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Mesh Grids - Redesigning
electricity networks from the
ground up

Microgrid Symposium 2023



🏠 OKRA 's Problem Space

**SDG7 far off
track**

>700M

People without electricity
worldwide

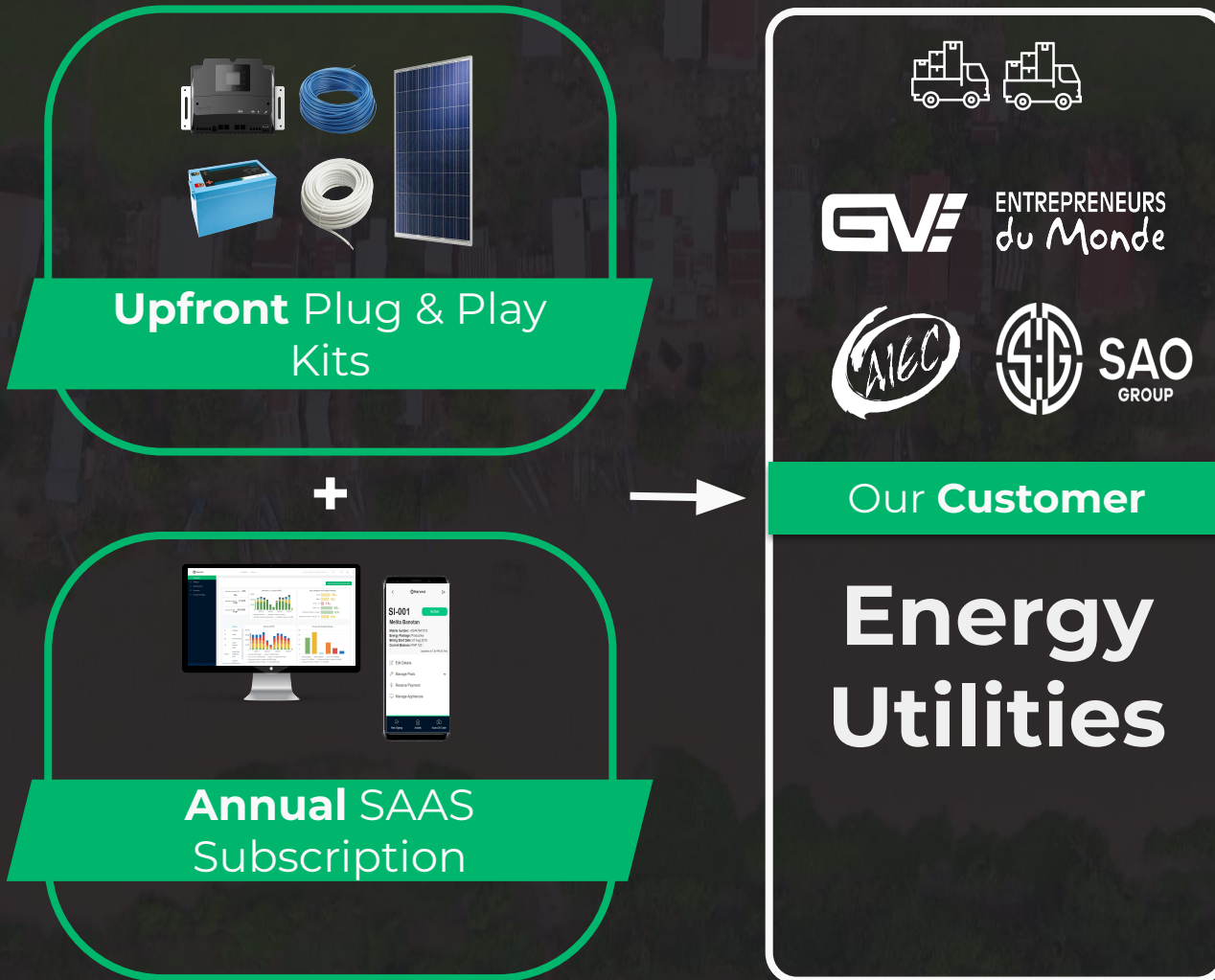
75%

of utilities in developing countries
likely loss making

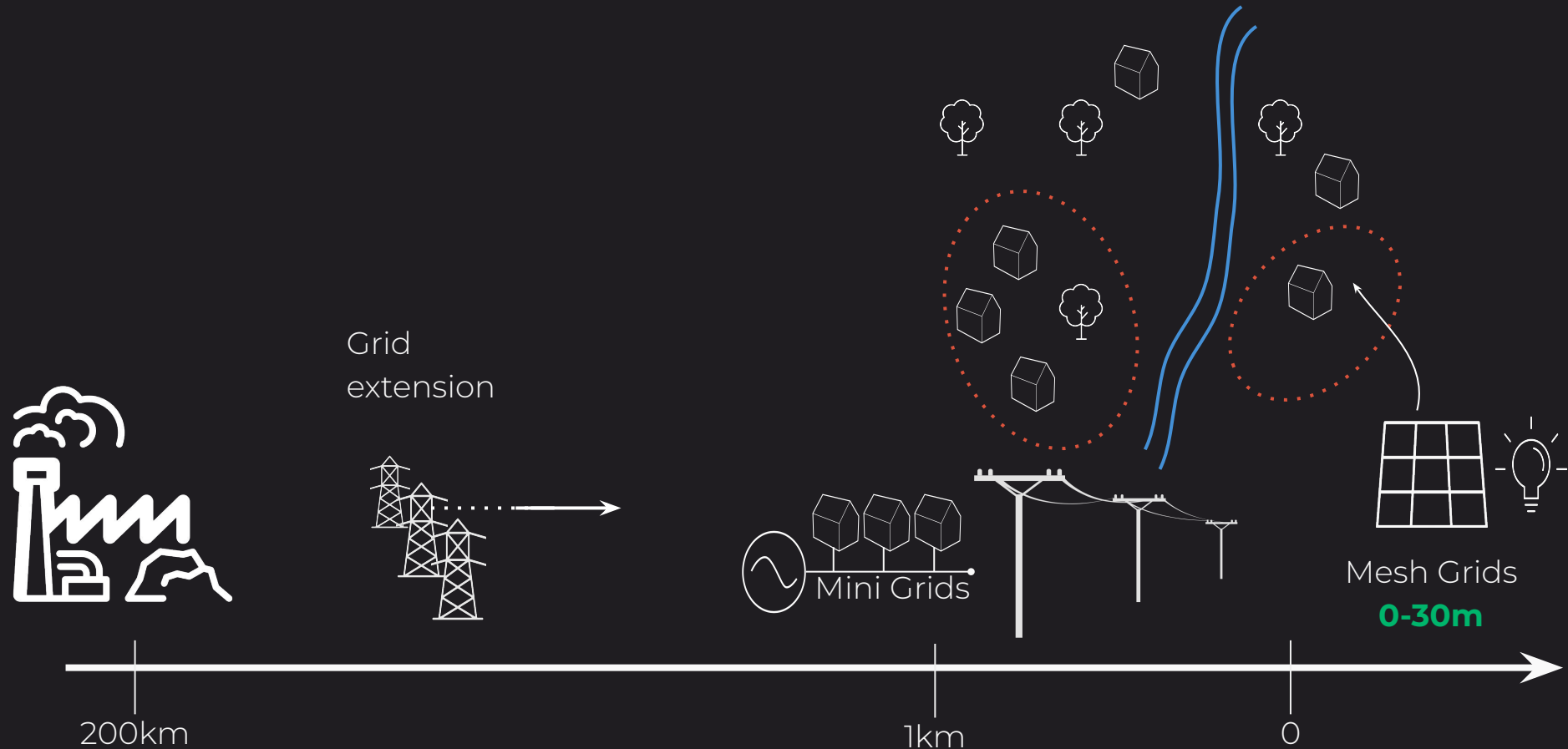
<5%

African minigrid developers are
currently reported profitable

Okra's business model



Taking Decentralised Energy beyond the last mile - to the last metre!



What is a Mesh-Grid?



