



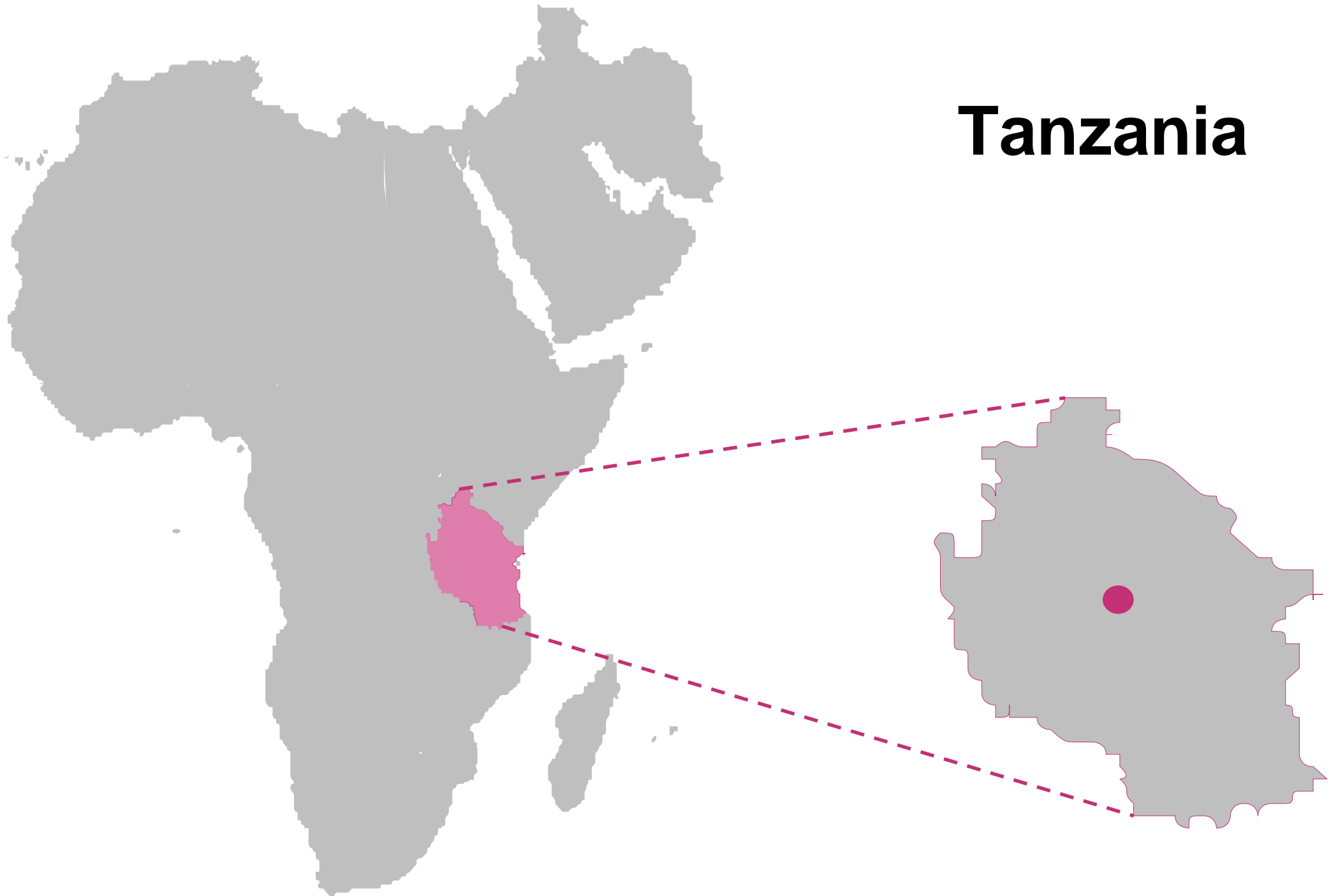
Hendrik Broering  
AMMP Technologies

GrafanaCon LA, Feb 2019

# How IoT is enabling electrification across rural Africa with smart, renewable energy



# Tanzania





## **Changombe**

**Country:** Tanzania

**Region:** Manyara

**Population:** ~2000

**No access to  
electricity till 2017**



**Commissioned:**  
Q1/2017

