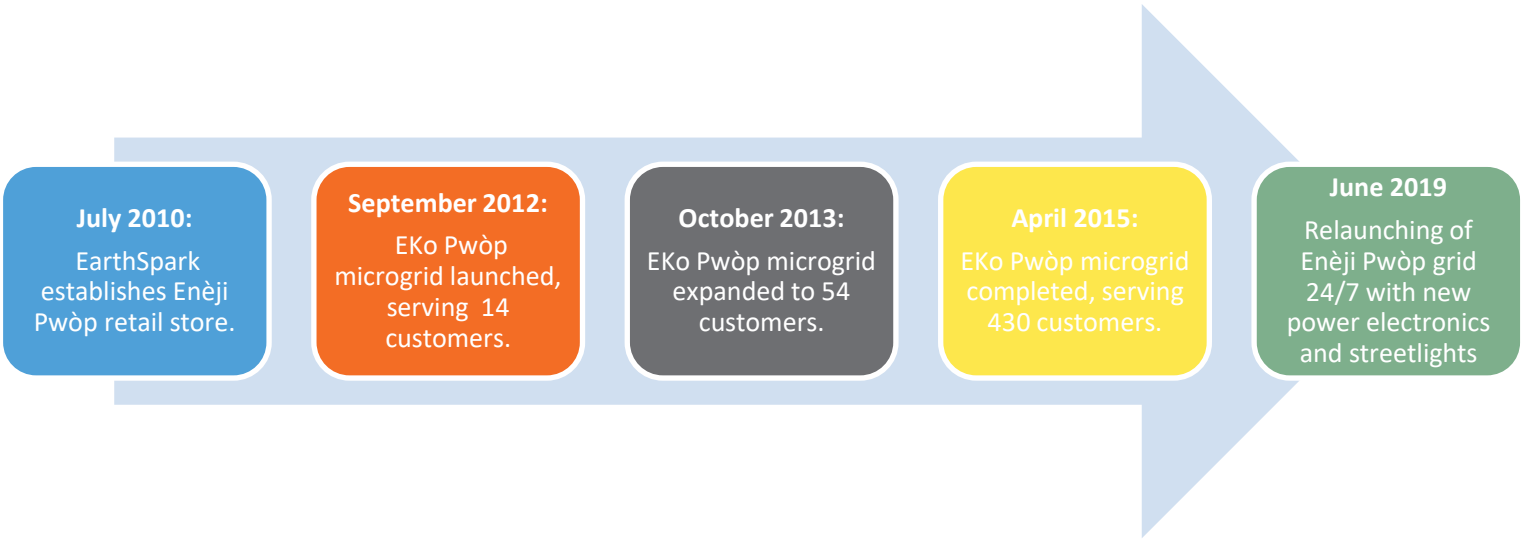
Les Anglais Microgrid Fact Sheet

In 2012, EarthSpark turned on a first-of-its-kind privately operated pre-pay microgrid in Les Anglais, Haiti, a small town that had never before had grid electricity. In 2015, EarthSpark had expanded the microgrid in Les Anglais to serve over 430 households and businesses (2,000+ people) with 24-hour electricity from a combination of solar, battery storage, and a diesel generator. This initial system also included tight consumption and load limits for customers because of issues with the generation system.

Following the devastation of Hurricane Matthew in October 2016, EarthSpark relaunched the Les Anglais microgrid in 2018. This newly relaunched grid continued to face service and reliability constraints due to issues with the generation system. This ultimately prompted EarthSpark to unveil a new battery and system setup for the Les Anglais microgrid (100 kw of solar + 208 kWh of storage) in June 2019 which enabled expanded 24/7 service.



Even with the departure of some anchor customers (they had invested in their own energy systems), total consumption greatly increased with the expanded 24-hour service, particularly amongst freezer customers. In fact, by the end of 2019, average monthly consumption by tariff level had increased 1.5x for the lowest customer tier (Limye), 2x for the next tier (TV), 2.3x for larger scale customers (Freezer), and 5x for the highest tier commercial customers (Gwo Bagay).