Bottom-up Electrification

Built for day 1 needs and expanded



A fully decentralised grid where **nearly all energy is generated and stored less than 30m from the point of use.**



Same energy provided at **half the cost** of equivalent minigrids

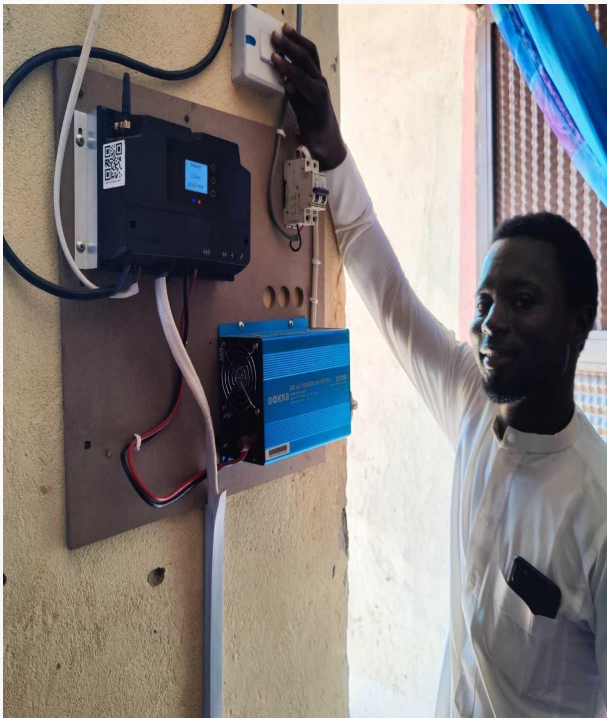


Mesh grids are here and growing!

GEAPP called Mesh Grids “[a game changer](#)”

