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Acronyms and Abbreviations

AA	Action Agenda
EPC	Electric pressure cooker
ESAG	Energy Sector Advisory Group
IP	Investment Prospectus
LPG	Liquid Petroleum Gas
MECS	Modern Energy Services
MoE	Ministry of Energy
SE4LL	Sustainable Energy For All
7NDP	Seventh National Development Plan

Definitions of terms

- **Clean cookstove:** Any type of cookstove is considered “clean” if its emissions meet WHO Guidelines. Currently available options that are clean at point-of-use include electricity, gas, ethanol, solar, and the highest performing biomass stoves¹. The cookstove options mentioned here are all included in the Zambian context.
- An **improved biomass cookstove (ICS)** typically describes a stove with higher efficiency or lower emissions than a traditional stove, but can include a wide range of performance
- **MECS clean cookstove options** include electricity and gas

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¹ POLICY BRIEF #2: Achieving Universal Access to Clean and Modern Cooking Fuels and Technologies

Executive Summary

This report summarises the findings of an **updated review of national policy and the market for clean cooking and electricity in Zambia**, with the aim of facilitating and accelerating the transition from biomass to electric cooking, eCook. It is part of a broader programme of work, designed to identify and investigate the opportunities and challenges that await in high impact markets such as Zambia.

Most recently, more international partners have joined the clean cooking campaign and are advocating for cookstoves of higher tiers starting from Tier 3, focusing on electricity, LPG and biofuels. The increase of stakeholders in the clean cooking realm has helped to re-establish important agencies such as the MoE's Energy Sector Advisory Group which are inclusive of key decision makers. The increased interest in clean cooking coinciding with the clean energy agenda provides an opportunity to change the narrative at top-down level for accelerated impact on the population.

Nonetheless there continue to be barriers in the clean cooking sector, particularly when it comes to addressing past issues such as poor grid connectivity, while at the same time proposing an ideal fuel mix for Zambia. For example, to date, there have been few clean cooking projects looking at electric cooking, as ZESCO are actively encouraging their users to switch to LPG in an attempt to reduce the loading on the grid and prevent further load shedding. Grid electricity is managed by a single state-owned company, ZESCO, and generation is almost entirely from hydroelectric sources. In recent years, late or inadequate rainfall has forced ZESCO to implement load shedding to balance demand with supply. ZESCO has a Demand Side Management department, who have shown a keen interest in the eCook concept and this study has confirmed that there is a strong market for eCook products and services in Zambia, however there are a number of regulatory challenges that need to be addressed.

Zambia has a huge off-grid population and emerging mini-grid and solar markets, primarily focused on lighting solutions. However, LPG is a fuel that consumers are not accustomed to meaning the 60% modern fuel target [with LPG as the majority percentage] a steep uphill climb. Moreover, due to the preceding electrification issues, overtime resource management has not run in parallel with cooking technologies- leading to lack of awareness of energy-efficient cooking devices, which could reduce cooking load on the grid, and allow consumers to cook in a cost-effective manner.

In rural areas, firewood is the most widely used fuel for cooking, whilst in urban areas, most households fuel stack charcoal and electricity, depending on which foods they are cooking and whether there are blackouts at mealtimes or not. Zambia has seen a range of clean cooking initiatives, the majority focused on improved biomass stoves. Zambia's most popular stove, the mbaula, is extremely inefficient, as it is entirely constructed from metal, with no insulation to focus the heat onto the pot.

There continues to be a barricade between modern energy interpreted as electricity and clean cooking, to which both must strongly associate with the other to attain government targets. Clean cooking crosscuts into various sectors of development agendas, such as gender, environment, health and energy; yet it lives in the shadows of government policies. The findings from this national policy and markets review will be combined with those from the other activities that have been carried under the eCook Zambia Market Assessment. Together they will build a more complete picture of the opportunities and challenges that await this emerging concept. Further outputs will be available from <https://elstove.com/innovate-reports/> and www.mecs.org.uk.

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Introduction

This report presents one part of the detailed in-country research carried out to explore the market for eCook in Zambia. In particular, this in-country work aims to gain much greater insight into culturally distinct cooking practices and explore how compatible they are electric cooking. The report is rich with detail and is intended to provide decision makers, practitioners and researchers with new knowledge and evidence.

This report is for the Modern Energy Cooking Services (MECS) programme, and it builds on an earlier, preliminary policy report supported by the Innovate UK funding (<https://elstove.com/innovate-reports/>). The earlier report was focused on battery-supported electric cooking solutions as an alternative to biomass use. Since then, the focus of the MECS programme has evolved to take a more holistic view of the role of electricity in clean cooking transitions. Consequently, this document is more concerned with grid-connected domestic customers, and with developments in electricity sector reform, both national grid and off-grid. The earlier version presented findings from focus groups but this current report is based on prolonged engagement with the energy sector and field experience relating to electric cooking from 2019 and continuing at the time of writing (Jan 2022).

1.1 Background

In 2017, Centre for Energy, Environment and Engineering Zambia (CEEEZ) in partnership with a research consortium (Gamos Ltd., University of Surrey and Loughborough University) undertook a study to investigate a potentially transformative battery electric cooker (eCook), designed to extend access to electricity and clean cooking facilities for poorer households.

In 2021, in partnership as a Southern Africa partner to the Modern Energy Cooking Services (MECS) programme, CEEEZ undertook a review of the eCook policy to update it with the recent activities since the first report². MECS Programme is a five-year initiative funded by UK Aid of the Foreign, Commonwealth and Development Office (FCDO) and led by Loughborough University and the World Bank's Energy Sector Management Assistance Program (ESMAP). The MECS Programme aims to accelerate the global transition from traditional biomass-based cooking to modern-energy cooking solutions which include electricity (from grid and off-grid sources), liquid petroleum gas (LPG), among others. Therefore, review of the 2019 report investigates the barriers and opportunities to scale up use of clean modern energy cooking services such as the use of LPG for cooking and heating on one hand. On the other hand, it investigates the possibility of using efficient electric cooking appliances like the electric pressure cooker and hot plates in households with access to electricity and also investigate the opportunity of using other cleaner fuels like biogas for cooking.