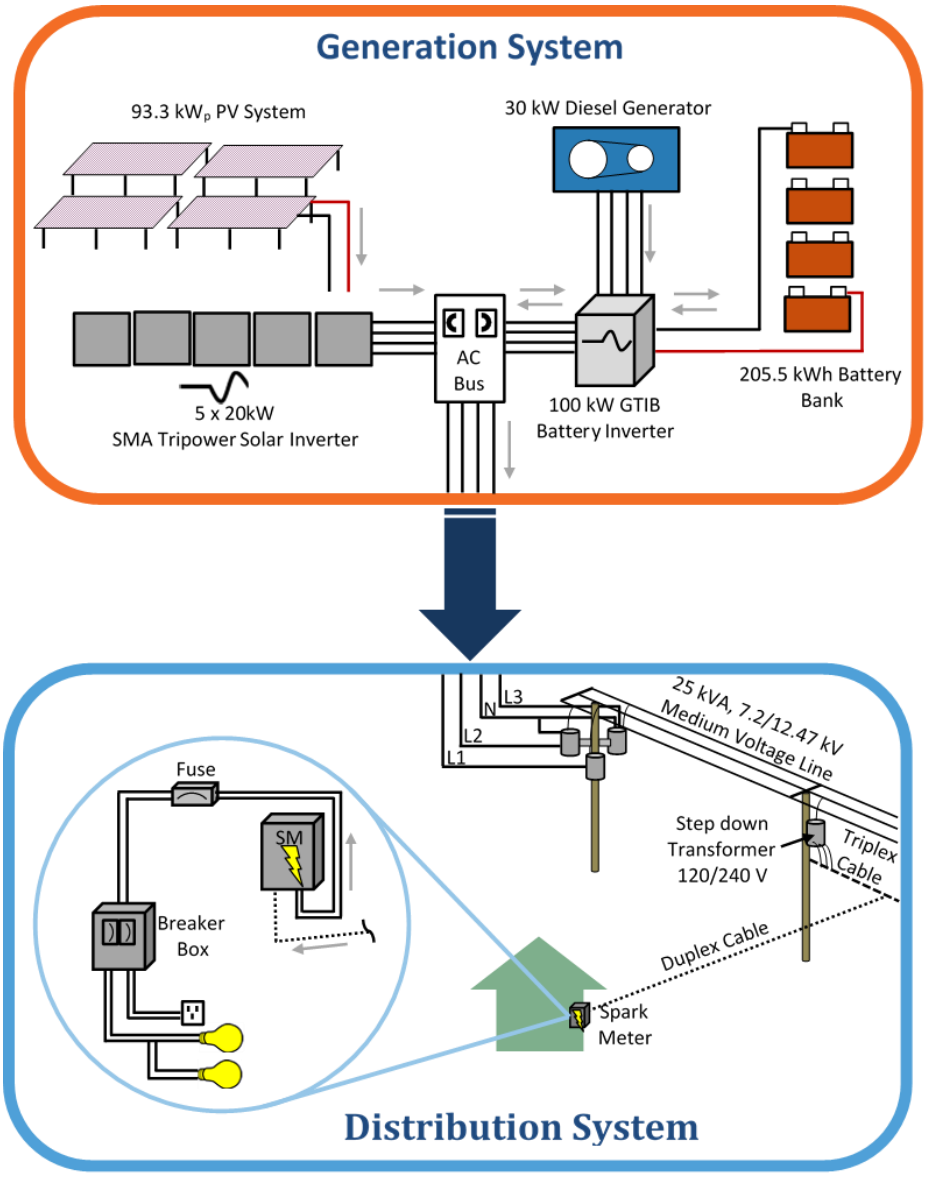
With the improved battery system, the Les Anglais microgrid also added 37 streetlights to its operations which supports improved safety and social activities in the community. It is also a key strategy of EarthSpark's Feminist Electrification Methodology which underpins all of EarthSpark operations and works to ensure that the opportunity and benefits of energy access are shared equally by everyone.

