

Genset Market Overviews: ZE-Gen Prioritised Countries

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ZE-Gen.

Genset Market Overview

Introduction

- In the first stage of the project, a prioritisation calculator was used to rank all the countries in Sub-Saharan Africa (SSA) based on set criteria
 - From the ranking, a qualitative approach was then applied to select the top 10 prioritised countries. These qualitative factors considered diversity among the prioritised countries in terms of geography, size and use cases and deprioritised countries with severe conflict
- This next stage digs deeper into each of the top 10 prioritised countries: Angola, Cote d'Ivoire, the Democratic Republic of Congo (DRC), Ethiopia, Ghana, Senegal, South Africa (SA), Tanzania, Uganda and Zambia
- Across these 10 countries, some consistent insights have not been called out in each case, which should be considered throughout:
 - **Lack of affordability:** relatively low GDP per capita and unaffordability is a main barrier across all use cases
 - **Low grid reliance:** even the relatively more reliable grid still incurs up to four hours of outages a month
 - **Large market of FFGs:** Given low grid reliability, there is a sizeable market of FFGs
 - **Drivers for switching:** the main factor that drives consumers to consider switching away from FFGs is cost, which is primarily the ongoing costs of operating the FFG, i.e. fuel costs
- In addition, there are some cross-cutting interventions that apply to all countries, that should be considered:
 - **Targeted market research:** All countries will need deeper research to understand the FFG landscape including demand, use cases, and sizes
 - **Green Genset Facility:** Solar distributors across the countries analysed require financial support to increase their inventory capacity
 - **Subsidies:** The affordability of solar energy is a challenge in all the countries analysed, therefore requiring either supply- or demand-side subsidies to boost the uptake of solar generators

Genset Market Overview

Definition of Key Terms

Term	Meaning
CO ₂ emissions	<p>High: more than 20M metric tonnes</p> <p>Moderate: 10M to 20M metric tonnes</p> <p>Low: less than 10M metric tonnes</p>
Electrification rates	<p>High: countries with national electrification above 70%</p> <p>Moderate: between 45% to 70% national electrification</p> <p>Low: less than 45% national electrification rate</p>
Donors	Include development partners offering concessional loans, grants, technical assistance, and supporting solar adoption plans and policies
Genset players	Include solar suppliers and manufacturers that have solar inverters, ACs or generators in their offerings
Grid reliability	<p>Very unreliable: 8+ hours of power outages daily</p> <p>Moderately unreliable: <8 but >2 hours of power outages daily</p> <p>Somewhat unreliable: <=2 hours of power outages daily</p>
Purchasing power	<p>Low: GDP per capita of \$1K or less</p> <p>Moderate: GDP per capita between \$1k to \$5K</p> <p>High: GDP per capita greater than \$5K</p> <p>NB: Although some countries have high or moderate purchasing power, there are widespread income disparities across all the countries</p>
Solar players	Includes all solar suppliers and distributors regardless of whether they have genset products

Genset Market Overview

Prioritised Countries Summary (1/3)

Country	Electrification	Grid reliability	CO ₂ emissions	GDP / capita	FFG market value	Diesel price/litre
Angola	43%	Very Unreliable	~21M mt	\$3K	N/A	\$0.23
Cote d'Ivoire	75%	Somewhat Unreliable	~12M mt	\$2.5K	N/A	\$1.19
DRC	21%	Moderately Unreliable	~3M mt	\$654	\$46M	\$1.21
Ethiopia	54%	Somewhat Unreliable	~18M mt	\$1K	N/A	\$1.39
Ghana	86%	Moderately unreliable	~21M mt	\$2.2K	\$55M	\$0.99
Senegal	75%	Somewhat Unreliable	~14M mt	\$1.6K	N/A	\$1.25
South Africa	89%	Very unreliable	~446M mt	\$6.8K	\$113M	\$1.25
Tanzania	43%	Moderately unreliable	~13M Mt	\$1.2K	N/A	\$1.23
Uganda	45%	Somewhat Unreliable	~6M mt	\$ 964	N/A	\$1.34
Zambia	47%	Very unreliable	~8M mt	\$1.5K	\$14M	\$1.19

Genset Market Overview

Prioritised Countries Summary (2/3)

Country	Most common FFG size	Most common use case	No. of solar players	Donor engagement
Angola	75-375 kVA	Industrial	Low	Low
Cote d'Ivoire	5-75kVA	Agribusiness	Medium	High
DRC	15-75 kVA	Residential	Medium	High
Ethiopia	75-375 kVA	Industrial	Medium	High
Ghana	15- 75 kVA	Industrial	High	High
Senegal	75-375kVA	N/A	Medium	High
South Africa	15- 75 kVA	Telecom	High	Medium
Tanzania	5- 75 kVA	Residential	High	High
Uganda	5-75 kVA	Agriculture	High	High
Zambia	15-75 kVA	Residential	High	High

Genset Market Overview

Prioritised Countries Summary (3/3)

Country	Region	Country context	Fossil fuel genset market	Consumer insights	Solar gensets market	Other enabling factors
Angola	Southern Africa					
Cote d'Ivoire	West Africa					
DRC	East Africa					
Ethiopia	East Africa					
Ghana	West Africa					
Senegal	West Africa					
South Africa	Southern Africa					
Tanzania	East Africa					
Uganda	East Africa					
Zambia	Southern Africa					



Favorable/
impactful



Moderately
impactful / favorable



Less impactful
/ unfavorable



Country context and rationale for prioritisation



43%
Electrification²

Very unreliable
Grid reliability

~21M mt
CO₂ emissions⁴

\$3k
GDP/capita (2022)⁹

- Angola's **low level of electrification** combined with an **unreliable grid** results in the need for backup power sources, often from FFGs^{1,2}
- Angola's grid suffers from **major supply gaps**, with no interconnection between regions, resulting in the formation of "grid islands" leading to **regular power outages**³
- The government is **committed to increasing electrification to 60% by 2025**, although this will **not guarantee improved reliability**. As a result, the need for backup electricity will likely persist
- Angola is a high emitter, having ranked 3rd in SSA by CO₂ emissions in 2021; the high emissions are mostly from land use change from forestry to agriculture^{4,5}
- Its **relatively high GDP per capita** is primarily driven by a large oil & gas industry, which the government plans to keep pursuing.⁶ The country faces **significant inequality**, with close to half of the population living in poverty as of 2022^{*7,8}

Current fossil fuel genset market dynamics



N/A
FFG market value

\$0.23
Diesel price per litre (June 2024)¹⁶

- There is **limited information available on the size of the FFG market in Angola**. Most recent data (2019) estimated 600k+ FFG units countrywide, with the highest FFG installed capacity across SSA, **driven by the oil and gas sector**^{*10,11}
- The **government plans to remove all subsidies on petroleum products by 2025**, with the first change in June 2023 resulting in a near doubling of fuel prices, and the most recent hike of 48% in April 2024.^{12,13} However, they are still comparably low compared to other countries **possibly because of a large O&G industry**. This will likely **increase the operating costs of FFGs and incentivise consumers to adopt cleaner alternatives**
- **Foreign FFG suppliers partner with local distributors**, e.g., DESCO and NGRC, to distribute and to date, they have **not ventured into the solar space**.^{14,15} While these distributors could serve as channels for solar products, they often lack the capability or interest¹⁷