1.2 Aim

The aim of this study is to update the information based on new findings of actions/activities that have taken place since the first report was published in 2019.

The objectives are twofold:

- To review the current regulatory framework in Zambia and assess which policies are likely to accelerate the uptake of the eCook concept and which may present significant barriers.

² Leary, J. et al (2019) eCook Zambia Cooking Diaries. MECS Project Working Paper.

- To assess the state of the existing clean cooking and grid/mini-grid/off-grid electrification markets, which may provide the foundation for future eCook products/services.

1.3 Methodology

A framework for the initial policy/markets analysis was developed by Gamos, Loughborough University and the University of Surrey, focusing on the following key areas:

- Clean cooking (health, deforestation, climate change, fuel/stove markets, etc.)
- Electrification (renewable energy, energy-efficiency, grid/mini-grid/off-grid markets etc.)
- Cross-cutting issues (gender, business environment, demographics, etc.)

The elements of the framework were based upon the factors that are most likely to affect the uptake of eCook products/services and the size of key market segments. These factors were first identified by Brown & Sumanik-Leary (2015), then further extended and contextualised by Leary et al. (2018).

It is for this reason that CEEZ have embarked on updating the 2019 report by undertaking further research, analysis, and reporting on activities in the clean cooking space through consultations, review of various literature available online, documents by stakeholders or from our archives.

Results

2.1 Clean cooking

2.1.1 What is the state of the clean cooking sector?

The Government of Zambia through the Ministry of Energy with support from the World Bank started developing a clean cooking program that aimed at contributing towards the achievement of the 2030 SE4ALL target of ensuring universal access to modern energy services. The program sought to promote efficient and clean cooking options. A consultation workshop called Zambia Clean Cooking Program³ took place in June 2019 with the objective of providing a platform for stakeholders to discuss viable options, share information, ideas and experiences in order to shape the country's program. However, this program only reached the consultation phase and was discontinued⁴.

Various activities in the clean cooking sector have however continued to take place and are being implemented by Cooperating Partners (CPs) through programs such as Alternatives to Charcoal (A2C) (USAID), Beyond the Grid Fund Africa⁵ (SIDA/NEFCO); UNDP/GEF⁶ and other private sector actors. The World Bank returned to the clean cooking sector in Zambia in 2021, partnering with the Ministry of Energy on the Modernising Cooking and Heating in Zambia (MCHZ) Programme.

In December 2021, the Ministry of Energy, working together with the USAID's Alternatives to Charcoal (A2C), project hosted a workshop which saw the relaunch of the Energy Sector Advisory Group (ESAG), an umbrella body which oversees five subgroups including Petroleum, Electricity, Renewable Energy, Clean Cooking and Cross-cutting issues. The group had previously been in existence until 2016. At the relaunch, the A2C project made a presentation on

³ <https://www.gprba.org/activities/zambia-clean-cooking-program>

⁴ Information to be verified by MoE

⁵ <https://beyondthegrid.africa/news/sweden-and-nefco-kick-off-new-initiative-on-clean-cooking-financing-solutions/>

⁶ <https://undpinzambia.exposure.co/58f1d6045cafe5b947f8f204cc9989b1>

behalf of the international partners that are operating in the clean cooking space in Zambia, among whom are the World Bank Group, SNV, MECS, USAID and Sweden. There is an expectation that the relaunch of the ESAG and its sub-committees, particularly the clean cooking subcommittee, will lead to the realization of a formal platform for the actors in the sector.

A representative of the Clean Cooking sub-committee made a presentation at the ESAG and the table below is an extract showing a summary of the similarities in the work that five partners from the international community are undertaking in the country.

Table 1: The international partners working in the clean cooking space in Zambia

	World Bank MCHZ	Sweden/NEFCO	MECS	SNV	USAID
Policy	Support GRZ's policy framework to accelerate the transformation of the clean cookstove market	Supporting regulatory environment for the private sector	Embedding MECS approaches within their electrification policies and clean cooking strategies.	Positioning biodigesters, support to industry associations, OGTF bioenergy sub-committee	Strengthening the business enabling through policy, regulatory, and fiscal reform
Fuel focus	Shift to Clean Alternatives (>Tier 4) as part of GRZ commitments	Focus >Tier 3: Bioethanol, liquid biofuels, biogas, electric cooking, and sustainable biofuels, e.g. pellets and briquettes	Electric cooking (EPC), LPG and non-biomass fuels	Shift to biogas digesters to displace firewood and charcoal, agroforestry project	Electricity, Biomass (>Tier 3), Liquefied Petroleum Gas (LPG), Biogas and Bioethanol
Market solutions	Market Development for sector-wide economic stimulus	Modern Cooking Facility for Africa (Results Based Financing)	Customer needs supply chain needs, business models and innovative financing	RBF, valorisation of bioslurry, working within enterprise framework	Support private sector actors to overcome barriers in order to scale (TA, Grants, Financing, Info sharing, Convening)
Behavior change	Inter-ministerial task force to promote behavior change	Promoting clean cooking to improve environmental and health outcomes	Change consumer behavior and supplier capacity	Awareness raising & behavioral change campaigns	Social Behavior Change and Communication Focus

The national utility, ZESCO, has been encouraging the switch to LPG from electricity for cooking. However, the use of LPG as a Demand Side Management (DSM) measure to reduce peak load has generally not been effective⁷. LPG stoves and cylinder refills can be expensive, and LPG distribution remains underdeveloped; cylinders can be difficult to access for those without a car or those living far away from gas stations and other refill centres. The most recent clean cooking projections from the Zambian government reveal an LPG-dominant approach. For urban areas, the government’s 20-40-20-20 strategy will require a reduction in charcoal users from 60% to 20%, a reduction in electricity use from 33% to 20%, and an increase in LPG use from less than 1% to 40%. As it stands, the World Bank are committed to help the Zambian government achieve these objectives.

