



Powerhive Micro-Utilities

Unlocking prosperity and human potential with clean, productive electricity

INTRODUCTION

Powerhive has been formally licensed to operate as a utility and acquired permission to generate, transmit, and distribute electricity directly to consumers. Powerhive was the first private company in the history of Kenya to do so, following close collaboration with Kenyan government authorities.

Congratulations, you are now the second company in the history of Kenya to be licensed to distribute electricity.

Mr. Buge Wasioya

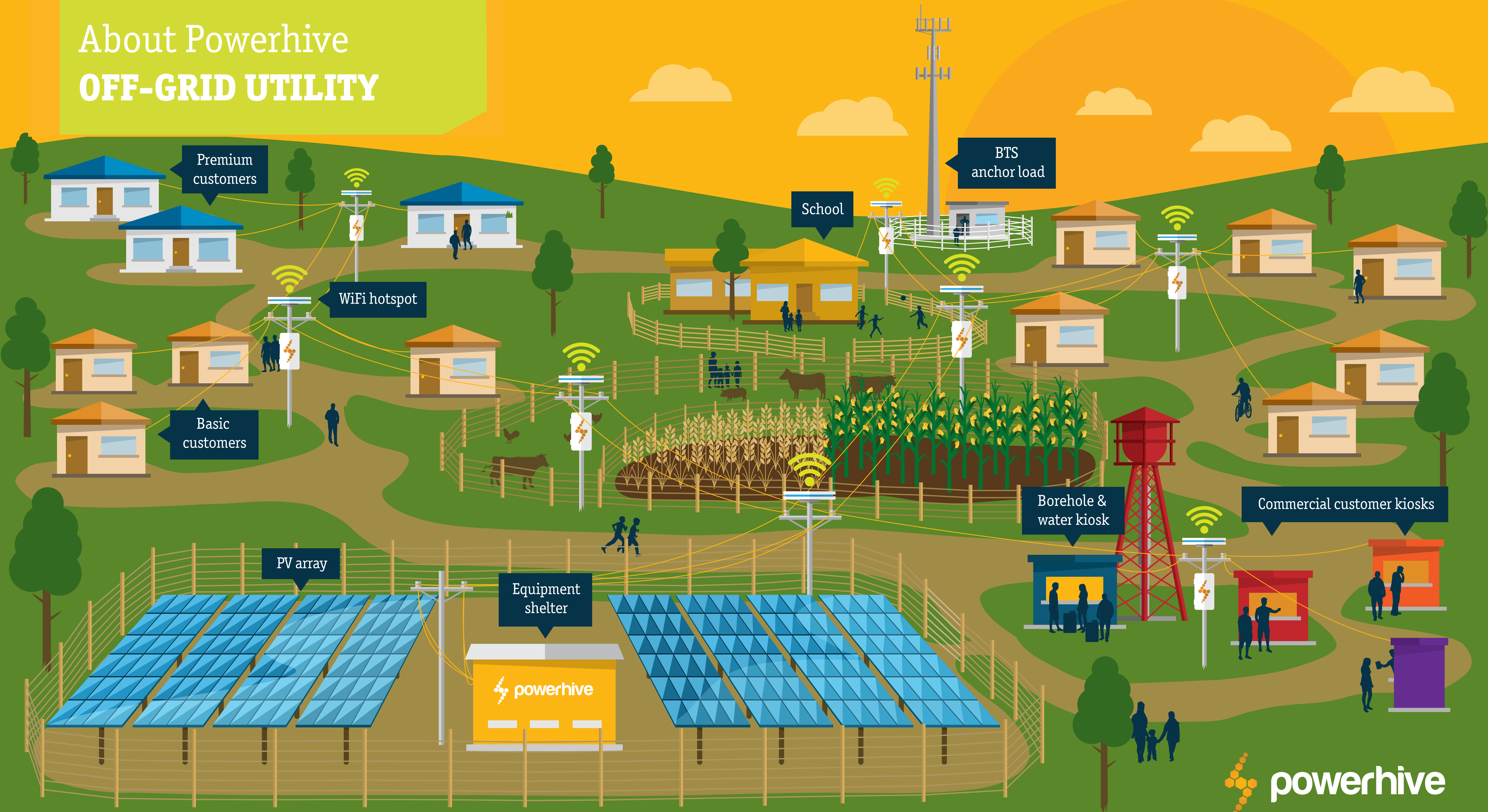
Chairman of Kenya's ERC Licensing Committee