**Project Developer:**  
Rafiki Power



**Connections:**  
351

**Types:**  
Households &  
Businesses



**Laundry service**



**Fridge / Freezer**



**Hair dresser**



**Productive use**



# Solar Mini-Grid



Power Electronics



Customer Line

Pole Top Hardware



Smart Meters



Pole

Trunk Cable



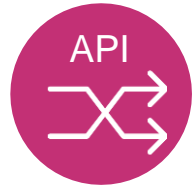
Batteries



**AMMP monitors  
100+ mini-grids  
across Africa**

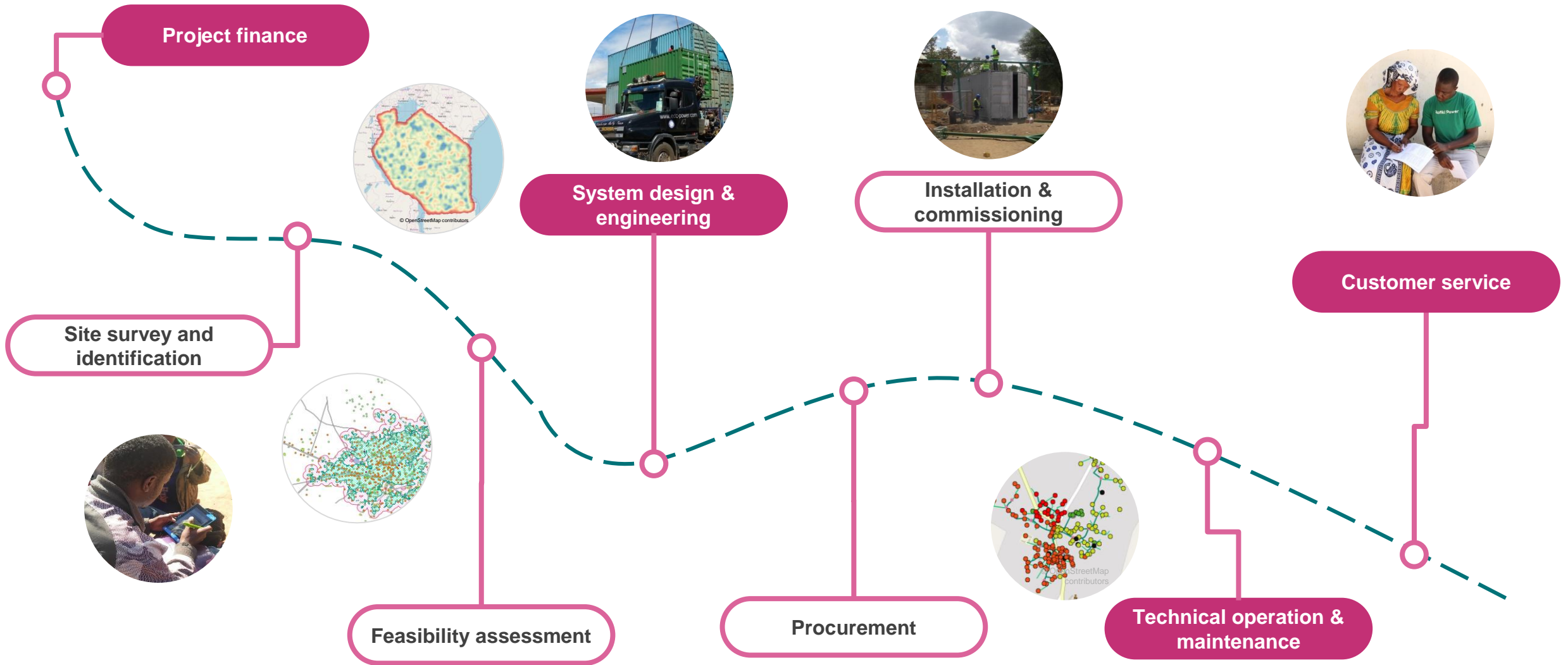
# AMMP

On-site gateway or  
API - connection



 **kapacitor** +  **loud**

# Operational data is useful in making smart and fast decisions across the mini-grid value chain





# Case 1

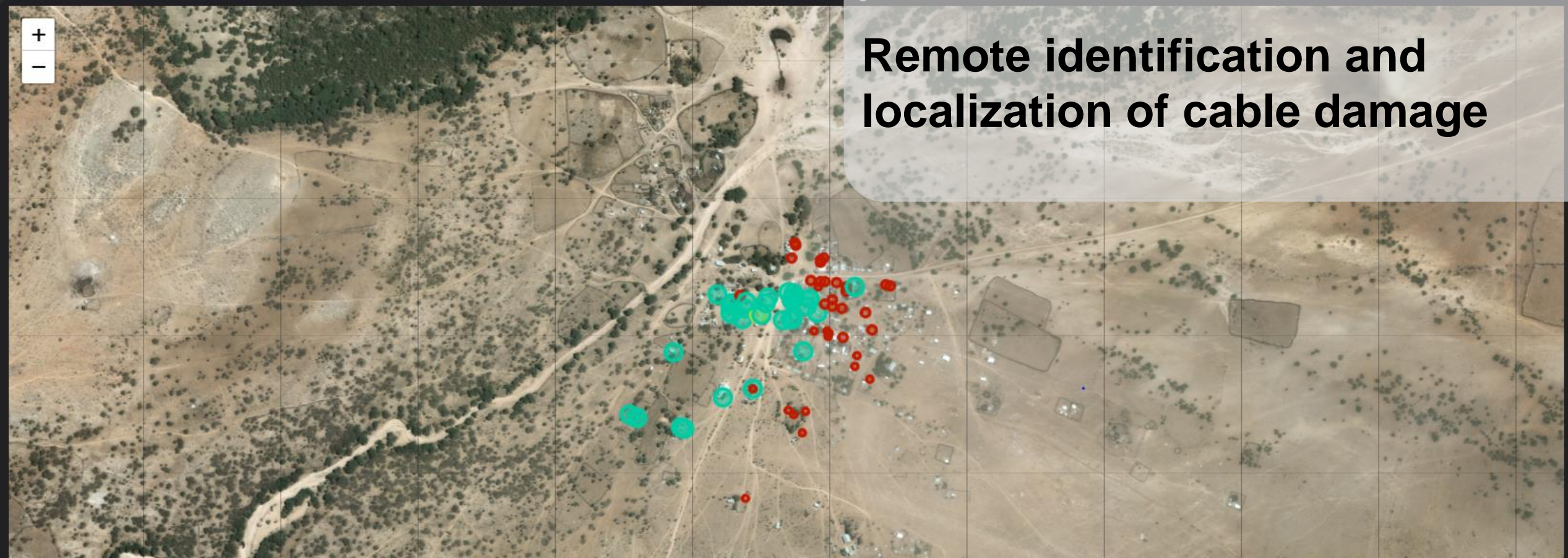
**Physical access to mini-grids is difficult. Whatever can be done remotely is beneficial.**