Aside from encouraging the switch to LPG, there has been a continued emphasis on the promotion of biomass improved cookstoves. The **Zambia SE4ALL Action Agenda**⁸ reports that the market for improved cook stoves (ICS) is not well developed; it is fragmented and dominated by the informal sector with no enforcement of minimum energy efficiency or quality standards. The report goes further to recommend prioritization of a scale-up in the production and distribution of ICS to yield large economic and social (mostly health) benefits. Another priority area is the substitution of charcoal and firewood with other fuels (biomass pellets, briquettes, LPG and biogas), as well as the introduction of more energy efficient charcoal production techniques.

The **Zambia SE4ALL Investment Prospectus**⁹ builds on the analysis of the sector strategy gaps, relevant high impact initiatives and opportunities as well as risk assessment and mitigation options of the priority areas identified in the Action Agenda. The Investment Prospectus (IP) responds to set targets under access to modern energy services (i.e. access to electricity and access to modern clean cooking solutions). The targets are presented in the table below:

Table 2: SEforALL 2030 Targets

Access to Modern Energy Services	
Access to electricity	Access to modern clean cooking solutions
Baseline 2015	
National: 31.4% Urban: 67.3% Rural: 4.4% (on-grid), 7.4% (off-grid)	National: 17% Urban: 38.5% Rural: 2%
Targets 2030	
Urban: 100% Rural: 50.6%	Urban: 100% Rural: 100%

Source: Zambia SEFORALL Investment Prospectus- Sustainable Energy for All Initiative. pg xii- xiii

The international community appear to be moving in the direction of genuinely clean, renewable cooking options, including a slow shift away from LPG as a long-term solution and developments in carbon financing for 100% clean devices, such as electric pressure cookers. Momentum is also building in Zambia. A number of private sector

⁸ covers the period 2019- 2030

⁹ cycle 2019-2025

organisations have either shown interest in developing electric cooking products for the Zambian market or entering the market with existing products. Carbon financing is being pursued by one of these businesses to help make their products affordable to lower-income households. It is thought that Zambia’s low electricity tariffs are one motivating factor behind the decision of these companies to consider doing business in the country.

2.1.2 Key players in the clean cooking sphere and their roles

Some key actors from government, NGOs, research and private sector in the clean cooking space have been identified and their roles are indicated in Table 2 below.

Table 3: Organization/Institution and their roles in the implementation of clean cooking

ORGANIZATION/INSTITUTION	ROLE
Department of Energy	Policy formulation and implementation for the energy sector which includes clean cooking
Forestry Department	Policy formulation and implementation for forests and forest by-products (i.e. woodfuel)
ZESCO	National utility involved in power generation, transmission and distribution
Rural Electrification Authority (REA)	National parastatal responsible for infrastructure development and electrification of rural areas. They are installing solar systems in chief’s palaces which have capacity to support EPCs
Energy Regulations Board	National energy regulator responsible for regulating the energy sector and licensing; standards development. They are currently reviewing and revising the standards for LPG with support from A2C project. Other standards that have been revised are for bioethanol
World Bank Group- Modernizing Cooking and Heating in Zambia (MCHZ)	Overall Objective: To provide technical assistance and investment support to accelerate the transformation of the cookstove market from one reliant on traditional, inefficient baseline stoves burning traditional biomass to one dominated by modern clean cookstoves and fuels. Key areas of focus include: market-based solutions, clean cooking only and behaviour change
Technology Development Advisory Unit (TDAU) at the University of Zambia	Research and development; technology transfer; sometimes sell ICS. Have capacity to fabricate improved cookstoves, cylinders and other components required for clean cooking. The facility is been assessed for its capability to undertake cookstove standard testing for biomass stoves
Emerging Cooking Solutions (trading as Supamoto)	They offer Clean Cooking, with a 100% Zambia sustainable fuel branded SupaMoto® (pellets), and Stoves (gasifiers) specifically designed for both Households and Businesses, as well as Solar products for Households, Small Businesses and Productive Use. They are piloting their stoves using a utility model where they give out the cookstove to interested households for free on condition that the household buys pellets from the company. This is currently taking place on the Copperbelt.
National Institute for Scientific and Industrial Research (NISIR)	Research and development; technology transfer; sometimes sell ICS or parts of e.g. clay lining for ziko stoves (similar to the Kenyan jiko)
Tetra Tech/Alternatives to Charcoal (A2C)- USAID	Objective: Reduce urban consumption of charcoal and increase use of alternative technologies and fuels to reduce deforestation and GHG emissions. Selected targets over the project lifespan include: Reduce urban