ABOUT US



- + Founded in 2011 in Berkeley, California
- + A team of experts from the renewable energy, utility, telecom and software industries
- + Patented, proprietary microgrid management platform
- + Years of experience in Kenya & development of 100,000-customer portfolio project
- + Financial backing from Caterpillar, Total, and First Solar
- + Pursuing aggressive expansion across African off-grid markets

About Powerhive OFF-GRID UTILITY



The Opportunity **FOR GOVERNMENT**



The Connected Village is an opportunity for governments to serve their constituents with clean, reliable, modern electricity. By incentivizing and expediting licensing for Connected Village projects, governments will enable private sector participation in pursuit of energy access goals.

+ Reach electrification goals sooner

The Connected Village will deliver electricity, water connectivity, and related services more efficiently than existing solutions such as grid extension.

+ Increase rate of development

The services provided by Connected Village are proven to increase socio-economic development within communities, by stimulating education and commerce, increasing incomes, improving livelihoods and lifting up future generations.

+ Reduce investment requirements for electrification

The Connected Village requires a lower investment than grid extension. For example, the budget for the “Last Mile” project managed by KPLC in Kenya is ~\$1000 per connection for service drops only. The CAPEX for an off-grid Powerhive Microgrid is ~\$550 per connection including both distribution and generation (excluding internet and water services).

Kenya Government **KEY SUPPORT**



- + ERC worked with us to develop mini grid license in absence of formal framework;
- + Received a presidential exemption from land control act to enable us to lease agricultural land;
- + County governments support project directly:
 - + Expedited processing of licenses (EIA etc)
 - + Free wayleaves for road reserves and public land for the reticulation
 - + County officials to attend baraza's
 - + Public support from Governor's office

Customer Data **DIVERSE LOADS**

Powerhive's extensive data on individual customers and grids allows us to properly design and size our microgrids. One microgrid can serve an array of different loads, enabling the creation of new businesses and community services.

Together, these various off takers provide a steady, predictable, and profitable revenue stream.



Value Creation

BUSINESS PROGRAM



Kuku Poa
Maisha poa

Join Kuku Poa from Powerhive today!

- Earn money raising bigger, healthier, fast-growing kuku kienyeji.
- Get the training and support you need to succeed.

NO PAYMENTS FOR THE FIRST MONTH
Then pay just **Ksh 155** each week.

For a limited time, Powerhive is offering two months free chick mash to new subscribers!

- Receive 5 improved week-old kuku kienyeji chicks every month.
- Free 2-day training course.
- Comprehensive kuku kienyeji training guide.
- Ongoing training and support.
- All necessary vaccines for chickens purchased through the program.
- Earn up to Ksh 900 profit per month.