Minimum meter voltage

# Remote identification and localization of cable damage

+  
-



Average Voltage

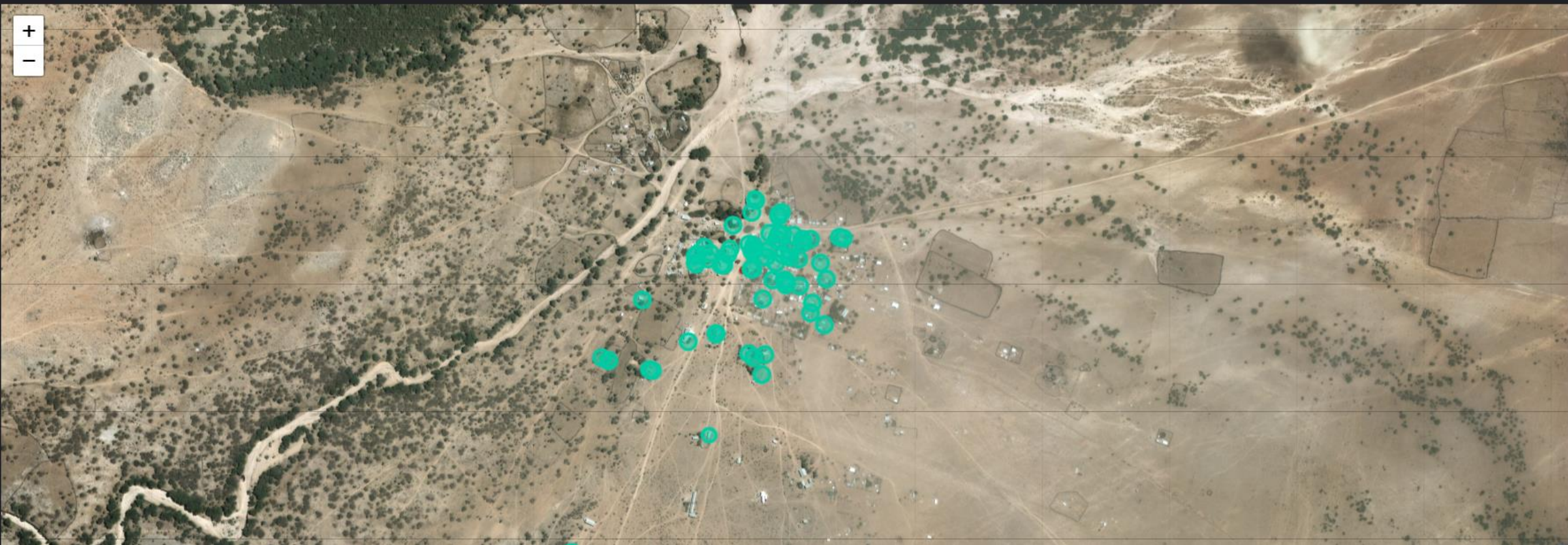
Meter phase voltage / CSV







Minimum meter voltage



+

-

Meter phase voltage / CSV



	min	max	avg
SM60R-02-00002F1F	202.63	240.64	230.24
SM20R-02-00000C21	203.98	238.97	228.52
SM20R-02-00000C42	204.20	239.09	228.65
SM20R-02-00000C10	204.22	238.78	228.32
SM20R-01-000006BD	204.31	238.81	228.45
SM20R-02-00000C13	204.35	239.18	228.76
SM20R-02-00000C07	204.43	239.09	228.68
SM20R-02-00000C2E	204.44	239.29	228.87
SM20R-02-00000C16	204.64	239.29	228.90