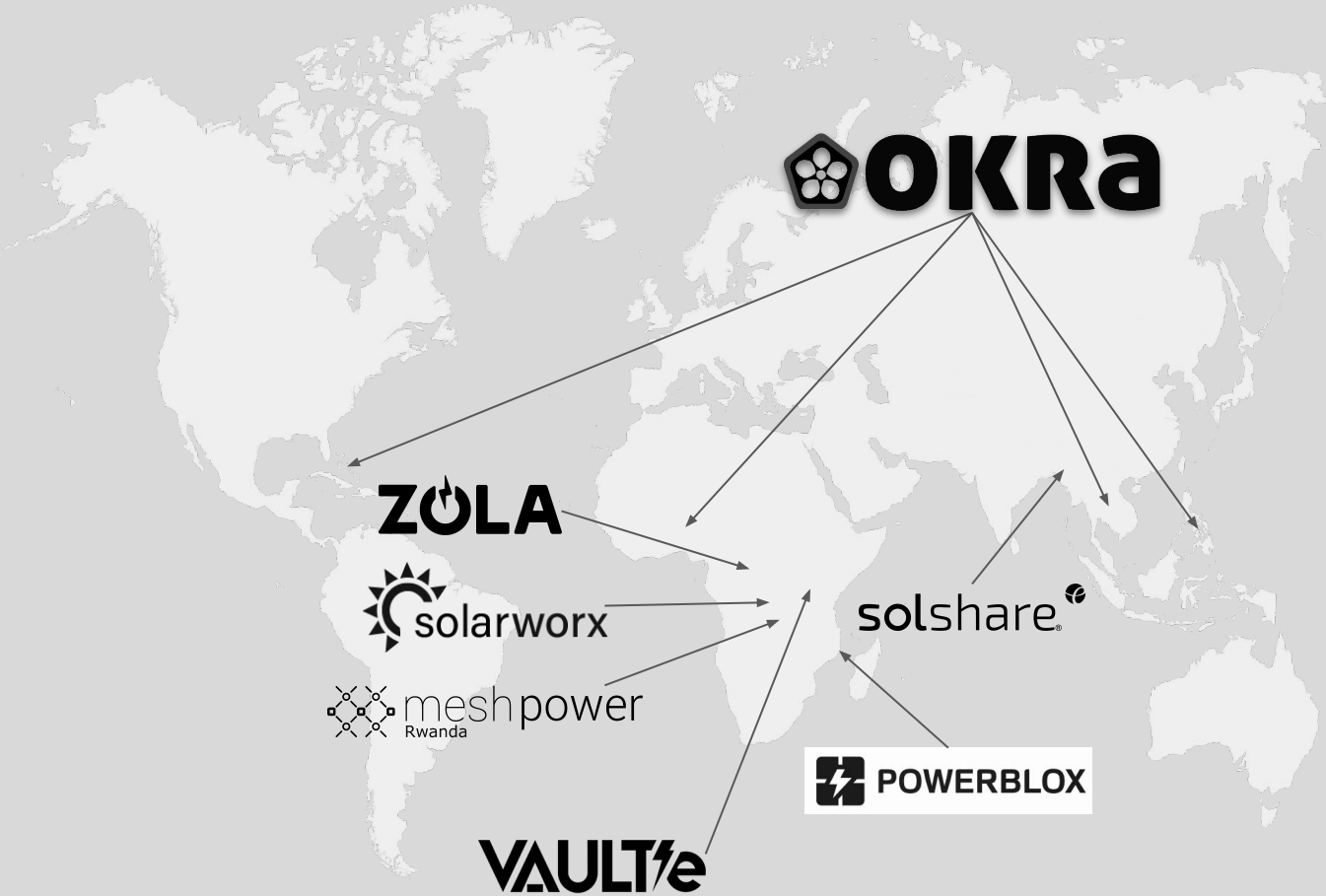
>14,000 users in 4 countries

Enabling household usage up to 1.2kVA for a fraction of minigrid cost, **making unviable sites viable**