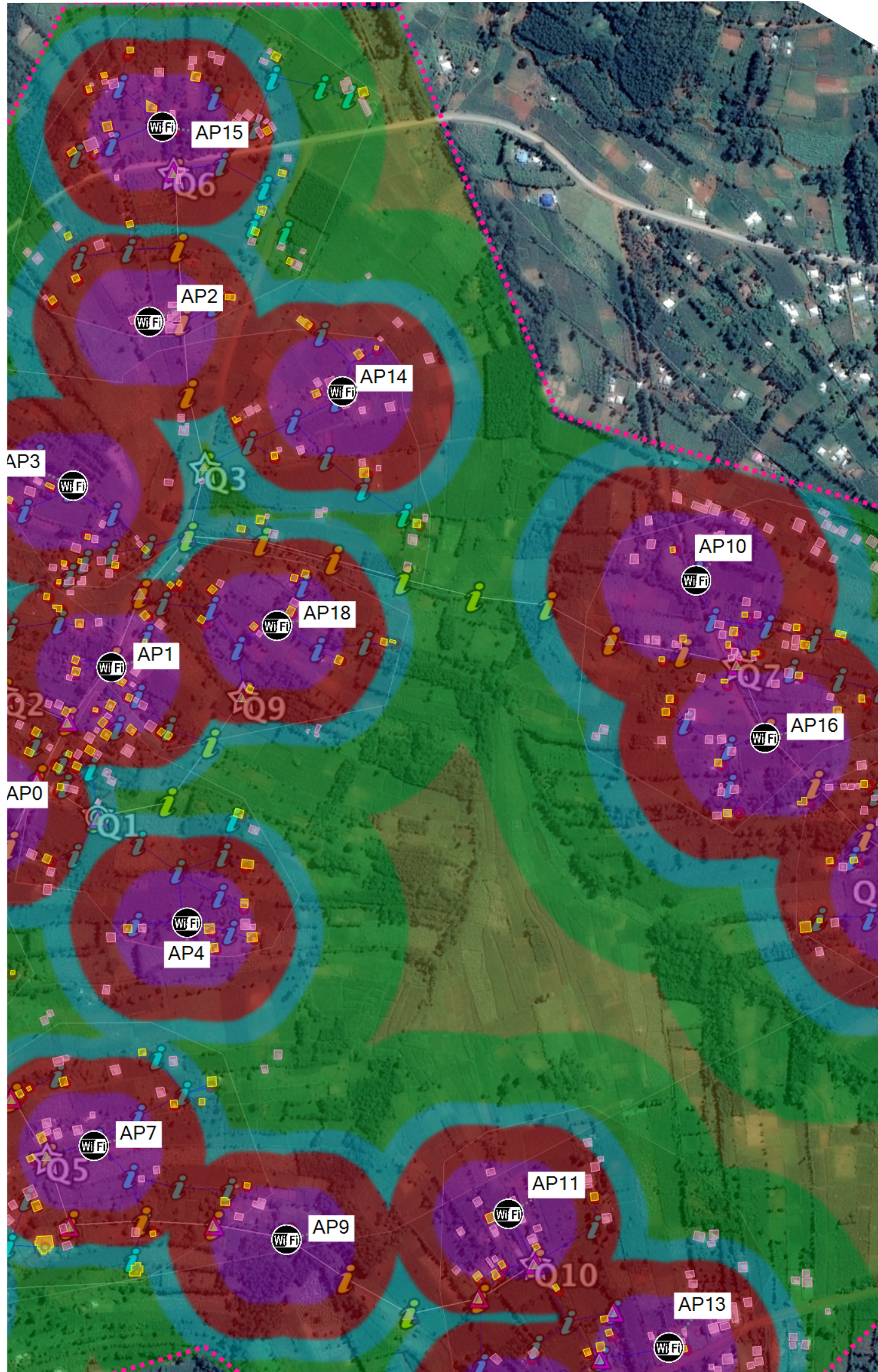
Terms & conditions apply

 powerhive

- + Stimulating sustainable demand by supporting customers to start profitable businesses using electricity
- + Providing enabling services (Internet, LPG sales, etc.)
- + Micro-business program running for 3 years: appliance loans and business training for eligible entrepreneurs
- + “Kuku Poa” pilot currently running: 80% of eligible customers signed up. Substantial increases in customer income and ARPU
- + Can be scaled to every operational site to maximize impact of electrification and drive revenue growth

Value Creation

VILLAGE INTERNET



- + Village-wide in-home Wi-Fi coverage
- + ISP license filed and approval in process (due July 2017)
- + Unlimited internet access for as low as \$2/mo
- + Local hosting of educational content
- + Premium content delivery service in development
- + Cyber cafe and training center on-site
- + Customers get tablet or laptop on monthly repayment
- + >70 customers signed up in 10 days for Internet+Tablet starter pack at pilot site
- + Increase of project IRR with ≥ 5 points