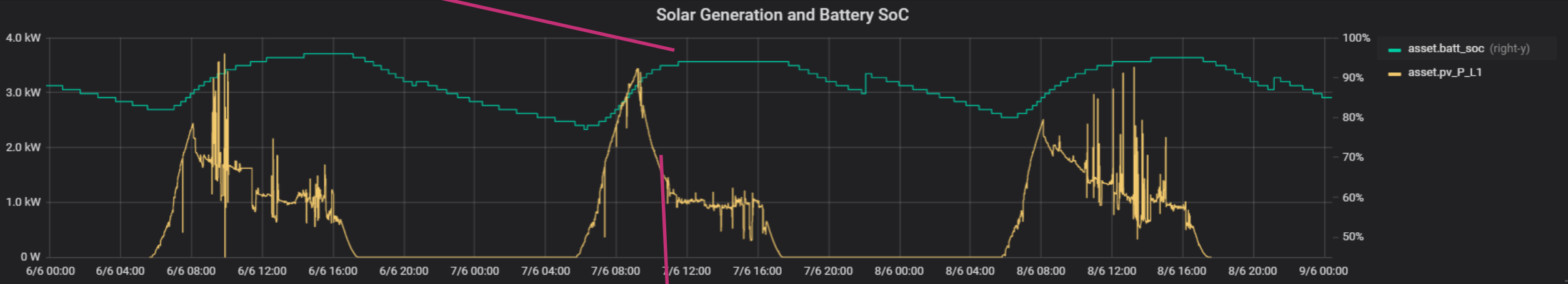


# Case 2

**Back to Changombe...**



**Battery reaches  
maximum state of  
charge**



**PV power curtailment → Unused PV potential**



**Commissioned:**  
Q1/2018

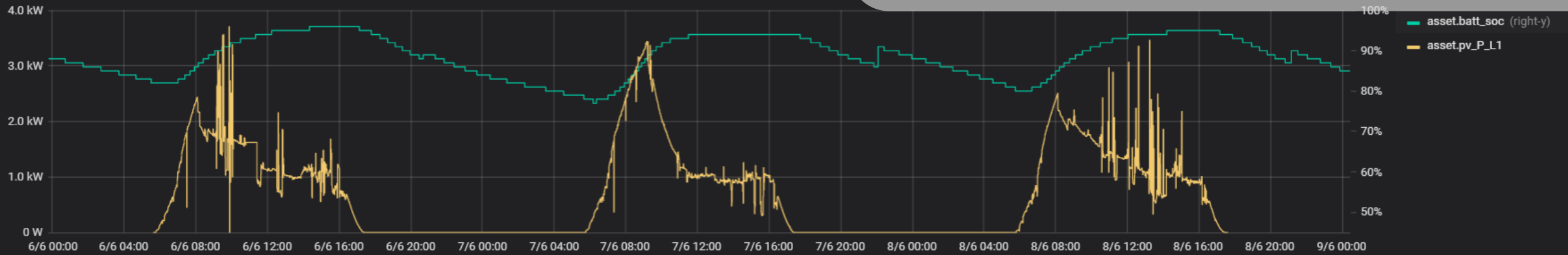
**Power:** 1.4 kW

**Yield:** 500 l/h

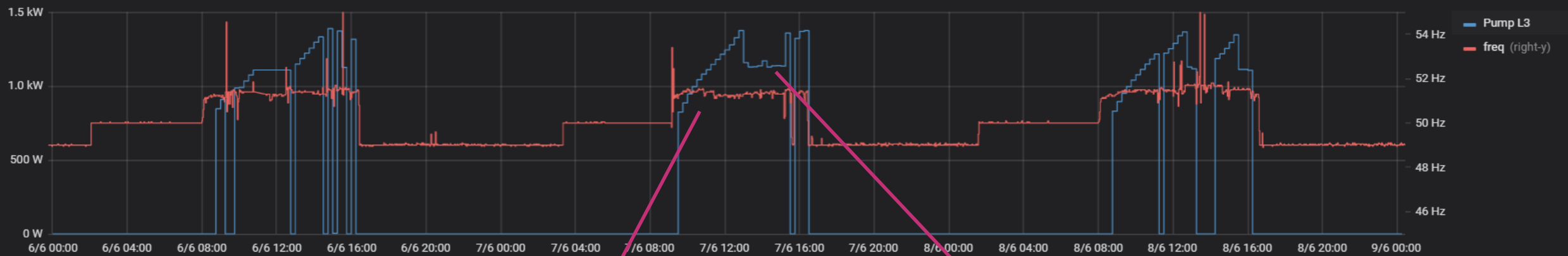
**Capacity:** 10 000 l

# Smart pump operation allows harvest of extra PV energy

Solar Generation and Battery SoC



Water Pump Power Consumption & Grid Frequency



Frequency control

Water tank is being filled





Thank you