Currently the Les Anglais microgrid provides 24/7 energy access with over 98% reliability to over 450 households and businesses with a total monthly consumption of over 4,000 kWh. All of the Les Anglais customers are outfitted with smart meters which enable pre-pay energy transaction and importantly smart control and demand side management strategies including time-varying prices, dynamic power limits, and grid power analytics which EarthSpark is currently building upon to further improve service reliability and customer participation. This technology deployment is supported by strong

community engagement and participatory governance through the locally elected Energy Committee which continues to systematically support outreach, energy literacy, and community buy-in.

Generation/Distribution Overview

- **Nameplate Microgrid Capacity (power electronics):** 100 kW
- **Installed PV kWpeak Generation Capacity:** 93.3 kWp
- **Effective solar capacity:** 70 kW (best case, at noon)
- **Installed Diesel Generator:** 30 kVA
- **Peak demand:** 40 kW (not taking into account battery charging)
- **Nominal solar daily power generation:** 420 kWh (peak)
- **Voltage of the medium-voltage distribution system:** 7.2/12.47 kV
- **Voltage of the low-voltage distribution system:** 120/240 V (split phase)
- **Kilometers of distribution line:** ~1.3 KM medium voltage, ~4.5 KM low voltage



PV system specs:

Component	Description		
Solar Panels	Solar World 250 W polycrystalline	Solar World 260 W polycrystalline	Solar World 295 W monocrystalline
Solar panel model name	Sunmodule SW250 Poly	Sunmodule SW260 Poly	Sunmodule Plus SW295 Mono

Open Circuit Voltage (Voc)	37.6 V	38.4 V	40.0 V
Rated Voltage (Vmpp)	30.5 V	31.4 V	31.5 V
Short Circuit Current (Isc)	8.81 A	8.9 A	10.1 A
Rated Current (Impp)	8.27 A	8.37 A	9.45 A
Field Wiring	Cu. only. 14 AWG min. insulated for 90°C min.		
Total number of panels	239	61	60
Number of strings	20	5	5
Number of modules per string	12	12	12
String Voltage	366 Vmpp/451 Voc	377 Vmpp/461 Voc	378 Vmpp/480 Voc
String current (Isc)	8.81 A	8.9 A	10.1 A
Nominal system voltage	369.8 Vmpp/457.6 Voc		
Nominal system current	254.5 A (Impp) / 271.2 A (Isc)		
Panel area	1.6 m^2 each.		

Generator specs:

Component	Description
Make	Cummins
Model	C30D6
Power Rating	27 kW (MCR)
Serial number	|14|117765
Manufacturing Order Number	GD03B-1413748

Declared rating	ESP	PRP
Rated Power (KVA)	37.5	33.8
Rated Power (KW)	30.0	27.0
Rated Current (A)	45.1	40.6
Rated Voltage (V)	480	480
Rated Frequency (Hz)	60	60
Rated Power Factor	0.8	0.8

Battery bank specs:

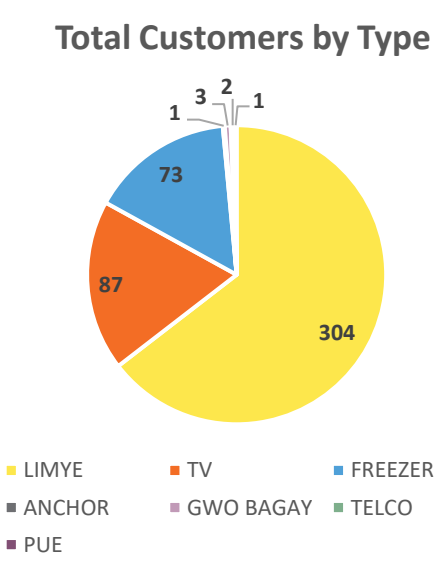
Component	Description		
Make	Samsung		
Model	22SIPs/ ELPM762-00007/E2-M076		
Type	NMC Lithium Ion		
Material	Aluminium		
Cell Voltage	4.15 V		
Module Voltage	80.96 (Nominal), 70.4 -91.3 (Operating)		
Dimensions (mm)	Length: 370	Width: 588	Height: 160
Weight (kg)	< 52.5		
Energy at 100-Hr rate	3.18 KWh per battery (205.5 kWh total, 164.4 kWh usable)		
Number of batteries	27		
Number of strings/number of batteries per string	3/9		