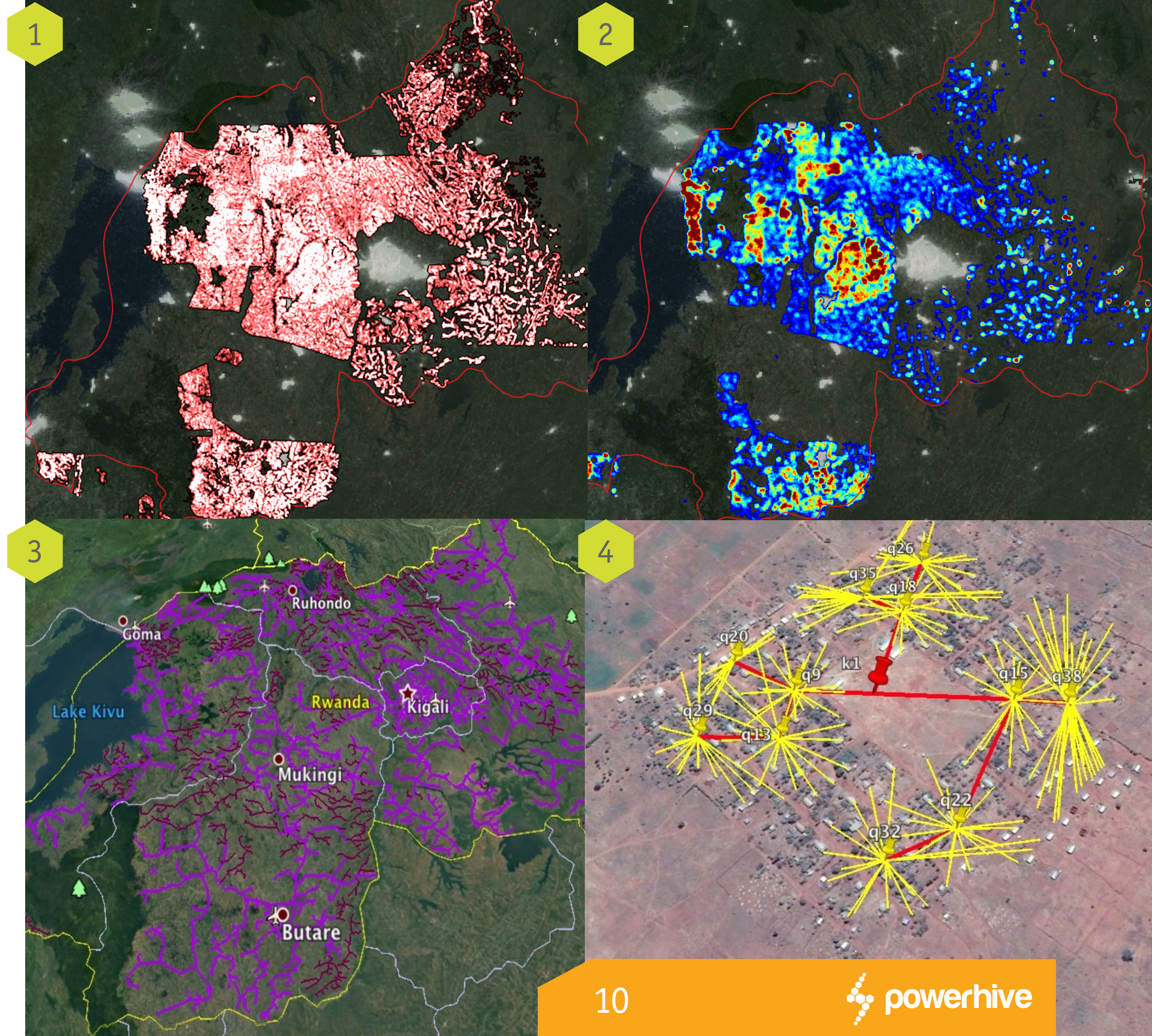
Site Identification

SWARM GIS SOFTWARE

Powerhive has used SWARM to analyze millions households in Kenya, Nigeria, Rwanda (shown), Uganda and other markets to assess their suitability for microgrids.

1. Heat map of all households identified to date by SWARM
2. Heat map of all communities with 200-800 households in a 1km radius
3. Grid location data is used to identify off-grid communities
4. Microgrid network designs are created for off-grid, dense villages

This process has identified hundreds of potential microgrid sites that could serve tens of thousands of households and small businesses across Rwanda.



Spotlight SITE SELECTION

Off-grid households

..... Powerhive acquires GIS-rooftop data and supplemental datasets such as existing grid maps to determine the **total number of off-grid households**

Possible grids

..... SWARM determines all viable grids based on technical and financial conditions and optimises for **minimum grid cost**

Viable grids

..... Based on actual **survey data** we develop a view on the financial viability of communities, **correlated with actual data** from operational grids. SWARM re-analyses optimal distribution and grid ranking

Sites

..... A detailed assessment of each site is **reviewed by the Investment Committee** and approved or rejected for construction

Powerhive has a 14 FTE GIS team which has been active for more than 2 years identifying 1000's of viable grids in key markets leveraging Powerhive technology.

Setting The Tariff

KEY ASPECTS



Cost-reflective

- + Most governments cannot afford to connect everyone, and customers are willing to pay the real cost instead of not getting connected at all;
- + Subsidies distort the market and limit roll-outs to the availability of concessionary funding.