ORGANIZATION/INSTITUTION	ROLE
	<p>charcoal energy consumption by 25%; Increase use of alternative technologies and fuels by 38%; Reduce deforestation attributable to charcoal production by 7%; Reach 3 million persons through communication campaigns to create behavior change; Leverage USD \$10 million for clean cooking in Zambia; and 33% fewer people engaged in the charcoal value chain.</p> <p>Supporting different government and private sector actors to ensure the clean cooking sector is operating to achieve the goals set out by the government.</p> <ol style="list-style-type: none"> 1. Supporting the Forest Department with the formulation of measures that will improve the enforcement of Forest laws to curb illegal charcoal production and distribution. Have formed the Charcoal Taskforce which brings together all relevant stakeholders. 2. ERB with reviewing and revising standards for fuels such as LPG and bioethanol. They are also supporting ERB's hotline to create/improve awareness on ATF. 3. Supporting the private sector with financing (grants) to enable them breakthrough the ATF market. A2C also plan to host an investor workshop to allow match making of companies and financing institutions
Non-governmental Gender Coordinating Council (NGOCC)	Championing women's empowerment and gender equity and equality. Have energy projects which include promotion of improved cook stove
Southgate Investments- Zambia	Dealers in electric home appliances including EPCs and gas appliances
Afrox Zambia Limited	Leading gases and welding solutions company. Also promoting LPG as an alternative cooking fuel
Beyond the Grid Fund Africa	BGFA was set-up in 2019 on the initiative of the Swedish Government, building on the successful, award-winning initial pilot phase in Zambia, the Beyond the Grid Fund for Zambia (BGFZ). BGFA is an ambitious multi-donor funding facility that aims to kick-start markets for clean, off-grid energy in Sub-Saharan African countries. It works through a combination of an innovative results-based financing mechanisms for energy companies, close cooperation with governments and real-time data collection and analysis.
Oyrx Energies Zambia	Importer and distributor of petroleum products. Also promote LPG as an alternative cooking fuel
Zambia Integrated Forest and Landscape Project (ZIFLP)	This is a five year Government project supported by the World Bank Group. The program seeks to promote reduced Greenhouse Gas Emissions from the Land Sector and improve rural livelihoods of targeted communities in Eastern Province. The project is promoting rocket stoves (ICS) in the area.
Mt. Meru	Importer and distributor of petroleum and petroleum products. Also promoting LPG use
CADAC	Promoting and selling LPG fuel and appliances

ORGANIZATION/INSTITUTION	ROLE
Home Energy Limited	Promoting agro-forestry as a way to encourage the communities to save/restore the forests; teaching them briquette making and promoting use of energy efficient cookstoves
VITALITE Zambia Limited	Solar energy company and first to offer its products on PAYG. The products include solar (lighting, TVs, radios, and panels), cooking (energy efficient stoves and eco-sacs) and agro-innovations
Engie PowerCorner	Solar mini-grid operator, had trialed EPCs on their grid in Eastern Zambia
Engie MySol	Sells the Jikoka Tier 2/3 stove
Kainos Green Energy	Manufacturing bioethanol gel and cookstoves on the Copperbelt
ChildFund	Have activities involving clean cook stove installation (ICS) and promotion
ZENGO	Capacity building for clean cook stove; construction/installation and marketing of ICS
Lion Alert	Conservationists and clean cook stove (ICS) promoters
Rasma Engineering	Clean cook stove (ICS) manufacturer and distributor (Tier 2)
Caritas Zambia	Have clean cookstove (ICS) promotion activities
Action Africa Help- Zambia	Work with refugees and have clean cookstove (ICS) promotion activities
First Quantum Mining/ The African Stove Company (TASC) (a Zambia-based carbon credit and environmental company) ¹⁰	FQM through a pilot program delivered 5,000 twig-burning stoves in the communities surrounding the company's Kansanshi mine in Solwezi in an effort to minimize deforestation and pollution as part of their environment policy contribution
GreenPop -Livingstone, Zambia	Have clean cookstove (ICS) promotion activities
Eco-Hazmat Solutions	Clean cookstove (ICS) manufacture and distribution
Up Energy Group	Fights climate change and poverty while protecting local environments. They leverage carbon finance to develop products and retail networks that make cleaner technologies accessible to people in low-income countries. They are piloting an ecook (with EPCs) project in Uganda. Currently promoting an efficient biomass cookstove (ICS) in Zambia. The have recently launched a \$20million Community Carbon investment fund focusing on cleaning cooking and drinking water which will aim to reach 15- 20 million people in five countries including Zambia.

Table 3 shows that there are a lot of organizations/institutions/projects that are promoting ICS (Tier 2) in the country. It should be noted also that a few companies are also working towards the promotion of eCook by selling, while others have/are piloting use of the EPC. LPG retail market is also well established, more so in the urban than rural settings.

¹⁰ <https://www.lusakatimes.com/2020/02/28/first-quantum-minerals-deliveres-5000-stoves-to-communities-in-a-new-initiative-to-minimise-deforestation-and-pollution/>

2.1.3 The National cooking energy mix and how it is changing

Zambia’s energy sources include; electricity, petroleum, coal, biomass, and renewable energy. woodfuel, in the form of firewood and charcoal, are widely used for cooking.

The National Woodfuel Study (2020) by the Ministry of Energy (MoE) indicates that woodfuel (i.e. firewood and charcoal) contributes about 70% to the national energy mix. This proportion differs from 84% reported in the 2019 eCook policy report. It should be noted that extensive studies into the proportion of woodfuel used had not been conducted for some time before the National Woodfuel study was undertaken.

The MoE made this presentation of the energy mix at the relaunch of the ESAG¹¹. The figure below illustrates the current energy mix.

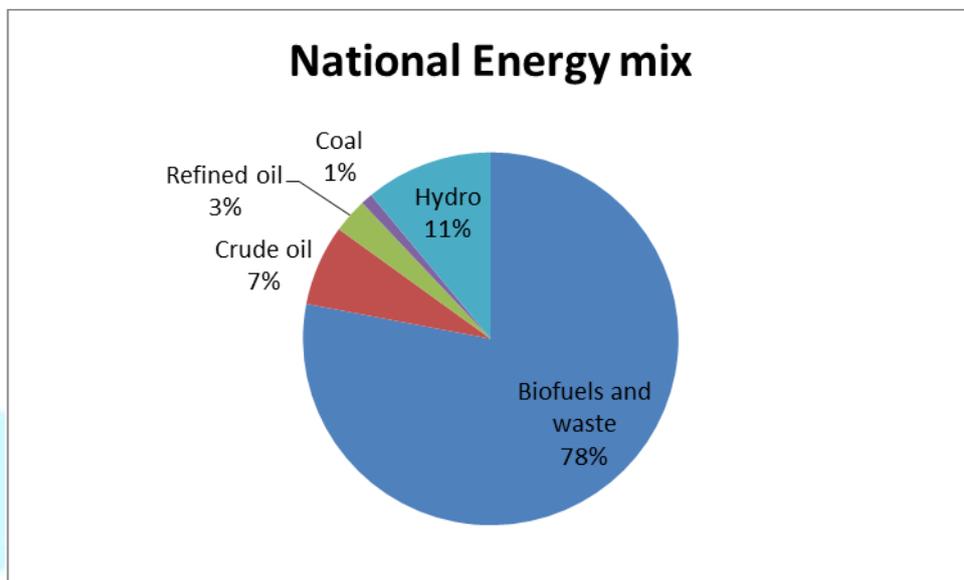


Figure 1: Zambia’s National Energy Mix

**Reproduced based on the information presented by the MoE at the ESAG relaunch in December 2021*

The Biofuels and wastes presented in figure 1 include woodfuel, forest and agriculture wastes. Biofuels and waste account for the largest proportion in the national energy mix, followed by hydro. It is interesting to note that renewable energy is not part of this energy mix.