Consumer insights



75-375 kVA
Most common FFG capacity

Industrial
Most common use case

- Angola's FFG market is **driven by medium and larger FFGs**, with capacity of over 75kVA. The medium category (75-375 kVA) is driven by the retail and commercial segments with the larger use of generators driven by the **large industrial sector** (oil & gas, refinery, power generation, and agro-industry)¹⁸
- The Angolan market **requires the introduction of appropriate clean genset products** to replace medium and large FFGs, which are not currently available to firms and institutions
- Furthermore, the adoption of broader solar products in Angola **remains low** (with <3K units of OGS products sold in the second half of 2019). This is driven by **low demand and high acquisition costs**^{19,20}



Supply-side solar market dynamics

- Angola's solar genset market is still in its infancy. There are **currently no known solar genset players available in Angola**, although Bboxx, who have developed a solar genset product for households and small businesses are present via their distributor Greentech¹
- Some solar genset providers have cited the **inability to identify on-ground partners as a key barrier** to entry²
- There are therefore no genset products that cater to the industrial segment. However, there is an emerging C&I market in Angola with players such as MCA Group and Sun Africa working with the government to develop additional solar capacity, **with 310MW installed solar capacity in 2023 with a target of 1GW³**

LOW

No. of solar players

Genset key players*¹



Other market enabling factors

- Angola has seen a **limited number of donor projects** due to a combination of **complex bureaucratic processes, corruption, and a lack of transparency** as well as **poor infrastructure, logistical challenges, and security risks** limiting the scope and effectiveness of projects^{1,4}
- The few donor programs have been focused on **business development** and basic energy access via **solar lighting**
- The government has demonstrated its **commitment to increasing solar capacity** through the approval of guidelines for electrification in 2023, which aim to **establish a political and regulatory framework conducive to private sector engagement** in diversifying its energy mix, extending its grid connections and off-grid electrification initiatives for rural areas^{5,6}

LOW

Level of donor engagement

Key donors^{1,4}



Opportunities and considerations

Angola's market requires targeted research and support for the development of the larger C&I market:

- **Targeted market research:** Engage research organisations to conduct a deeper market study to gain a better understanding of the level of demand for FFGs and their use cases, and the extent of consumer education needed to displace them with cleaner alternatives
- **Enhance partnerships with C&I players to develop the larger solar genset market:** Engage C&I players such as MCA Group and Sun Africa to explore the support they require to continue to grow the market and develop products to displace FFGs.
- **Financing support for mini-grid developers:** Provide grants or low-cost financing to C&I developers to subsidise their development costs and encourage uptake
- **Government standards & policy capacity building:** Engage the government to incentivise the replacement of FFGs, e.g., via VAT waivers; train relevant government institutions on how to communicate incentives and encourage the development of the sector

Country context and rationale for prioritisation

75%
Electrification¹

Slightly
Unreliable
Grid reliability

~12M mt
CO₂ emissions⁵

\$2.5K
GDP/capita
(2022)⁵

- Côte d'Ivoire (CIV) has a high electrification rate, with 95% of urban areas electrified.¹ The government is committed to further increasing electrification with several solar and biomass power plant projects underway²
- Grid reliability has significantly improved since 2021, with outages reducing from 1-2 per week in 2021 to once or twice a month currently.³ However, the severity of these outages varies across the country with outages lasting between two to four hours in urban areas and up to a whole day in the more rural Northern region, leading to a greater need for FFGs in these areas³
- CIV is a moderate CO₂ emitter, ranking 10th in SSA in 2021, with large contributors including agriculture and electricity and heat generation, given that ~66% of grid electricity comes from fossil fuels^{4,5,6}
- The country has moderate GDP per capita and low poverty levels, with the 2023 poverty rate estimated at 10%, indicating relatively higher purchasing power compared to other analysed countries⁷

Current fossil fuel genset market dynamics

N/A
FFG market value

\$1.19
Diesel price per litre (June 2024)⁸

- There is minimal information on the size of the CIV FFG market. Stakeholder consultations suggest that there is limited need for FFGs in urban areas, with more reliance in the peri-urban areas and within the agro-processing sector³
- In 2023, the government announced plans to remove fossil fuel subsidies, but stakeholders indicated that these plans have yet to be implemented. Nonetheless, fuel prices have risen by 24% over two years, and high electricity costs (\$0.12 per kWh in 2023 compared to the average of \$0.09 in the ten assessed countries). This may drive a shift towards clean energy^{9,10,11}
- Given the previous poor grid reliability, there are a few established FFG distributors like Clarke Energy and Seco Power in CIV; however, there is no indication that any are supplying or positioned to supply solar products

Consumer insights

n/a
Most common FFG capacity

Agro-processing
Most common use case

- There is extremely limited secondary information on FFG use cases and common capacities in Côte d'Ivoire. However, according to stakeholder consultations, the most common FFG users are in peri-urban areas and within the agro-processing sector, which requires medium to large FFGs
- CIV is a leading global producer of cocoa and cashews, which requires reliable energy¹². Many processors invested in FFGs when the grid reliability was low and continue using them as a back-up source of electricity given the current outages can be up to a day in the areas where many of these companies are located³
- Solar adoption to replace these FFGs is generally low due to low awareness of the reliability and long-term cost savings, as well as high upfront costs^{3,13}

Supply-side solar market dynamics

- CIV's solar generator market is in its early stages, with few solar companies offering products. **WHC SOLAR** and **Aims Power** supply inverters up to 11 kW and **Sun King** and **Zimpertec** are also engaging partners to introduce solar inverters to the CIV market^{1,2}
- Although SHSs and some solar components are duty-free, **inverters and batteries incur import duties of 5% and 20% respectively, making them more expensive for consumers.**³
- 69% of solar companies identified access to finance as a constraint, **due to high interest rates and low availability of early-stage equity**⁴
- To address the financing gap, initiatives like the **Afrigreen Debt Impact Fund** have emerged, planning to invest in solar companies with **debt tenors of 8 to 10 years**^{3,5}. However, current initiatives are unlikely to meet the market's funding needs sufficiently

Medium

No. of solar players

Genset key players^{1,2}



Other market enabling factors

- Côte d'Ivoire has been politically stable since 2011, with significant **infrastructure development** and a **conductive business environment**. CIV has favourable macroeconomic conditions, with an **annual inflation rate of 3.6% as of April 2024** and a **3% currency depreciation vs the USD in the past year**, making it attractive for donor programmes and business operations⁶
- Several donor-funded projects, such as the **Africa Renewable Energy Fund**, **provide early-stage grant funding and equity investments for small-to-medium renewable energy projects**. Others offer **concessional loans, results-based financing, and technical assistance**, primarily for rural electrification solar projects
- The government is committed to achieving **42% renewable energy inclusion by 2030** through tax exemptions on solar home systems. However, **some solar products still incur up to 20% import duty and 18% VAT**. Additionally, **most government policies and financial incentives favour grid expansion and natural gas development**, hindering solar adoption³