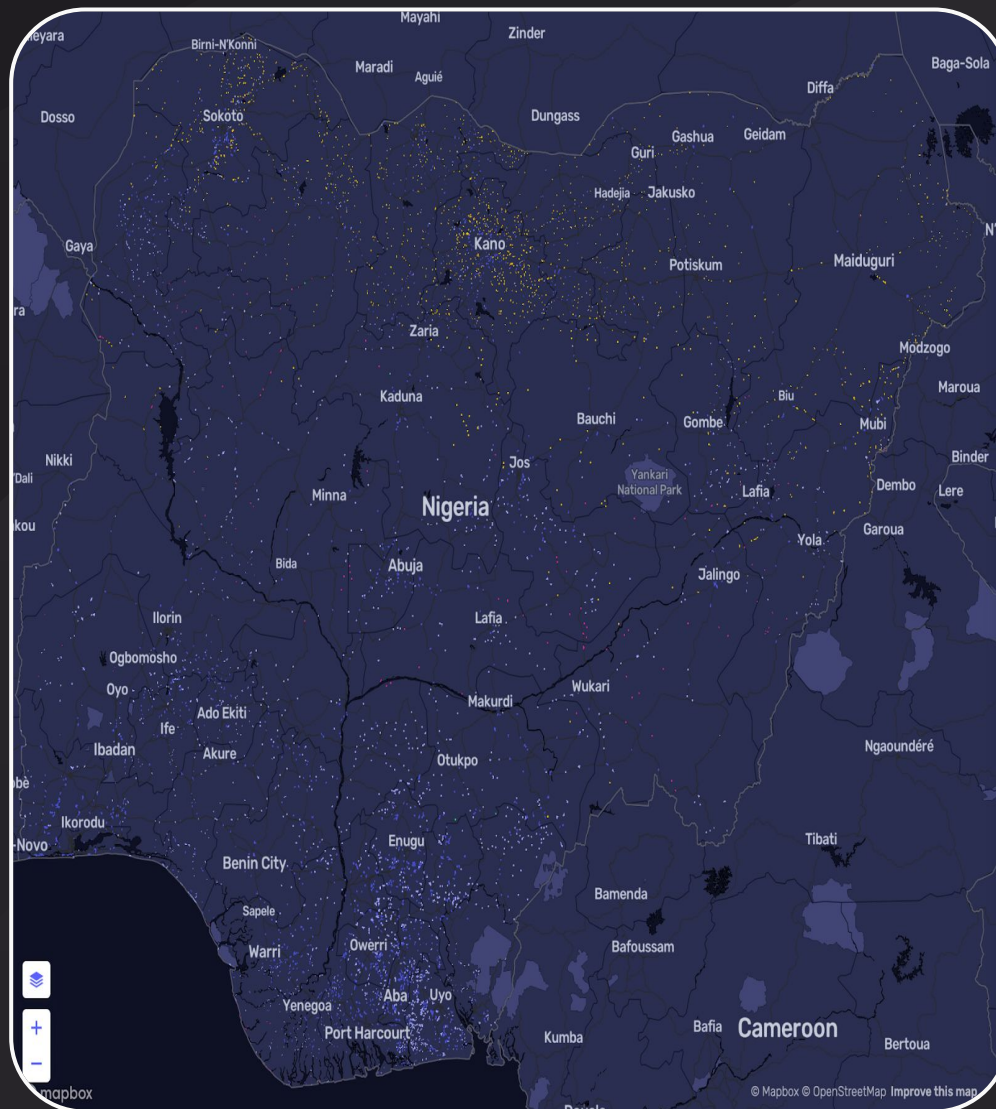


Mesh Grids are not just Okra

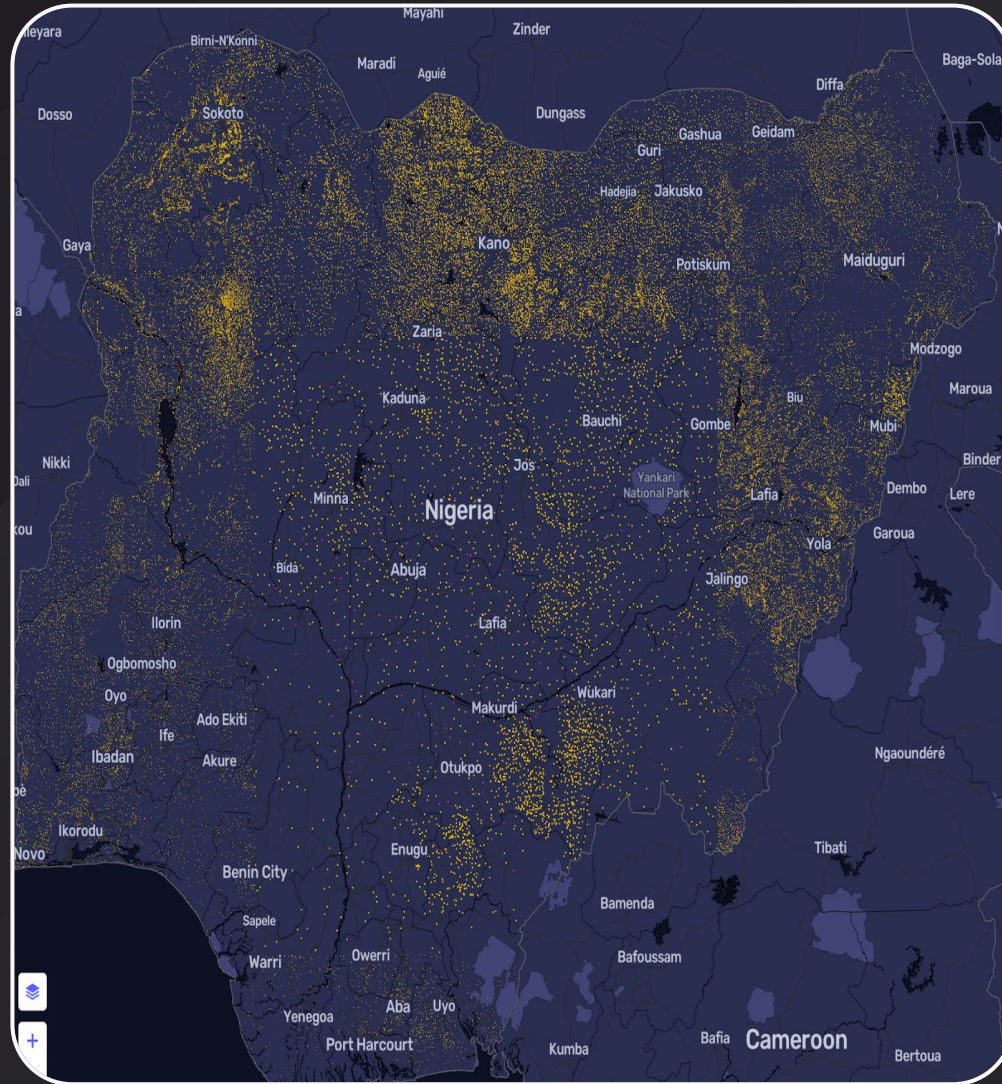
A new wave of hardware vendors are serving markets in more than 10 countries



Number of off-grid sites with **more than 500 households**



Number of off-grid sites with **less than 500 households**



The off-grid Energy Technology Gap

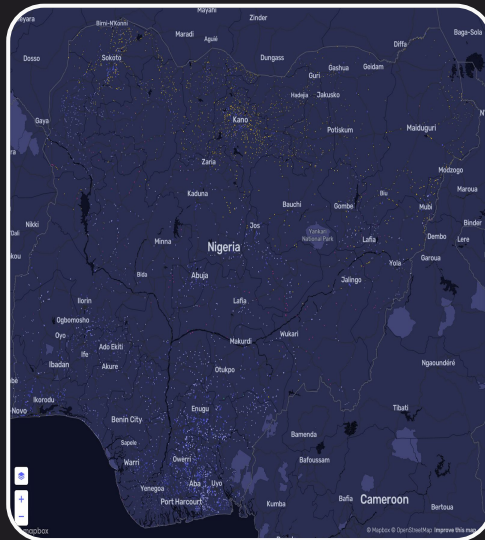
How do we get productive use energy to low density last-mile areas?

