MICROGRID INNOVATIONS REQUIRED TO BUILD THE UTILITY OF THE FUTURE IN AFRICA

By: Sa'ad Jolade Kamal-deen

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Konexa's integrated model is based on partnerships with existing utilities in emerging markets, cutting edge technology, and a customer value proposition for 24/7 reliable power



Konexa is the Energy Company of the Future

We are a UK based company and the first integrated utility, deploying long-term capital to 1) make grid investments 2) deploy off-grid technologies 3) install embedded generation & storage capacity and 4) integrate cutting-edge information and operations systems in our technology platform.



Outside of Konexa's business model. Konexa will opportunistically invest in transmission if required to ensure reliable and high quality power supply to its customers

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1st mini-grid overview

The mini-grid serves a community in the north west of Nigeria and construction was completed in Q2 2021 and Konexa has a pipeline of projects across two states in Nigeria



Summary

- Total Budget: \$160,000
- No of Connection: > 100
- System Size: 21.9 kWp
- Duration of Construction: 12 Weeks
- System Description: A containerised hybrid mini-grid with a 87 kWh li-ion (LFP) battery and 15 kW diesel back-up system.
 Insulated ABC cabling was utilised for the distribution network with smart metering for all connected customers
- Main Challenges: Low demand utilisation by customers, Peak demand occurs in the evenings, low ability to pay, security and accessibly to site is challenging

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The mini-grid operational technology is split between generation and payment management



downstream

services for the community

Metering DCU/Base station is used to aggregate and

communicated with customer household meter

collection of payments for Konexa and financial

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• Payment service provider integration provides

- Edge device, used to aggregate and optimise control of all generation devices
- The edge device gateway is also to sensors used to monitor environmental conditions
- The Edge device cloud platform has integrated modules for incident management and customer relations management



Our first mini-grid has generated significant positive impact on the community



Connections: > 100 connections, of which 9 are productive use



Project Beneficiaries: 608 people



Carbon¹: 4.700 L fossil fuels or 11,800 kg of CO₂ displaced yearly from current activities



Economic Impact: productive use appliances including 6 women-owned paste grinders, 1 community grain miller, 2 fridge/freezers, access to financial (savings group and payment) services, business and farmer training and agricultural support to improve yields and income

Community deployment is central to our energy access efforts and a key pillar to operational success

- Electrification gives Konexa a social license to operate in communities in our sub-franchise area
- Konexa employs locals for the construction and operations of our assets were possible
- A Community Power Committee (CPC) is setup in the communities we operate as a local governance and accountability structure
- Electrification unlocks other community development opportunities, such as sustainable livelihoods, agricultural extension programs, modernising education and healthcare facilities



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Together with our partners we build an ecosystem for community development around our off-grid sites through a range of interventions



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Two different tariff types A) residential and low demand businesses, and B) large productive anchor customers

A) Economy Tariff

- Consumption based tariff for residential and low demand businesses with Monthly Service Fee i.e. shops
- Discounted day time tariff
- No load limit for now, but could create one if customer behavior requires it

Time of use, consumption-based tariff with monthly service fee

B) Business Tariff

- Consumption based tariff with daytime discount designed for high energy demand daytime productive users
- Customers must select a higher monthly service fee to qualify for the tariff
- Night tariff is the same as the Economy Tariff
- Day time tariff is significantly discounted compared to the Economy Tariff
- Nighttime load limit is in place to ration consumption
- A higher minimum vending amounts



Similar tariff model to Economic Tariff but with discount to stimulate daytime usage and ease transition from fossil fuel

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Technology deployments drive efficient operations and enable integration of on-grid and off-grid business models



Overview of Mesh-grid

Konexa is in the process of trailing a mesh-grid solution that **provides IoT HARDWARE + software** solutions to enable solar panels, inverters & batteries to be connected in a modular, smart, pay as you go **DC mesh grid**

Advantages of Mesh-grids

- Cost savings for similar service level compared to smaller mini-grids
- AC or DC power delivery to households
- Power sharing between connections (compared to SHS)
- Large productive use can be incorporated through a separately metered installation
- Rapid deployment (though small mini-grids can be quick too)

Disadvantages of Mesh-grids

- Similar modularity constraints as a standard minigrid
- Individual connections are **limited to 1.2KW of demand** (larger productive use can be metered separately with excess power supplied to the grid)
- Supply to DC grid is **limited to 2kVA for each generation point** on the network (limitation on connecting mesh grid to a mini-grid or large generation point)
- Locked into SaaS offering by OEM's
- More expensive than SHS per connection but SHS have less flexibility for large households, and are not well adapted to energy as a service





Mesh-grids appears viable as a way of providing flexible power as a service to smaller communities with small productive use requirements

Pilot: trial 3 configurations across residential connections and a stand-alone paste grinder

Overview of configurations

- 1. Standard Mesh grid (600W per HH): DC network powering several connections with each household having a Kit (Controller, AC Inverter, energy generation + storage) which can share excess power on a DC network
- Custom set-up (300W per HH): One Kit sharing power among 6 connections with single point of generation and storage capacity (limited to 6 connections 10 – 20 m from generation)
- **3. AC integration (5kW)**: Receiving power from an AC source, powering a grinder with excess energy sent (1.6kW limit) to both mesh-grids highlighted above
 1. Standard Mesh grid

Learning objectives

- Achieving a cost/connection lower than \$1,000 (Ideally \$600)
- **Understand how customers benefit** over time from absence of capacity limit associated with SHS (consumption flexibility and demand growth)
- Include a motorized PU appliance i.e. grinder and share excess AC power to DC mesh grid (< 50 m away for DC network)
- Understand limitations of DC distribution and benefits of power sharing
- Better understand OEM's technology offering (Proprietary features)



Konexa's Innovations for mini-grids can be summarised by the following 3 components:

1. Mini-grid Deployment Innovation

- Remote monitoring and control of assets
- Use of cutting edge technology i.e. LFP, Smart meters, Passive cooling of batteries,
- Strong community participation in the roll-out of assets from construction to governance

2. Business Model Innovation

- Innovative tariff model to increase energy utilisation and revenue assurance
- Livelihood support program to stimulate local economy
- Appliance financing to stimulate household demand

3. Technology Innovation

- Integrated technology platform for electricity utility management
- Mesh-grids to reduce the cost per connection compared to mini-grids for residential rural customers and provide greater flexibility for addressing demand growth

Thank You



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