High

Level of donor engagement

Key donors^{3,7,8}



Opportunities and considerations

The CIV solar market could benefit from:

- **Targeted Market Research:** Engage research organisations to conduct further assessments of the FFG market, focusing on the agro-processing sector, and gather more information on sizes, use cases, and how they could be displaced
- **Research on recycling options and grants to incentivise recycling companies:** Given the improved reliability of the grid in recent years, further research is required to explore the requirement and services currently being provided for recycling of FFG products, with the potential to provide grants to recycling companies
- **Partnership for Policy Advocacy:** Partner with the **APERCI*** to advocate for favourable policies, such as import duty and VAT exemptions for all solar products, and promote the adoption of quality standards
- **Targeted market sensitisation for ag players:** Awareness and willingness to adopt solar systems are low, highlighting the need for market sensitisation on the financial, reliability, and environmental benefits of solar to drive demand, particularly among agri-processors



Country context and rationale for prioritisation



21%
Electrification¹

Mod. unreliable
Grid reliability

~3M mt
CO₂ emissions⁷

\$654
GDP/capita (2022)⁹

- DRC faces **low electrification**, with the grid mainly **supplying power to urban areas** where electrification stands at 44%. These areas are fraught with **frequent power outages** and **reliance on FFGs**¹²
- The grid's unreliability primarily arises from **insufficient supply to meet rising demand** and the **inability of transformers to support load requirements in some urban areas**³. The grid heavily relies on hydroelectric power, mainly from the two Inga Dams, which are **vulnerable to droughts**
- Historically, these dams have been underutilised due to inadequate maintenance, but are now being restored to their full 1.8GW capacity, with plans to develop an **additional 4.4GW, one-third of which will contribute to the grid and the rest for copper mining and smelting operations**.^{4,5} Despite this, the supply will still fall short of the **per capita demand of 125 kWh** and will remain susceptible to drought⁶
- The DRC is a low CO₂ emitter, although **94% of the population are dependent on biomass as the main cooking fuel**.⁷ Substantial electricity demand gap and the rise of FFGs may increase CO₂ emissions in the coming years^{8,9}
- There is low purchasing in the DRC due to the country's low GDP per capita, with **nearly 60M people living in poverty**¹⁰

Current fossil fuel genset market dynamics



\$46M
FFG market value (2021)¹⁰

\$1.21
Diesel price per litre (June 2024)⁸

- DRC's revenue from the sale of **new FFGs (excl. O&M) at the distributor level is projected to grow at a 3.3% CAGR**, rising from \$46M in 2021 to \$62M by 2030, driven by the **growing urban population and increase in infrastructure development**, including telecoms and transportation¹¹
- Its **diesel prices (\$1.21 per litre)** are above average (\$1.13) of the ten countries assessed¹². This is due to the government's **removal of fossil fuel subsidies in 2015**, coupled with global fuel price increase, which may incentivise a switch to cleaner alternatives¹³
- We were **not able to identify any FFG distributors who also distribute solar gensets** and given the difference in the two products, it would be challenging to leverage the existing networks

Consumer insights



15-75 kVA
Most common FFG capacity

Residential
Most common use case

- There is a relatively large market for **small generators (15-75 kVA)**, driven primarily by residential usage, which accounts for ~35% of electricity consumption in the country. Demand for small generators is expected to grow at a **3.7% CAGR due to increasing urbanisation and pressure on the grid** which reduces its reliability¹¹
- The **industrial sector also contributes heavily to the FFG market**, primarily due to usage in mining and oil and gas production, **requiring much larger generators**¹¹
- There is currently low willingness and ability to purchase solar products due to **high upfront costs**, especially in the residential sector. However, **recent innovations in the solar industry and pricing models such as PAYG** lower upfront costs, which are expected to encourage some users to switch to solar solutions^{14,15}



Supply-side solar market dynamics

- The DRC's solar market is nascent but growing, offering products like solar lanterns, SHS, and mini-grids^{1,2}
- Anern has supplied **80 solar inverters** through a local energy company, while **BBOXX** plans to launch its solar gensets in a few months in the DRC. Also, **Sun King and Zimpertec** are securing distribution partners for their inverters^{3,4}
- The C&I market is well-established, with **Nuru** working on several large and mini-grid project
- However, solar players are hindered by high taxes (34% import duty and 16% VAT), inaccessible and costly funding from local financial institutions (interest rates above 25%), and inadequate local technical expertise in solar system maintenance^{1,5}

Medium

No. of solar players

Genset key players*^{1,3}



Other market enabling factors

- DRC faces **political instability, security concerns, limited infrastructure, high inflation** (avg. 20% in 2023), and a **significant currency depreciation** (~22% in 2023)⁶
- Despite challenging macroeconomic conditions, **DRC's donor programs and international investment is increasing** to address climate risks and leverage its natural resources, with a large opportunity for CO₂ abatement and a strong deforestation angle given the high use of biomass in cooking
- The World Bank has been supporting ARE and ANSA to **develop regulations to improve the enabling environment in DRC and increase participation of the private sector**¹
- In addition, various projects have been providing **concessional loans, grants, results-based financing, and technical assistance to increase solar affordability and supply**.¹ However, there have been **limited programmes focused on building local technical capacity**

High

Level of donor engagement

Key donors⁷⁻¹³



Opportunities and considerations

DRC has a large and growing off-grid market due to the unreliable grid electricity with a need for additional sources of financing and capacity building:

- **Targeted market research:** Conduct a market study to further understand FFG use cases; consider the use of smart metering to establish any unexplored use cases
- **Funding for genset distributors:** Introduce GGF into the DRC to support distributors with affordable working capital lines. Also, financial assistance could be provided to quality genset providers to enhance their marketing initiatives and educate the public on the appropriate usage of their solar systems and products
- **Policy and advocacy:** Partner with stakeholders to lobby for policy reforms that support zero-emission generators and the solar sector. GOGLA and BGFA have established a platform to discuss challenges in the solar sector and address key issues. A task force has been created to work on these matters and will soon be formally commissioned by the minister
- **Technical capacity building:** Provide technical capacity building for local technicians through partnerships with current solar suppliers, such as Bboxx and Sun King, to increase the capacity for maintenance of the available products and effectively utilise new systems



Country context and rationale for prioritisation

54%
Electrification¹

Somewhat Unreliable
Grid reliability

~18M mt
CO₂ emissions⁵

\$1k
GDP/capita (2022)⁹

- Ethiopia's electrification is relatively high, with an urban rate of 94% and a rural rate of 43% as of 2021.¹ However, the grid is somewhat unreliable with 80% of firms (based on a survey) experiencing 47.5 hours of total power outage in a typical month^{2,3}
- Despite the increase in generation from the construction of the Grand Ethiopia Renaissance Dam (GERD) and the Koyscha Hydro Power dam, the inefficient existing networks and insufficient investment into transmission and distribution networks remain a critical issue, creating a need for backup electricity^{4,5}
- Ethiopia is a moderate emitter and ranked 7th in SSA by CO₂ emissions in 2021; the country's emissions are mostly from agricultural practices^{6,7}
- As reflected in its low GDP per capita, 68% of Ethiopia's population lives in poverty which diminishes their purchasing power; Ethiopia, however, remains one of the fastest-growing economies in the region, having grown by 7.2% in FY 2022/23^{8,9}