The National Woodfuel study report (2019) further analyses the domestic/household woodfuel consumption for the period 2015 to 2019. The results are summarized in the table 4.

¹¹ Energy Sector Advisory Group (ESAG)

Table 4: Household woodfuel consumption for the period 2015 to 2019

Year	2015	2016	2017	2018	2019
No. of households (millions)	2.8	2.9	3	3	3.1
Charcoal (million tonnes)	1.54	1.6	1.6	1.6	1.7
Firewood (million tonnes)	1.5	4.3	4.4	4.5	4.6

Table 4 shows an increasing trend in the consumption of woodfuel as the population of households increases. The increase is higher in the use of firewood compared to charcoal.

Many factors can be attributed to why the use of woodfuel increases over time. A study conducted by Stockholm Environment Institute (2013), looked at perceptions on cost of energy, using a user-centered approach for Lusaka Province, it was established that electricity was perceived to be very expensive for cooking and would mainly be used for lighting, simple tasks such as boiling an egg, refrigeration and/or television, depending on which of these they have. In the households without a grid connection, it was established that although some households had the capacity and willingness to pay tariffs, electricity would be used just for lighting, they could not afford the connection fee. Almost all interviewees responded that their electricity use dropped remarkably when tariffs were raised in 2010 (Atteridge, Heneen, & Senyagwa, 2013). “Thus, among low- and middle-income households, electricity remains a niche energy source, even though it is widely accessible, and households are generally willing to use it much more if it were less costly. Further, charcoal was the dominant fuel for cooking in urban areas, water heating and space heating when needed”.

2.1.4 Successful interventions that have facilitated transitions to cleaner cooking solutions

It is worth noting that most interventions in the cleaning cooking space have, until recently, been biomass based, that is, improved cookstoves (ICS) of Tier 1 and 2. Some successes and failures have been observed with utilization of these ICS. The ICS probably owe their success to the fact that the stoves are still using charcoal and/or firewood, which are familiar fuels. However, these technologies have been on the market for decades, and they have failed to replace the mbaula/3 stone fire as the primary biomass stove in Zambia. Despite years of campaigns and demonstrations, the ICS are not widely accepted by households. This is because of (a) the high upfront cost of the devices compared to the traditional mbaula; (b) ICS cannot cook all types of food (for example, roasting maize which is normally done by placing the maize cob under the opening of the mbaula); and (c) other socio-cultural reasons (from various in- country research activities). In addition, recent findings suggest that improved biomass stoves rarely result in improved health outcomes for the households, as an extreme emissions reduction is required to provide the potential for such improvements.

In addressing the barrier of high upfront cost, some companies have introduced a payment plan to enable households acquire their ICS. Supamoto have a pay-as-you-go system with periods of payment lasting from 3 months to thirty-six months. Vitalite Zambia use the corporate sales system, where they engage with the management and conduct demonstrations and awareness campaigns with the members of staff of a company. Those that are interested in purchasing the cookstove then register and are allowed to pay in two installments. These two companies also have a warranty period on their products. UpEnergy, who are the new players on the market, are developing their supply chain to include local manufacturing of the cookstove in an effort to make the product more affordable to the end-users. UpEnergy have also been leveraging on carbon financing to make the product affordable.

Various efforts among some ICS manufacturers have included modifying the stoves to make them compatible with the end-user needs. The modifications include making the ICS a two burner, increasing the size and adding a roasting tray/rack.

Awareness campaigns aimed at addressing behavior change are currently on the increase with the A2C project. They have been conducting road shows in the high-density areas to educate people about the benefits of using alternative technologies and fuels. A2C have also established a Toll-free line where individuals interested in knowing more about the ATFs can get that information. As mentioned above, A2C are promoting pellets stoves, ethanol, biogas and electric cooking.

On the other hand, the MECS programme has been promoting the use of the EPC and LPG through community engagement and demonstrations; discussions/dialogue with policy-makers, businesses, mini grid operators; conducting and publishing studies on appliance availability, cost of cooking with electricity and LPG.

SNV have been promoting the use of biodigesters across the country with 4,878 digesters installed through a market-based approach over a period of five years (2015-2019). SNV also trained a number of masons to install the biodigesters.

2.1.5 Adopters of Improved Biomass stoves

The exact number of ICS that have been adopted is unknown. But each intervention implementer has records of the ICS they have distributed.

Refer to the table below of some published ICS interventions. Part of this information was gathered for the Barriers project in 2016 but has been updated based on new information since the first draft report. Note that the number of disseminations/installations is not the same as number adopted.

Table 5: Commercial ICS intervention in Zambia

Name of project/project developer	Year/duration	Type of cookstove	Project description/ Location	Contact
Katete improved cookstove Zambia VCS		Rocket stove	75,000 stoves were disseminated over the period in Katete	The CarbonNeutral Company. London Tel: +44 20 7833 6000 E: info@carbonneutral.com New York Tel: +1-646-367-5800
3Rocks (Icecap)	2010	Bespoke	40,000 stoves were installed over the project period in different rural areas of Zambia	http://www.icecapltd.com/3rocks/
SNV Zambia	2010- 2012	Fixed mud stoves and the pulumusa	Out of the 8200 stoves produced, 6,375 were sold and in use by 2012 in Northern, Muchinga, Lusaka, Central, Luapula and Southern Provinces	Renewable Energy sector Leader. Tel: +211 255 176. Renewable Energy Advisor, SNV Kasama. Tel: +214 222 988
CDM project	2008- 2011	Save80	30,000 stoves were sold in Lusaka Province	Climate Management Ltd, Garden Township, Lusaka.