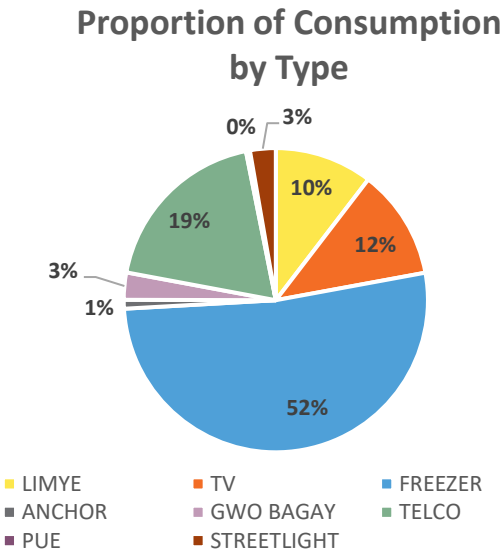
Voltage per string (V)	37.35

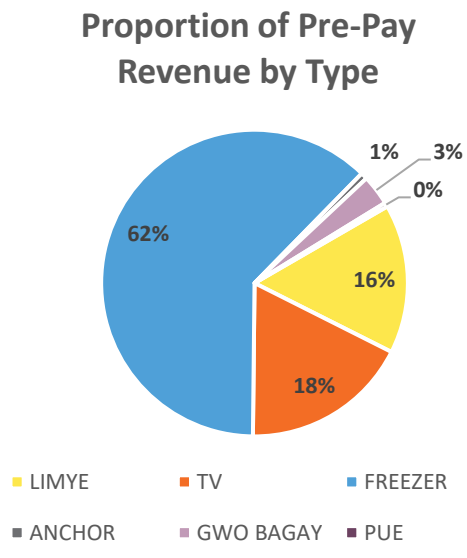
Customers and Grid Operations

Grid Operations are currently managed by EarthSpark's spin-off Enèji Pwòp, SA. Overview customer and operations metrics (July 2021) are presented below.

- **Number of connections:** 471 households and businesses
- **Number of streetlights**: 37
- **Average total energy consumption from all users:** average of 250 - 325 kWh/day
- **Average Service Availability (Grid up-time):** 90%
- **Average Monthly Sales:** 200,000 htg – 250,000 htg Pre-pay and an additional 80,000 from telecommunications post pay







*Load figures exclude electric cooking and consumption from Eneji Pwop operations so that the load and revenue figures align. There are additional sub-categories for customers (i.e. Limye plus, TV plus) which allow for some greater flexibility within tariff tiers, but they have been grouped here for clarity.

Class (Power Limit)	Rate (HTG/kWh)[1]	Number of connections	% of Total Consumption	Average monthly consumption per connection (in kWh)	Average number of transactions (Average monthly expenditure)
Lighting (30W)	40 – 60	304	10%	2.5	2.2 (115 htg/month)
TV (120W -360W)	40 – 60	87	12%	9.7	5.5 (475 htg/month)
Freezer (360-600W)	30-45	73	52%	51.3	12.5 (2000 htg/month)
Gwo Bagay (600-1000W)	25-54	4	3%	69.3	8.3 (2500 htg/month)
Anchor (1000-10,000W)	20-30	1	1%	67.6	8 (1000 htg/month)
Telco (No Limit)	Variable[2]	2	19%	Digicel: 900-950 / Natcom: 450-500	1 (Digicel: $540 Natcom: 38,000 htg
Streetlights (20W)	36	37	3%	5.3	N/A

[1] Range represents day to night tariffs. Daytime tariffs are lower and run from 8AM – 6PM. Nighttime tariffs are higher and run from 8AM – 6PM.

[2] Telco customers pay monthly or quarterly bills based on negotiated contracts. Currently Digicel pays quarterly at $0.58/kWh and Natcom pays monthly at 70 htg/kWh.