Current fossil fuel genset market dynamics

N/A
FFG market value

\$1.39
Diesel price per litre (June 2024)¹¹

- There is limited information available on the size of the FFG market in Ethiopia. The most recent data from 2019 estimated Ethiopia's backup generator fleet to be 62k units, with an installed capacity of ~3GW.² It was estimated that this fleet consumes ~370 million litres of fuel per year translating to an annual fossil fuel spending of ~USD 500M at June 2024 prices^{2,11}
- The government started to gradually lift all fuel subsidies in July 2022 causing the prices of diesel and gasoline to more than double within a year.¹² The increased fossil fuel prices will make the cost of operating FFGs higher, potentially incentivising consumers to switch to cleaner alternatives
- Most local distributors only focus on FFGs. However, there is an opportunity to partner with players that are already distributing solar products e.g., Davis & Shirtliff Trading Ethiopia PLC, to promote solar gensets through their existing customer base

Consumer insights

75-375 kVA
Most common FFG capacity

Industrial
Most common use case

- The industrial sector, and more specifically agriculture, is among the largest users of FFGs in Ethiopia. This is largely due to the increasing industrial output, especially in food processing^{13,14}
- Medium sized FFGs are the most common in this sector, and will require C&I solutions for suitable replacement products
- There is also increasing utilisation of FFGs by growing domains such as telecom infrastructure and the commercial sector, which is expected to grow due to hotel expansions and a growing banking industry^{13,14}
- High initial investment costs leading to unaffordability, lack of local manufacturing, frequent failure, and lack of spare parts are the main reasons consumers are hesitant to take up clean energy product alternatives¹⁵



Supply-side solar market dynamics

- Several players have developed solar genset products in the market, although not all of them have launched these products in Ethiopia.¹ SunKing and Zimpertec do have solar genset products available via distributors and other suppliers, such as SolarRun and Azuri are yet to introduce their inverter products in Ethiopia^{1,2}
- The C&I segment in Ethiopia is also growing with several players like Lydetco and GridX Africa already operational. Industrial and agricultural sectors have the greatest potential for C&I systems³
- Solar suppliers and distributors grapple with lack of access and a high cost of raising working capital, and an unclear and inconsistently applied framework which encourages importation of subpar products. Industry associations too grapple with financial and technical limitations^{1,2,4}

Medium

No. of solar players

Genset key players*¹



Other market enabling factors

- The COVID 19 pandemic, a mounting debt burden and civil war adversely affected Ethiopia's economy, leading to currency devaluation and high inflation^{5,6,7}
- Despite this challenging macro environment, the Ethiopian government has been very strategic in forging key donor partnerships to drive growth of its solar market. Current donor programs in Ethiopia's solar sector entail market research, technical assistance and training, mostly for Productive Use of Energy (PUE) technologies²
- It continues to open its markets to foreign aid and investment, and to incentivise the solar sector through favorable tax policies to encourage local manufacturing and assembling^{8,9}

High

Level of donor engagement

Key donors²



Opportunities and considerations

The Ethiopian market has a high level of donor engagement, which can be leveraged to tap into existing networks and relationships to implement the following:

- **Financing for genset distributors:** Expanding the Green Genset Facility to Ethiopia would support distributors to access affordable working capital to get more products in the country
- **Targeted market research:** Engage research organisations to determine the opportunity in developing the larger industrial sector, e.g., C&I and mini-grids
- **Policy advocacy:** Partner with organisations like GOGLA who have a relationship with the government to lobby for better tax policies and quality control framework to enhance market attractiveness for new players
- **Product innovation:** Conduct a pilot to test and validate alternative solutions to FFGs in different ag value chains, considering the sector's significant contribution to emissions
- **Capacity building for industry associations:** initiate a capacity building and technical assistance program for solar industry groups and support organisations (e.g. ESEDA and ASEDA) to help address their financial and technical limitations



Country context and rationale for prioritisation

86%
Electrification¹

Mod. unreliable
Grid reliability

~21M mt
CO₂ emissions⁴

\$2.2K
GDP/capita (2022)⁶

- Ghana has a high electrification rate but low grid reliability, with power outages **averaging ~16 hours per week***, forcing businesses and households to rely on backup electricity. The situation is uncertain, as further consultations indicated that some areas occasionally experience **up to 12 hours of daily outages**¹²
- Although the country has a large surplus of installed capacity (5.6 GW vs 3.6 GW of peak hour demand), **lack of funds for maintenance of its gas thermal plants ultimately result in a deficit**, with the effects compounded by the **inefficient transmission infrastructure**.³ These issues are likely to persist without additional funding
- Ghana is a high CO₂ emitter, ranking 4th in SSA in 2021, with **electricity and heat generation as the third largest contributor**, emitting 6.5M tonnes average over a century^{4,5}
- The country has moderate purchasing power, as reflected in its GDP per capita, but poverty is widespread, with ~31% of the population living in poverty in 2023^{6,7}

Current fossil fuel genset market dynamics

\$55M
FFG market value(2021)⁸

\$0.99
Diesel price per litre (June 2024)¹¹

- Ghana's revenue from the sale of new FFGs (excl. O&M) at the distributor level is projected to grow at a 2.3% CAGR from \$55M in 2021 to \$67M by 2030, driven by frequent power outages, high electricity prices, and growing industrial sector⁸. Demand for backup electricity solutions in Ghana is linked to the seasonality of grid reliability, due to irregular gas supplies and low rainfall, with **recent increases due to ongoing power outages**⁹
- Ghana's fossil fuel subsidies were completely removed in early 2023, combined with global fuel price hikes led to a **43% increase in fuel prices over the past two years**.^{10,11} In addition, electricity prices are also high, with a **further 6% tariff increase announced for July 2024**.¹² These factors could encourage solar adoption
- Jubaili Bros, who distribute FFGs in Ghana, could **potentially widen their product base to include solar products as they have done in other SSA countries**

Consumer insights

15- 75 kVA
Most common FFG capacity

Industrial firms
Most common use case

- ~40%** of 2021 market value was from small FFG (15-75 kVA), due to high usage in residential apartments and commercial complexes, such as SMEs, retail stores, and telecom towers⁸
- Residential uptake of solar is still low due to **low public awareness, high upfront costs, and the perceived inability of solar solutions to power large equipment (e.g. fridges)**¹⁶. However, affordable pricing models, (e.g. PAYG) could encourage a switch to solar energy
- Also, the demand for **large FFGs (375.1-750 kVA) is growing**, due to the unreliable grid and the large industrial sector which grew at 7% in 2023, driven by power producers, miners, construction, and manufacturing firms^{3,15}
- The industrial adoption of solar systems has been slowed by the **high costs**, which require financing with high interest rates. Access to affordable financing solutions could increase the demand for these products from now on