C-Quest Capital			1,000 stoves were disseminated	http://carbonfinanceforcookstoves.org/connect/profile/1936/
CQC partnership with Community Markets for Conservation (COMACO)	2014	Mud brick rocket stove	60,000 stoves were set to be installed in Luangwa, Eastern province; Lusaka province	http://www.cquestcapital.com/programmes/cookstoves-in-zambia-2/
Vitalite Zambia	Since 2013	Improved cookstoves including the Ecozoom	More than 5,000	https://vitalitegroup.com/
Supamoto	2012	Mini moto stove	More than 5,000	http://www.supamoto.co.zm/

Table 6: ICS Interventions by individuals

Project developer	Name of SME	Year	Type of stove	Project description	Contact
Rashid Phiri	Rasma Engineering	1985-to-date	8 types of biomass stoves including the ziko	During the period 2001-2003, about 9,360 domestic stoves were produced and sold. The business is now mostly bespoke, manufacturing biomass stoves for commercial applications such as markets. Customers of these stoves are mainly in Lusaka Province	rashid.phiri@gmail.com
Alfred Mumbi	Enviro-care International	1999-to-date	Ziko stoves	Have weekly production of 100 stoves. Sales have and are made to regular customers from the SME premises or through retail outlets like Pn'P, Shoprite, Spar, and during exhibitions at public events	caregroupzambia@gmail.com

Project developer	Name of SME	Year	Type of stove	Project description	Contact
Lazarus Chewe	Dread & Works Enterprise	2003-to-date	Rocket, jiko, currently promoting biogas fuels and cookstoves	Previously had a record monthly production of 350 stoves. They have produced stoves for supply to an already established market that include hospitals and boarding schools. Currently make stoves on demand	chewelazarus@yahoo.co m

Source of improved stoves on the Zambian market

Some improved stoves are wholly or certain parts manufactured in Germany, China, Kenya, Malawi or South Africa and are then assembled in Zambia. Local stoves are manufactured locally in Zambia.

The most popular cooking appliances In Zambia

The electric 4-hob hotplate cooker is commonly used in households of well to do families. The electric 2-hob hotplate cooker is common among bachelors and bachelorettes and small families. Due to tariff increases coupled with the inefficiency of the hotplates, this form of cooking can be expensive, and it is common for these devices to be used for quick cook foods, like eggs. Other popular cooking appliances include the microwave, electric kettle, bread toaster and sandwich maker.

The most popular appliance that cuts across the family size or economic status is the traditional mbaula. This appliance is used for preparing long-cooking dishes, water heating and space heating. The fuel (charcoal) is considered cheap, although this has been changing in recent years as the cost is rising. The price of charcoal fluctuates depending on the season, making cleaner alternatives more affordable at certain times of the year. Almost all households in urban areas have one or more mbaulas.

The National Woodfuel study (2020) highlights fuel and device use, and estimates stacking with the order by proportion for 4, 289 households that were sampled.

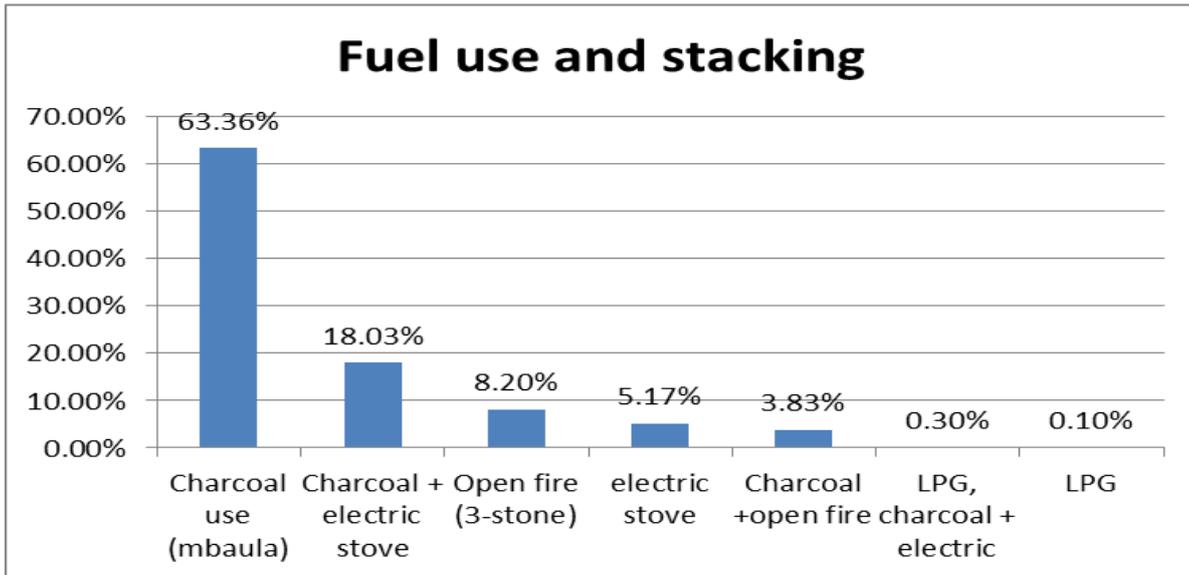


Figure 2: Fuel/device use and stacking in sampled households

Figure 2 results indicate that charcoal use is the most commonly used fuel and household use it on the inefficient mbaula. This is followed by stacking of charcoal with electricity. LPG use is the least used by the sampled households.

