one behind and do no harm principles]
Project Implementation Process

1. Feasibility studies
2. Approvals (National & County Governments)
3. Tendering and Contracting private sector
4. Stakeholder engagements and land acquisition
5. Permitting (Power supply and ESIA licenses)
6. Financing and EPC
7. Commissioning, Verification & Disbursement
8. Operation & Maintenance and Scaling Up
Stakeholders and Roles

Layers of intervention

Who?

- Sponsor and Funder: DFID/FCDO, BMZ
- National Supply: MoE, County Government, NEMA, EPRA
- Implementing Partner: Private Sector, GIZ, BBK/ABSA
- Humanitarian Service Provider: UNHCR, RAS, WFP etc

How?

- Approvals
  - RBF Management, Technical Assistance
  - Providing RBF, Funding for expansion

Doing What?

- Drivers for Energy Transition
- Power Supply permits and licences approvals
- Project Management and Implementation
- Shelter, Protection, WASH, Health, Food, Agriculture, Education, business environment
## Project Specifications Summary

<table>
<thead>
<tr>
<th></th>
<th>Kalobeyei Settlement</th>
<th>Kalobeyei Host Community</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project type</strong></td>
<td>Hybrid Mini-Grid</td>
<td>Hybrid Mini-Grid</td>
</tr>
<tr>
<td><strong>Daily production per household</strong></td>
<td>254 Wh</td>
<td>187 Wh</td>
</tr>
<tr>
<td><strong>Indicative appliances</strong></td>
<td>Light, Phone, TV</td>
<td>Light, Phone, TV</td>
</tr>
<tr>
<td><strong># hours serviced</strong></td>
<td>24 hours</td>
<td>24 hours</td>
</tr>
<tr>
<td><strong>Cooking optional</strong></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>PUE</strong></td>
<td>Yes, for commercial customers</td>
<td>Yes, for commercial customers</td>
</tr>
<tr>
<td><strong>Project Total power supply capacity (Wp)</strong></td>
<td>60 kWP, 100KVA DG, 120kWh batt</td>
<td>20 kWP PV, 10KVA DG, 60kWh batt</td>
</tr>
<tr>
<td><strong># of households supplied</strong></td>
<td>347</td>
<td>97</td>
</tr>
<tr>
<td><strong>Connected to the grid (Y/N)</strong></td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td><strong>Hybrid (other connection)</strong></td>
<td>Genset &amp; battery</td>
<td>Genset &amp; battery</td>
</tr>
<tr>
<td><strong>Project Cost (USD) per kWp Installed</strong></td>
<td>7,663.45</td>
<td>7,663.45</td>
</tr>
<tr>
<td><strong>Monthly USD paid by the beneficiaries for the electricity delivered</strong></td>
<td>Residential 0.16 USD/kWh</td>
<td>Residential 0.16 USD/kWh</td>
</tr>
<tr>
<td></td>
<td>Business/Institution: 0.20 USD/kWh</td>
<td>Business/Institution: 0.20 USD/kWh</td>
</tr>
<tr>
<td><strong>Payback period (for the minigrid)</strong></td>
<td>5 years</td>
<td>5 years</td>
</tr>
<tr>
<td><strong>Country Implementation</strong></td>
<td>Kenya</td>
<td>Kenya</td>
</tr>
<tr>
<td><strong>Rural/Urban</strong></td>
<td>Rural</td>
<td>Rural</td>
</tr>
<tr>
<td><strong>Settlement duration and profile</strong></td>
<td>Protracted (6 years)</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Any other relevant information to the specific solution</strong></td>
<td>......</td>
<td></td>
</tr>
</tbody>
</table>
Electricity Consumption Patterns

Total Consumption (kWh)

- Kalobeyei Host Town
- Kalobeyei Settlement
Electricity Consumption Patterns

Percentage Demand Growth

-20.00%  -10.00%  0.00%  10.00%  20.00%  30.00%  40.00%

Kalobeyei Host Town  Kalobeyei Settlement
Electricity Consumption Patterns

Average Monthly Consumption (kWh) – Commercial Customers
Electricity Consumption Patterns

Average Monthly Consumption (kWh) - Households

Kalobeyei Host Town
Kalobeyei Settlement
Electricity and Revenue Model

**Sponsor and Funder**
- Sponsor
- Financial institutions
- Dev Bank

**NGO & Dev Agency**
- Grant
- Subsidies

**Power generation**
- Private Sectors
  - ESCO, BOO

**Power distribution**
- Private sector
  - BOO
  - Prepaid, Mobile Money
  - Metering
  - UN Livelihood and clusters
    - PoC
    - Host
    - CVA/CBI

**Power Supply**
- Sponsor and Funder
Clean energy transition
Reliable electricity generation & distribution
Safe electricity distribution
Experiences and lessons learned

• Plan how to manage unexpected demand growth while sustaining profitability

• Inclusivity of host and refugee communities to minimize conflicts

• The regulatory framework for development and operation of mini-grids should be flexible and responsive e.g. for tariff adjustments (draft Mini-grid regulations also under review)

• Private sector payback risk guarantee in cases of camp closure.

• To ensure that electricity prices are affordable (LNOB, do-no-harm) sustainable subsidies are required.

• More intensive community engagement and buy-in from the onset will help to counter a recipient mentality among the communities and to identify early on site-specific socio-cultural, logistical and other challenges

• Promote productive use of electricity for sustainability of mini-grids.
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