Supply-side solar market dynamics

- **Dyson Energy** operates in Ghana, offering solar generators and inverters. Additionally, **Sun King** is preparing to introduce its solar generators in Ghana through its partners
- Some distributors such as Starsight Energy and Suka Solar provide products for the C&I segment
- Solar providers are hindered by inadequate and expensive local funding, with **interest rates of ~30%**.^{3,4} Also, insufficient technical expertise in operating and maintaining renewable energy technologies leads to **underutilisation and reliability concerns of solar systems, affecting demand**⁵
- There are various ongoing interventions addressing the funding gap, including Wangara Green Ventures' fund offering **concessional loans in local currency at 18% interest, repayable over 5-7 years**.⁶ However, more financial interventions are needed to service the entire market

High
No. of solar players



Other market enabling factors

- While Ghana remains politically stable, its business environment has been challenging since 2022, with the Cedi depreciating by **86% in two years** and inflation averaging **25% in 2024**.⁷ However, the **industrial and energy sectors have been less affected and are continuing to grow** due to the market's high potential⁸
- Ghana has numerous donor-funded projects **providing concessional loans, grants, and technical assistance** to make solar affordable and encourage adoption¹⁰⁻¹²
- **SEforAll** is advancing the government's renewable energy agenda by developing the GETP*, which outlines the path to universal energy access, net-zero emissions, and investment opportunities for global participation¹³
- To generate **10% of the country's energy from solar**, the government has initiated **import duty and VAT exemptions** on all solar components and **reduced import duty to 5% on pre-assembled SHS**.⁶ However, stakeholders indicated that the exemptions are applied inconsistently, causing uncertainty among solar players

High
Level of donor engagement



Opportunities and considerations

Ghana has a significant solar genset market that could benefit from supply and demand financing to increase affordability and capacity building to increase utilisation

- **Funding for genset distributors:** Ze-Gen could introduce GGF into Ghana to support distributors with affordable working capital lines. Also, financial assistance could be provided to quality genset providers to enhance their marketing initiatives and educate the public on the appropriate usage of their solar systems and products
- **Consumer financing mechanisms:** OCA will conduct consultations to explore suitable financing mechanisms for the market, such as subsidies, carbon credits, or low-interest loans
- **Technical Assistance:** Provide additional technical capacity building for technicians to enhance installation and aftercare services, addressing current inadequacies in technical expertise for operating and maintaining renewable energy technologies
- **Targeted market research:** Conduct a market study to further understand FFG use cases; consider the use of smart metering to establish any unexplored use cases



Country context and rationale for prioritisation



75%
Electrification¹

Somewhat Unreliable
Grid reliability

14M mt
CO₂ emissions²

\$1.6K
GDP/capita (2022)⁴

- Senegal has high access rates, with 97% electrification in urban areas; its electricity generation is dominated by heavy fuel oil, which provided 79% of the electricity supply in 2022¹
- In past years, the grid suffered frequent power shortages due to power supply challenges caused by rising consumption and high fuel prices; the government has invested in additional generation capacity and reinforcement of transmission lines to increase power supply. This has reduced the number of power interruptions, which now mostly result from planned works for the maintenance of installations¹
- Senegal is a high emitter and ranked among the top 10 emitters in SSA in 2021²; the agriculture and industry sectors drive the country's CO₂ emissions³
- Senegal is a lower-middle-income economy with moderately low purchasing power. In 2019, 57.3% of its population lived below the poverty line of \$ 3.20 per day, which was below the average of lower -middle-income countries in Africa^{4,5}

Current fossil fuel genset market dynamics



N/A
FFG market value

\$1.25
Diesel price per litre (June 2024)⁷

- There is very limited information on the size of the FFG market in Senegal highlighting a need for a deeper market study
- The Senegalese government removed all fuel subsidies in 2023, which increased fuel prices and consequently the operating costs of FFG. Solar alternatives may therefore be cheaper in the long run and could incentivise consumers to switch^{1,6}
- Despite there being established FFG distributors in Senegal, e.g., CFAO Equipment and Cummins West Africa, there is little indication that they supply or are keen on partnerships to distribute solar products⁸

Consumer insights



75-375 kVA
Most common FFG capacity

N/A
Most common use case

- There is very limited information on FFG use cases in Senegal, although the available information shows that those with a rating of 75-375 kVA are the most imported into the country⁹. This is likely driven by large industrial (mining and food processing), and emerging oil and gas sectors that require large amounts of energy¹⁰
- Some segments of the population have a negative perception of solar systems and there is a need to support the supply of good quality solar products to address this^{1,12}
- Uptake and awareness of PAYG is very high in Senegal, being the highest ranking West African country in the 2019 PAYGo Market Attractiveness Index¹³



Supply-side solar market dynamics

- **SunKing and Zimpertec's genset products** are currently available in Senegal via distributors; other companies with a local presence such as Bboxx have genset products but are yet to start supplying these products in Senegal¹
- Non-genset solar players in Senegal such as Oolu Solar and Baobab+ have established **partnerships with microfinance institutions** which have been a key driver in the uptake of off-grid solar solutions. Mobile money penetration is rising, making it easier to access financing. **Specialist debt providers and crowdfunding platforms** are also financing early stage companies²
- Mini-grids have also attracted a lot of investment, driven by a **supportive ecosystem** and their suitability for the country's **densely populated rural communities**; this reduces their reliance on FFGs³

Medium

No. of solar players

Genset key players*



Other market enabling factors

- An increasing public debt (>76% of GDP), tighter international financing conditions, and increased political instability in the region have made Senegal's macro-economic environment challenging. It however has **good prospects for recovery, driven by an emerging oil and gas industry**^{4,5}
- Senegal's solar sector has benefitted from a wide range of donor-driven programs, denoting a donor-friendly environment. The donor programs conducted in Senegal entail the **provision of technical assistance, grant funding, and policy and advocacy**
- The government is also committed to leveraging off-grid solutions in supporting its National Off-Grid Consultation Framework¹ and has granted **VAT exemption on solar PV and other renewable energy equipment**⁶

High

Level of donor engagement

Key donors¹



Opportunities and considerations

Senegal has a relatively reliable electricity supply compared to other countries, and most of its solar solutions are targeted at rural electrification. It could therefore benefit from:

- **Targeted market research:** Engage research organisations to conduct further assessment of the FFG market and to gather more information on size and use cases
- **Education campaigns on the benefits and reliability of solar systems:** Partner with industry associations such as the Business Council of Renewable Energy of Senegal (COPERES) to educate the populace on the benefits of standalone systems and their reliability besides the electric grid
- **Financing for genset suppliers and distributors:** Given the large numbers of suppliers in the country, expanding the Green Genset Facility to serve Senegal would give distributors access to affordable working capital to enable them to get more products into the country
- **Support microfinance institutions:** Engage microfinance institutions supporting the purchase of other solar products to determine how to strengthen their offering and encourage the uptake of genset products



Country context and rationale for prioritisation

89%
Electrification¹
Very Unreliable
Grid reliability
~446M mt
CO₂ emissions⁵
\$6.8k
GDP/capita
(2022)⁷