The World Bank Group (WBG) conducted a study which revealed that firewood used on an open fire or three stone fire was the most popular among households in Zambia¹². The next common fuel was charcoal, followed by electricity. These results agree with the finding in the National woodfuel study. The results of the study are shown in the figure below.

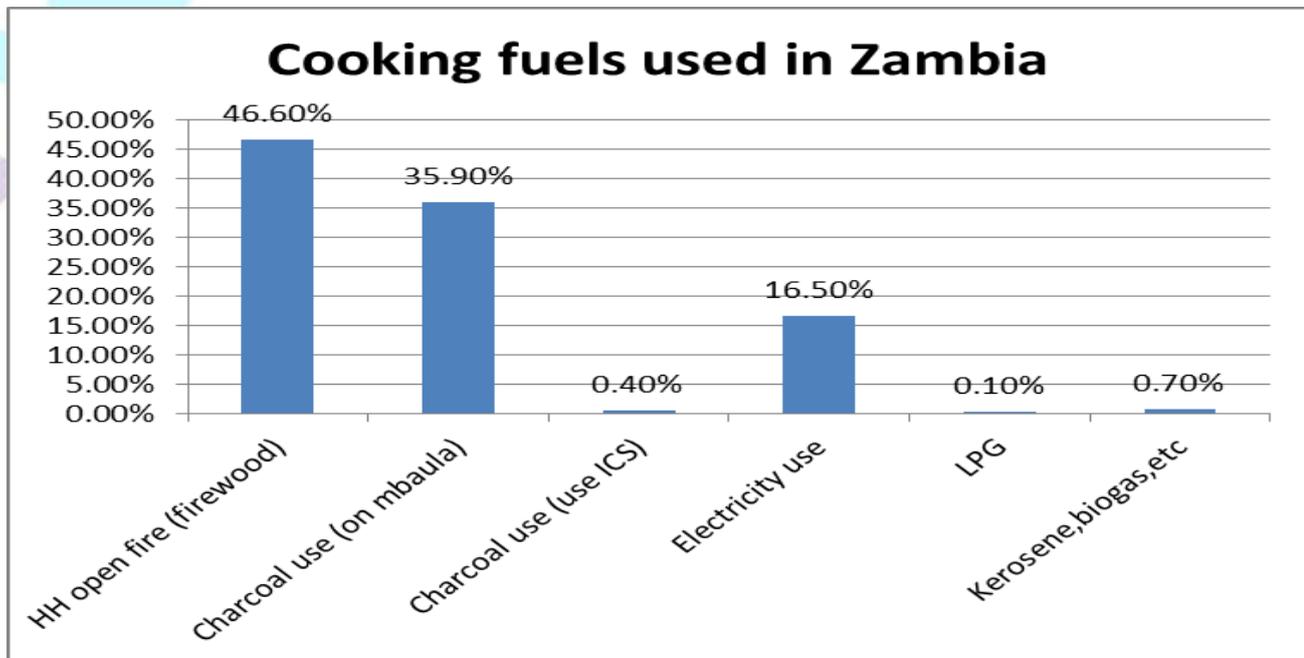


Figure 3: Cooking fuels used in Zambia

¹² Information shared at ESAG relaunch in December 2021

In addition to the results presented in the figure 3 above, the WBG also mentioned that of the 16.5% that were using electricity, 34% were in urban areas and 41% in Lusaka. They also mentioned that of the 35.9% using charcoal on the traditional mbaula, 51% were in the urban areas.

In terms of foods cooked, five dishes can be identified on basis of commonality in Zambian households, cultural ties and also because the foods represent different preparation categories, that is long, medium and short cooking events. The foods/dishes include nsima, chicken, beans, porridge and rape¹³.

2.1.6 Compatibility of popular electrical appliances with battery-supported electricity

The power rating of the electric 2 hotplate cooker, bread toaster, kettle and sandwich maker ranges between 500 and 2000W. Cooking appliances may be compatible with battery- supported electricity, depending on the size and capacity of the battery.

2.1.7 National fossil fuel reserves

Between 2010 and 2019, Zambia's total recoverable coal remained stable at around 50 million short tons¹⁴. Coal is utilized in power generation at Maamba Collieries Limited (MCL) in Sinazongwe District, Southern Province. The thermal plant has a generation capacity of 300MW. Commissioned in August 2016, it generated about 326MW by the end of 2016. Electricity is generated and sold to Zesco under a 20-year long- term power purchase agreement (PPA).

Jain, in an article published in the Southern Africa Journal of Policy and Development (2017)¹⁵, wrote that Zambia now plans to produce more power from coal using its vast coal reserves in Maamba collieries. The capacity of the Maamba coal plant is planned to increase from the current 300 MW to 600 MW and further to 900 MW to meet the escalating power demand in the country. Additionally, another coal power plant is planned by EMCO Energy Zambia, a subsidiary of the India based EMCO Energy, with a total capacity of 600 MW in two phases of 300 MW each in the same region. The plant is nearing financial closure and is expected to be completed by 2020. More coal power plants are on the cards. Recently, Zambia signed a treaty with Mozambique for the setting up of a 1,200 MW coal power plant in the coal-rich province of Tete, to bolster electricity supply to both countries. It appears Zambia is fully on path to exploiting coal power for electricity generation to add to its arsenal of power sources.

All of Zambia's total petroleum requirements are met through imports because the country does not have any proven reserves of crude oil. The petroleum industry in Zambia is made up of TAZAMA Pipelines Ltd, which is owned, by the Governments of Zambia and Tanzania, INDENI Refinery, Ndola Fuel Terminal, Bulk fuel storage depots and the Oil Marketing Companies (OMCs). The major activities that take place in the petroleum sector are; procurement, transportation, refining, distribution and supply petroleum products to various customers at a reasonable cost¹⁶. The refinery was operational until 2021 when it was placed under "Care and Maintenance".