Tariff components

- + Connection charge – a one-time payment upfront to ensure that customers who sign up have some ‘skin in the game’ and contribute towards connection cost;
- + Fixed monthly charge – a fixed monthly amount, based mostly on the cost of the distribution network;
- + Usage charges – variable charges based on the cost of generation. Powerhive distinguishes between daytime and nighttime pricing to account for the cost of battery storage and promote daytime commercial use.

Powerhive Platform

ASALI SMART METER



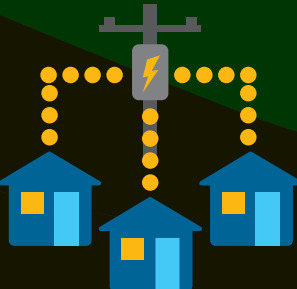
Demand management

Circuit control for load shedding and tariff management



Electricity metering

secure, utility-grade, cloud-connected metering



Designed for emerging markets

Multiple circuits per meter minimizes cost per connection



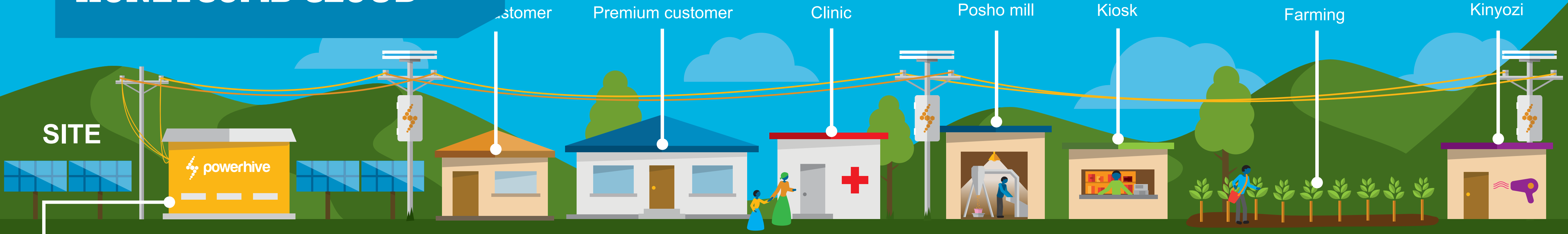
Theft detection

integrates multiple novel theft detection algorithms



Powerhive Platform

HONEYCOMB CLOUD



REMOTE OPERATOR

Security
AWS, SSL,
minimum open
port, server access
via key only

Powerhive Honeycomb

Grid control
Power management;
manages loads to
ensure maximum
quality of service

Tariff engine
Supports an unlimited
range of tariff models,
including dynamic
pricing

O&M
Algorithms developed
from pilot project
learnings and best
practices from utility
scale projects

Data platform
15-minute payment,
power and energy
data streams

Mobile money
Integrates with all
major providers

Payments recieved	Payments pending

Automated support
Proactive and reactive
consumer communications

4+ Years Experience

ACHIEVEMENTS



- + 5 years of quantitative and qualitative data from operations
- + Approval by Kenyan electricity regulatory commission for 25-year generation and distribution license
- + Detailed understanding of customer satisfaction and operational requirements off “off-grid utility”
- + Achieved IC approval from OPIC for project debt (we decided not to draw)
- + Sustained concurrent construction of 10 mini-grid sites;
- + Presidential exemption from Land Control Act in Kenya
- + BTS Power agreement with some of continent’s largest MNOs
- + Launched unlimited, low-cost broadband internet services for our mini-grid sites available to all customers.

4+ Years Experience

CHALLENGES



- + Capacity and quality of construction partners is lacking and will need substantial support to enable the scale required;
- + Regulatory work takes substantial efforts and time, holding back the speed of deployment that could be achieved by multiple active market players;
- + Duties, taxes, and VAT increase cost to consumers substantially, and governments should consider removing these instead of cash subsidies.

Scaling Mini-Grids

RECOMMENDATIONS



- + Powerhive has proven in 5+ years of operations that off-grid mini-grids are commercially viable;
- + Off-grid mini-grids / utilities are less about electrons than about supporting communities to derive maximum benefit from the electricity;
- + Like most infra and utility projects, scale is required. Scale needs well-designed regulations, political risk mitigation and long-term planning;
- + Large-scale funders are standing by to jump on the opportunity once developers, governments and regulators are showing that they can collaborate quickly and efficiently to establish a privatized market for off-grid utilities.



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