- Despite SA's high electrification rate, residents experience **daily power outages of up to 10 hours** creating a demand for FFGs from households and businesses^{1,2}
- The planned daily outages (load shedding) are due to a **severe supply shortage by *Eskom** resulting from the **ageing Komati coal-fired power plant infrastructure**.³ The situation significantly declined in 2019 with **no short-term solution, given Eskom's severe financial situation and growing debt burden, limiting the ability to fund new projects**. With an annual population growth rate of 2.5%, the demand for FFGs is expected to continue to grow^{3,4}
- SA is the highest CO₂ emitter in SSA, with about **55% of emissions from electricity and heat generation**, due to the coal-fired power stations that produce 80% of the country's electricity^{5,6}
- Despite a high GDP per capita, income inequality is substantial, with about **40% of the population living in poverty in 2023**, indicating that many residents have low purchasing power and may not be able to afford solar energy^{7,8}

Current fossil fuel genset market dynamics

\$113M
FFG market value (2021)⁹
\$1.25
Diesel price per litre (June 2024)¹¹

- SA's revenue from the sale of new FFGs (excl. O&M) at the distributor level is projected to grow from \$113M in 2021 to \$160M by 2030 (3.9% CAGR).⁹ It is estimated that as of 2019, there were 2.1 FFGs for every 100 South Africans, which could be replaced with clean alternatives¹⁰
- Although the government subsidises fuel significantly (~\$125 per capita in 2023**), fuel prices remain high, with diesel at **\$1.25 per litre compared to the \$1.13 average across the ten countries**. Additionally, the **~70% increase in unleaded petrol prices from 2020 to 2023** incentivises consumers to switch to alternative energy sources such as solar^{11,12}
- SA has an established and broad FFG market, with players like **Jubaili Bros distributing both FFG and solar products**, presenting an opportunity to market solar gensets to their customer base

Consumer insights

15-75 kVA
Most common FFG capacity
Telecom
Most common use case

- There is significant FFG demand from commercial, industrial and residential sectors¹³
- **Small generators (15-75 kVA)** used in homes, small commercial buildings and retail stores **account for ~40% of the market value**^{9,13}
- The **rapid growth in the telecoms sector** is also a key driver for the FFG market, predominantly using **medium-sized generators (76-375 kVA)**. This FFG category is **predicted to grow at 4.1% CAGR** driven by demand from commercial buildings, banks, data centres, telecom towers, and restaurants⁹
- **High initial solar product costs and reliability concerns** have remained a challenge for solar adoption in SA; however, **innovative financing models have emerged** to reduce the high upfront cost burden for smaller generators¹⁴
- Furthermore, the **demand for hybrid generators** is increasing due to their **reliability, affordability, and usability** across various sectors¹⁰



Supply-side solar market dynamics

- SA has an established solar genset market with players like ARTsolar and Sun King offering products directly to users. Its C&I market is also well-developed, with firms like Starsight Energy engaged in various mini-grid projects
- Industry associations, including SAPVIA*, offer subsidised capacity-building and training programmes to members, including installers to ensure compliance with safety standards provided by SANS**²
- There are limited funding opportunities for suppliers, hindering their ability to meet the growing demand³
- Some financial institutions offer consumer financing to increase solar adoption, with loan interest rates capped at 15% and repayment periods of 2 to 7 years. However, there is still significant impact potential, given the middle-income segment that have FFGs are unable to afford solar without additional financial assistance⁴

High
No. of solar players



Other market enabling factors

- South Africa's market is conducive for donor programs, given the well-established infrastructure, financial systems, and regulatory frameworks
- There are several projects in the solar space providing subsidies to make products more affordable for end customers and concessional finance for larger projects, especially in rural areas.^{4,5}
- The government offers various incentives to attract private solar companies such as 25% tax incentives for household rooftop solar installations and 125% tax incentives for business solar system investments^{6,7}

Medium
Level of donor engagement



Opportunities and considerations

South Africa's solar generator market is relatively established from supply, demand, and financing perspectives, with huge potential for carbon reduction:

- **Green Genset Facility:** Despite various financial and tax incentives, they mostly favour the wealthy. ZE-Gen could support distributors in implementing and marketing flexible payment models through peer learning and promote the adoption of carbon credits to reduce consumer costs.
- **Testing hybrid models for larger use cases:** Offer financial assistance to medium-sized FFG users, such as hospitals, schools, and telecom companies, to implement hybrid solar systems for testing their reliability and cost-effectiveness
- **R&D for large use case innovations:** Run R&D competition for solar innovators to introduce solutions that could effectively replace large FFGs, especially in urban areas
- **Targeted market research:** Conduct a market study to further understand FFG use cases; consider the use of smart metering to establish any unexplored use cases
- **Insights documentation:** Given the well-established SA solar market and its significant advancements, ZE-Gen could document insights on solar policies, industry association activities, financial and tax incentives, and other relevant factors to guide emerging solar markets in SSA

Country context and rationale for prioritisation



43%
Electrification¹

Mod. unreliable
Grid reliability

~13M mt
CO₂ emissions⁵

\$1.2K
GDP/capita (2022)⁷

- Tanzania's national electrification rate is low, with the grid supplying mainly urban areas, where the rate is **77%**¹. Since 2022, urban residents have experienced **occasional power outages lasting up to 6 hours and occurring twice per week**, relying on backup electricity²
- The grid's unreliability is due to a capacity decrease from **gas-powered plant maintenance** and **drought affecting hydroelectric capacity**, which accounts for 45% of the country's energy mix^{3,4}
- Grid expansion is a priority for the government** and TANESCO* plans to increase electricity capacity through various gas-powered, solar, and geothermal sources, **but reliability challenges may persist short-term due to rising demand**⁵
- Tanzania is a moderate CO₂ emitter, ranking 9th in SSA, with agriculture and transportation being the main contributors^{6,7}
- The country has moderate purchasing power, but widespread poverty persists, with **~45% of the population living in poverty in 2023**^{7,8}. This is due to a high rural population (about 64%) relying on subsistence farming and lacking access to quality health, sanitation, and educational infrastructures¹⁰

Current fossil fuel genset market dynamics



N/A
FFG market value

\$1.23
Diesel price per litre (June 2024)¹³

- Tanzania's FFG market value is currently **unavailable**. The country's off-grid diesel generator installed capacity was **5GW in 2022**, ~ 60% higher than the grid capacity(1.9 GW)^{11,12}
- The FFG demand is projected to grow at a **CAGR of 4.4% over the next five years**, driven by the demand for reliable power from households, small businesses, and the manufacturing sector¹³
- Tanzania has a relatively low fossil fuel subsidy (~\$8** per capita in 2023) and **high diesel prices (\$1.23) per litre** compared to the **\$1.13** average of all ten countries due to recent price hikes^{14,15,16}. This may encourage a switch to solar energy
- There is an opportunity to partner with companies such as Energy Masters Limited, which distributes FFGs and solar systems in Tanzania, and leverage their FFG customer base¹³