20% of (non grid ext)

Densely populated communities, some commercial anchor loads, **suitable for mini-grids**

Distribution costs

PV, Batteries,



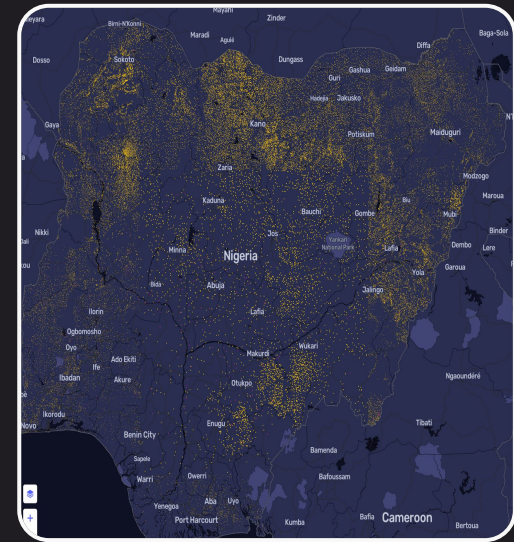
High Density - 500+ households

80% of (non grid ext)

Sparsely populated communities **challenging to justify distribution investment**

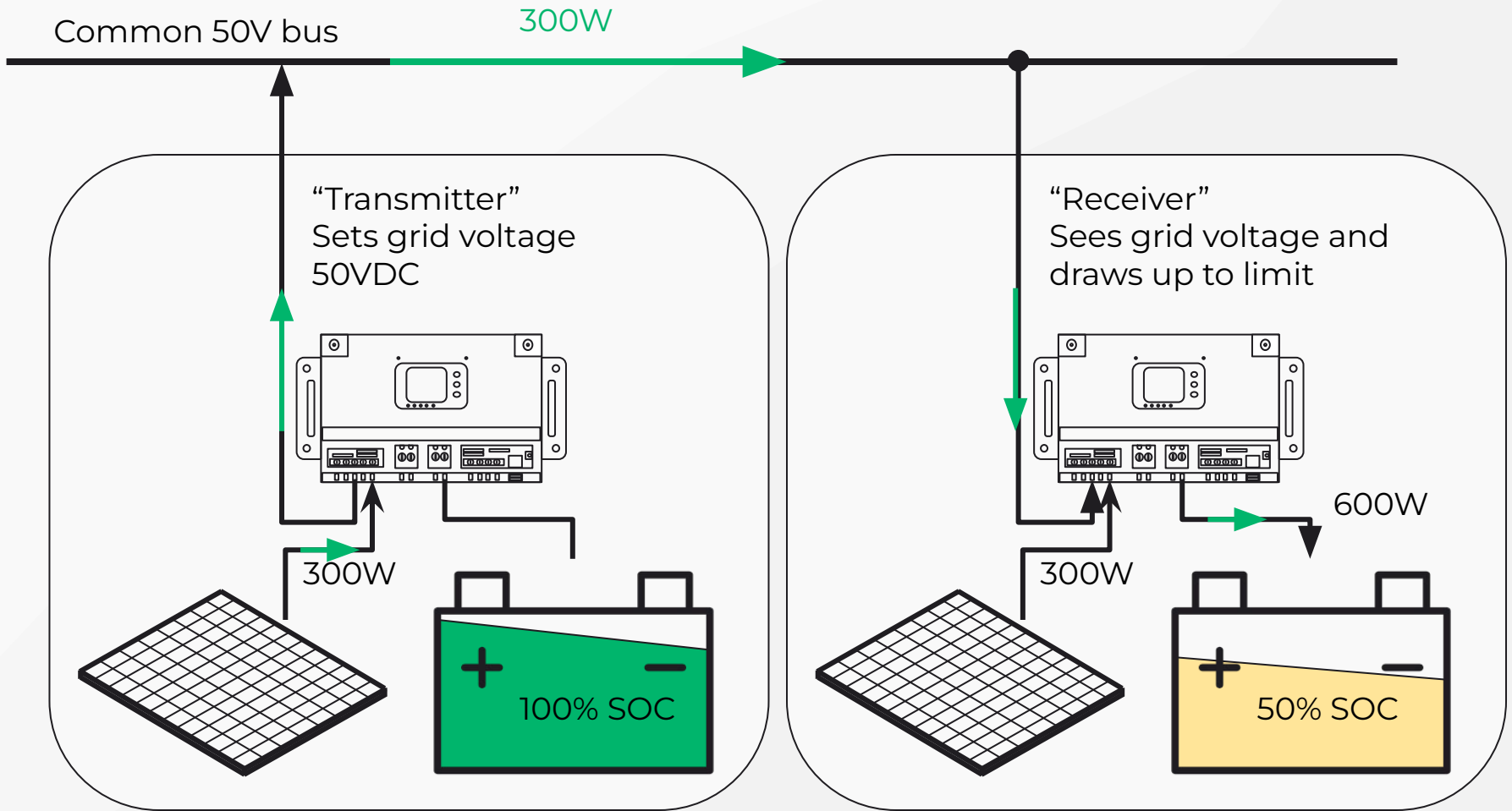
Distribution costs

PV, Batteries,



Low Density - Less than 500 households

Mesh grid control logic



The Power vs Energy Paradigm Shift

Minigrid topology

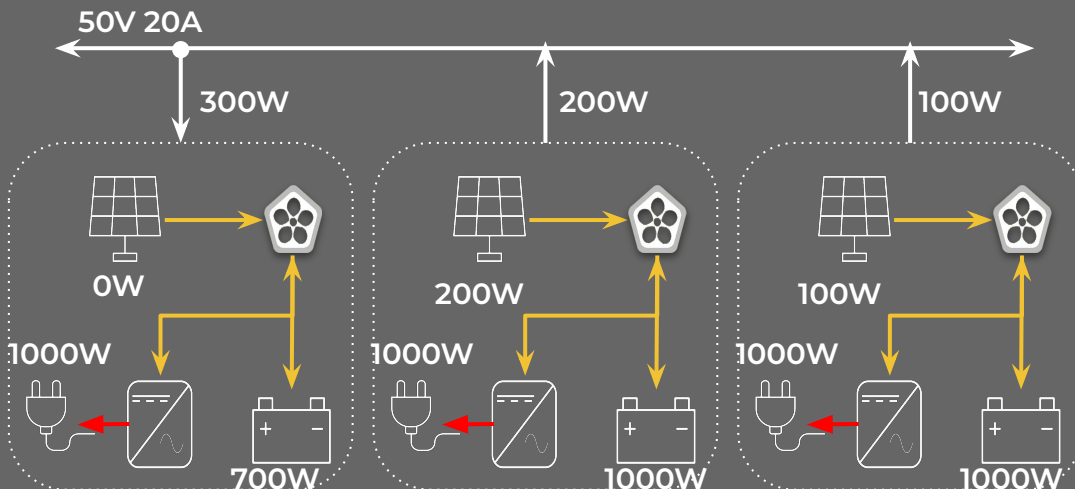


Maximum Demand is the driving force of grid design

Results in 50mm² carrying 24kVA for 1hr

Every house using electric cooker at 7pm will cause under-voltage trip

Mesh grid topology



Energy Demand is the driving force of grid design

Results in 2.5mm² carrying 1kW for 24hrs

Every house using electric cooker at 7pm has no effect on grid


Haiti Case Study

- Blog Post [here](#)
- >1,000 Houses connected
- <\$500/cxn installed, supplying 300Wh/d
- 98.5% average uptime
- Comparable minigrids [cost >\\$1k/cxn](#)



An aerial photograph of a village in a savanna landscape. The village consists of numerous circular huts with conical thatched roofs. A large herd of sheep is visible on the right side of the image. The background features rolling hills under a hazy sky. The word "Conclusions" is overlaid in the center in a large, white, sans-serif font.

Conclusions

An aerial photograph of a village in a savanna landscape. The village consists of numerous circular huts with conical thatched roofs. A large herd of sheep is visible on the right side of the image. The background features rolling hills under a hazy sky. The text 'Q&A' is overlaid in the center of the image.

Q&A