Consumer insights



5-75 kVA
Most common FFG capacity

Residential
Most common use case

- There is **limited tangible data on FFG use cases in Tanzania due to the unavailability of market value data**. However, available data indicate significant demand for **small generators** (5 kVA to 75 kVA) in residential areas, small businesses, and the healthcare industry. This demand is expected to rise with rapid urbanisation¹³
- Similarly, demand for **medium generators** (75.1 kVA to 375 kVA) is increasing, driven by their use in commercial complexes and industrial operations¹³
- Despite income disparities in Tanzania, there is a high willingness to purchase solar products, reflected in the 75% score on the 2021 MAI. This is influenced by a **favourable business and macroeconomic environment, tax exemptions on solar products, and the availability of PAYG pricing**, making these products more affordable^{17,18}

Supply-side solar market dynamics

- Tanzania's solar generator market is rapidly growing despite being in its early stages. Companies like **Ensol, Sun King, and Lento** supply solar generators directly to homes and small businesses, while **Zimpertec** distributes its products through local partners
- The C&I market is also established, with players such as Starsight Energy and NextGen Solawazi Limited working on various off-grid projects through donors
- Despite its high potential, the market faces several challenges. These include **inadequate domestic financial facilities**, with providers relying on donors and international organisations for funding, and **the lack of technical skills** which makes it difficult for suppliers to identify installation technicians, leading to poor after-sales services and underutilisation of solar technologies

High

No. of solar players

Key players^{1,2}



Other market-enabling factors

- Tanzania is conducive for donor programs and businesses to thrive due to its stable political environment, developing road infrastructures, and efficient financial system, with a relatively **low interest rate averaging 13% over the last year and a currency depreciation of 10% against the USD⁶**
- The country has several donor-funded projects offering **grants, result-based financing, and concessional loans** to provide off-grid solar energy in rural and peri-urban areas, including Shinyanga and Kishapu. These initiatives aim to increase energy access and reduce dependence on hydropower, which is vulnerable to irregular rain patterns^{4,7,8}
- Although the government has introduced VAT and import duty exemptions on main solar components, including panels, batteries, and inverters, these are **inconsistently applied, making it difficult for smaller providers to benefit⁹**
- Additionally, some financial institutions, including TAMFI*, CRDB Bank, and other commercial banks, offer solar financing with favourable payment tenors. However, it is unclear whether the interest rates are concessional^{10,11}

High

Level of donor engagement

Key donors^{4,7,8}



Opportunities and considerations

Although the exact size of Tanzania's FFG market is unknown, its growing solar market could benefit from subsidies to increase affordability and capacity-building

- **Further Research:** Due to the low availability of data on the FFG market, further research is needed on use cases and key sectors for the ZE-Gen replacement program
- **Partnerships:** With an established solar market and significant donor programs, ZE-Gen could collaborate with donors like AFD, SNV, and AfDA to offer concessional funds to solar genset players like Sun King and Ensol to promote supply and affordability
- **Policy Advocacy:** Work with the government to strengthen VAT and import duty exemptions, to provide clarity to smaller companies. ZE-Gen could also work with TREA** for further policy advocacy
- **Technical Assistance:** Collaborate with established solar players like Sun King and accelerators like ClimAccelerator to build capacity and technical know-how of more distributors and installers, to address the after-sale challenges and underutilisation.



Country context and rationale for prioritisation

45%
Electrification¹

Somewhat
Unreliable
Grid reliability

~7M mt
CO₂ emissions¹

\$ 964
GDP/capita
(2022)⁵

- Uganda has moderate electrification rates with the grid predominantly supplying the urban areas, where the access rate is 72%.² Despite having an electricity generation surplus*, Uganda experiences, on average, 14 planned power outages per month, mainly due to ageing infrastructure, electricity thefts, and vandalism of transmission and distribution infrastructure.^{3,4,5} Outages in the central region last 30 minutes to one hour on average⁶
- The government is investing in last mile connectivity policy and is providing free electricity connections which has helped to enhance access in rural areas; it is also targeting universal electricity access by 2030 via both on and off-grid electrification^{7,8}
- Uganda ranked 18th in SSA by CO₂ emissions in 2021, which is comparably lower than for other countries, and mostly driven by the agriculture sector^{9,10}
- Widespread poverty in Uganda lowers the country's purchasing power as shown in its low GDP per capita; 30% of Ugandans lived below the poverty line in 2019/2020^{11,12}

Current fossil fuel genset market dynamics

N/A
FFG market value

\$ 1.34
Diesel price per litre (June 2024)¹⁵

- There is limited information available about the current size of the Uganda FFG market, although it is expected to grow at a rate of 3.9% between 2024 and 2030, driven by a rapidly growing population and rising urbanisation rates despite low electrification rates¹³
- The government of Uganda does not subsidise fuel which makes diesel expensive compared to other countries, and the highest among the countries under review¹⁴
- Most local distributors, e.g., Mantrac Group, solely focus on FFGs. However, there is an opportunity to partner with players that are already distributing solar products such as Jubaili Bros, to promote solar gensets through their existing customer base

Consumer insights

5-75 kVA
Most common FFG capacity

Agri-culture
Most common use case

- Although there is very limited information on FFG use cases in Uganda, FFG usage in the country seems to be driven by the agricultural, hospitality, and manufacturing sectors which require reliable power for efficient operations so FFGs provide an ideal solution for their needs¹³
- The industrial sector is also a key user of FFGs in Uganda which is rapidly growing. This sector requires larger FFGs (75kVA+) and will require a larger solar solution to replace¹³
- Consumers are hesitant to take up alternatives due to a lack of awareness, fear of unreliability, and inability to pay for the high upfront costs for solar products^{16,17}



Supply-side solar market dynamics

- The solar genset market in Uganda is still nascent. **Several players with operations in Uganda have developed inverter solutions**, among them Azuri, D.Light, Jubaili Bros Solar, and SunKing. SunKing has already introduced its inverter product in Uganda¹
- The C&I segment is also growing with several players e.g., **OFGEN and Solar Now** developing systems for segments such as schools, agricultural facilities, hotels, office buildings, and malls²
- Ugandan solar suppliers and distributors face barriers to scale, e.g., **working capital and liquidity challenges, capacity and skills gaps, and little business development support**. Suppliers also grapple with **unfavorable taxation policy**³

High
No. of solar players



Other market enabling factors

- **High levels of corruption, increasing political repression, and rising global energy prices** have adversely affected the economy, driving up inflation and currency depreciation^{4,5} However, it has **demonstrated resilience** due to robust key sectors, i.e., agriculture, industry, and services.
- Despite government efforts to incentivise the solar sector, tax waivers are applied only to some solar product categories, e.g., panels and DC powered mills³
- **The Ugandan solar sector has benefitted from a wide range of donor programs** seeking to address market barriers and policy challenges; however, the recent passing of an anti-homosexuality law has led to donors like the World Bank freezing any new funding⁷
- These programs entail **technical assistance, capacity building, and access to finance** for both **solar players and financial institutions** to develop the ecosystem⁸

High
Level of donor engagement



Opportunities and considerations

The Ugandan market requires support for suppliers and distributors, targeted research and policy and advocacy for more favourable tax regimes:

- **Support for suppliers and distributors to introduce clean genset products in country:** Provide financial support to regional suppliers, e.g., Azuri and D.Light to competitively introduce their products in Uganda; Provide distributors with financial support and capacity building to take on genset products from suppliers and train installers
- **Targeted market research:** Engage research organisations to conduct a deeper market study to gain a better understanding of the use cases of generators and how they could be displaced with cleaner alternatives
- **Policy and advocacy on taxation:** Partner with the Uganda Solar Energy Association (USEA) and other associations to lobby for favourable tax regimes for solar products
- **Partner with C&I players for industrial solutions:** Engage C&I players such as OFGEN to develop products that cater to the growing industrial sector in Uganda



Country context and rationale for prioritisation



47%
Electrification¹

Very unreliable
Grid reliability

~8M mt
CO₂ emissions⁵

\$1.5K
GDP/capita
(2022)⁸

- Zambia has **high electricity access rate** in urban areas at 86% in 2021 but the country's **grid remains very unreliable**.¹ Load shedding by the Zambia Electricity Supply Corporation (ZESCO) has resulted in **8-12 hours of power outages daily**, forcing consumers to depend on back-up sources^{2,3}
- 85% of Zambia's electricity mix is derived from hydropower which has been **susceptible to irregular rainfall patterns** since 2022. It is unlikely that ZESCO will invest in more generation or stabilisation of the grid due to inadequate resources, political interference and corruption^{3,4}
- Zambia has low CO₂ emissions, ranking 14th in SSA in 2021, largely driven by land use change and forestry degradation⁶. An increase in FFGs due to the grid unreliability could increase the emissions
- **60% of Zambians lived in poverty in 2022**, an increase from 54% in 2015.⁷ This explains Zambia's **moderately low purchasing power** as shown in its low GDP per capita⁸

Current fossil fuel genset market dynamics



\$14M
FFG market value (2021)^{8,9}

\$ 1.19
Diesel price per litre (June 2024)¹⁴

- Zambia's revenue from the sale of new FFGs (excl. O&M) at the distributor level is expected to grow at a CAGR of 4.9% from **\$14M to \$21M+ by 2030**; besides grid unreliability, **increasing commercial and residential construction and infrastructural developments** is fuelling the demand for standalone and backup power sources^{9,10}
- The Zambian government **removed all direct fossil fuel subsidies and restored taxes on fuel in September 2022**, resulting in a 58.7% increase in price for petrol and 39% for diesel.¹¹ This led to **higher operating costs** among those who depend on fossil fuels for energy.^{12,13} Clean energy gensets may therefore be cheaper in the long term, incentivising consumers to switch
- Although most FFG distributors **focus solely on FFGs**, there is an **opportunity to partner with players already distributing solar products** like Timbuktu-Zambia, to promote alternative solutions through their customer base which includes large clients in the telecoms, O&G and mining industry¹⁵

Consumer insights



15-75 kVA
Most common FFG capacity

Residential
Most common use case

- There is a **high demand for small gensets (15-75kVA rating)** in Zambia which **account for more than 40% of sales**, driven by residential buildings, retail stores, hospitals, offices and hotels⁹
- The growing FFG sector is also driven by the large mining sector, the industrial sector (construction, and manufacturing) and a rapidly evolving telecom industry which rely all on **larger gensets (375-750kVA)**^{9,10}
- **Low consumer awareness** of the potential benefits of clean energy technologies and **low purchasing power** coupled with **limited access to consumer financing options** hinder the switch to clean power generation alternatives¹⁶

Supply-side solar market dynamics

- SunKing and BioLite currently supply inverter products in Zambia. Zimpertec is also in the process of designing a partnership to launch its products
- Several training institutions and accelerators, e.g., the Pumulani Renewable Energy Centre provide training and capacity-building support for technicians and entrepreneurs dealing in solar products; the solar Industry Association Zambia (SIAZ) works with the government to develop policies that promote the sector¹
- Solar suppliers grapple with low consumers' ability to pay, and inconsistency in the application of import tariffs and exemptions. Both suppliers and distributors struggle with lack of affordable working capital^{2,3}
- A few C&I players exist, among them MBHE Zambia, a subsidiary of MBHE Group, South Africa⁴

High

Level of solar players

Genset key players

ZIMPERTEC

BioLite

sun king.
from Greenlight Planet

Other market enabling factors

- 70% of Zambia's export revenues are derived from copper mining. Low mining output, unstable copper prices, increased domestic government borrowing, and unsustainable external debt have therefore made its macro-environment very challenging^{1,5,6}
- Despite the adverse economic environment, the Zambian government has continued to encourage the solar sector via tax benefits such as import duty exemptions on solar batteries and inverters, and most recently results-based incentives for mini-grid developers in partnership with the Rockefeller Foundation, GEAPP and SEforALL^{7,8}
- The government also has forged key partnerships with development partners and donors who have been very instrumental in the development of the solar sector; current donor support ranges from technical assistance and funding, to policy support and credit guarantees¹

High

Level of donor engagement

Key donors

Foreign, Commonwealth & Development Office

Sida

giz



MINISTRY OF FOREIGN AFFAIRS OF DENMARK



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Opportunities and considerations

Zambia is a high-potential market, especially in the short term, given the severe load-shedding situation. The market therefore needs:

- **Innovative consumer financing models:** To enhance ability to pay, it is critical to explore flexible payment models. There is also an opportunity to promote carbon credits and the possibility of encouraging government subsidies to increase uptake
- **Financing for genset suppliers and distributors:** Suppliers requested for working capital for their distributors. Extending GGF may help them access affordable working capital lines.
- **Grant funding to encourage new market entry:** Grant funding for suppliers would encourage market entry and increase supply of products to address the current loadshedding situation
- **Targeted market research:** Conduct a market study to further understand FFG use cases, including focusing on opportunities for replacement in the large mining sector
- **Product innovation:** Engage mining companies to validate and test solutions that can replace or reduce FFG usage in this sector. The pilot could be used as a consumer awareness campaign to showcase the reliability and cost effectiveness of the solutions

Report Glossary

Term	Meaning
AfDB:	African Development Bank
BGFA	(Beyond the Grid Fund for Africa): offers incentives, technical assistance, and capacity building for solar providers in Uganda, DRC, and Zambia
C&I	Commercial and Industrial
EDB	(Ease of Doing Business) Index: published by the World Bank to measure the ease of starting and operating a business in a country
FCDO	Foreign, Commonwealth & Development Office
FFGs	(Fossil Fuel Generator Sets): gensets powered by fossil fuels used for electricity generation during power outages
GDP per capita	A country's gross domestic products divided by its population over a specified period
GEAPP	Global Energy Alliance for People and Planet
GOGLA	Global Off-Grid Lighting Association
kVA	(Kilovolt-Amperes) A measure of total power in an electrical circuit
MIA	Market Attractiveness Index (for PAYG models for Solar systems)
MW	(Megawatt) 1,000 kilowatts of electricity generated per hour
PAYG	Pay As You Go
SEforAll	Sustainable Energy for All
SHS	Solar Home Systems
SSA	Sub-Saharan Africa
USD	United States Dollar