¹³ MECS Kitchen Lab report 2021

¹⁴ <https://knoema.com/atlas/Zambia/topics/Energy/Coal/Total-recoverable-coal>

¹⁵ Jain, P. (2017) Coal Power in Zambia: Time to Rethink. Southern Africa Journal of Policy and Development. 3 (2) (14-24). <https://scholarship.law.cornell.edu/cgi/viewcontent.cgi?article=1042&context=sajpd>

¹⁶ <http://www.pmrzambia.com/wp-content/uploads/2015/06/Fuel-Procurement-Infographic.pdf>

2.1.8 Deforestation and the initiatives to address it

Deforestation in Zambia is reported to be occurring at a rate of 250,000 to 300,000 ha/yr (2012 Deforestation Index). Various new interventions are currently being implemented. These include:

- 1) The **USAID's Alternatives to Charcoal (A2C)**. This is a US\$24.9 million worth fund that is been implemented by Tetra Tech and has a project life of 5 years (2021- 2026). The (A2C) Activity works to reduce deforestation related to the production of charcoal. A2C is taking a market-driven approach to this challenge, by catalyzing a shift in household cooking away from charcoal towards private sector-led low emissions technologies and fuels. The alternatives to charcoal include stoves powered by electricity, LPG, gel fuel, processed biomass (e.g. pellets), among others. The A2C activity works with the private sector, GRZ, civil society, and communities to remove barriers and create opportunities to advance consumer adoption of ATFs; strengthen enforcement of existing charcoal regulatory frameworks; and work alongside consumers to shift preferences and reduce demand away from charcoal while supporting alternative livelihoods for former charcoal-producing households¹⁷.
- 2) **Beyond the Grid Fund Africa**
The Scaling of Clean Cooking Solutions is a new programme under the BGFA umbrella. A funding round called BGFA1 with the aim to incentivise the scale-up of clean off-grid energy solutions in Burkina Faso, Liberia, Mozambique and Zambia is about to start in autumn 2020¹⁸.
- 3) The **Modern Cooking Facility for Africa (MCFA)**, launched by Sweden and Nefco in late November 2021, has been established to support the development and scale-up of clean cooking technologies in Africa, with an initial SEK 275 million (~EUR 27.8 million) of financing. The facility will support access to clean and affordable energy solutions and will develop new markets for the clean cooking sector in the Democratic Republic of the Congo, Kenya, Mozambique, Tanzania and Zambia through results-based financing for private sector actors. The aim of the MCFA programme is to provide 1.5 to 3 million Africans with access to clean cooking solutions, improving overall health and increasing economic growth. The programme will also have a large positive environmental impact, reducing CO2 emissions and mitigating deforestation in the target countries. The programme contributes to the Sustainable Development Goals: SDG7 on access to affordable and clean energy access, SDG13 on climate action, SDG3 on good health and well-being, SDG15 on life on land by encouraging the use of renewable fuels and SDG5 on achieving gender equality and empowering women and girls¹⁹. The programme is set up to serve as a complementary facility to the Beyond the Grid Fund for Africa. The new MCFA programme is expecting to launch its first Call of Proposals-based funding round during the first half of 2022.
- 4) A **UNDP-GEF partnership** is promoting energy-saving stoves in Zambia's rural communities in support of the government's efforts to cut forest loss, clean up cooking, save lives and curb climate change²⁰. The stove costs US\$7 to build and it is made from soil and other locally available raw materials.
- 5) **Zambia Integrated Forest Land Project (ZIFLP)**, a US\$32.8 million funded project by GEF, implemented by the World Bank and executed by the Ministry of National Development Planning, was approved in 2017. The main

¹⁷ <https://www.usaid.gov/documents/alternatives-charcoal>

¹⁸ <https://beyondthegrid.africa/news/sweden-and-nefco-kick-off-new-initiative-on-clean-cooking-financing-solutions/>

¹⁹ <https://www.nefco.int/news/sweden-and-nefco-launch-a-new-facility-to-support-the-scale-up-of-clean-cooking-technologies-in-africa/>

²⁰ <https://africanfarming.net/technology/infrastructure/wood-saving-cookstoves-are-helping-zambia-cut-forest-loss>

aim of the project is to improve landscape management and increase the flow of benefits for targeted rural communities in the Eastern Province. The Government through the Forestry Department and Ministry of Energy are spearheading the promotion of an improved cookstove, Rocket stove, to curb the cutting down of forests for firewood.

- 6) **World Bank** is supporting the Ministry of Energy (MoE) to transition Zambia away from traditional fuels toward cleaner, modern and more efficient cooking future. Their overall objective is “to provide technical assistance and investment support to accelerate the transformation of the cookstove market from one reliant on traditional, inefficient baseline stoves burning traditional biomass to one dominated by modern clean cookstoves and fuels”.
- 7) **SNV** through its ‘Energy for Agriculture’ project which ran from 2015- 2019 installed 4,878 biodigesters across the country in the rural areas. The project involved the promotion of cooking with biogas and use of biodigester residuals for agriculture.

2.1.9 Policies currently enabling or constraining the roll out of cleaner cooking solutions

The Zambia SEforALL Action Agenda mentions that in order to achieve the targets of universal access to clean and modern cooking solutions, government should implement a number of strategies through the framework provided by the revised National Energy Policy (NEP2019). It should be noted that there is a lot of emphasis towards environmentally sustainable exploitation of biomass resources, efficiency through better management and introduction of new sources such as biofuels in the NEP (2019). These strategies include:

- ✓ Providing appropriate financial and fiscal instruments for stimulating the production of charcoal and biogas, and the use of other biofuels through the formulation of comprehensive and innovative financing mechanisms. These will include smart subsidies, concessional loans, loan guarantees, provision of tax incentives and waivers on biomass energy capital equipment. It also recommends blending financing and programmatic approach for supporting the sector thereby reducing the high cost of financing.
- ✓ Raising public awareness on benefits and opportunities for other modern biomass energy sources and develop capacity for their implementation through a) provision of information to relevant stakeholders, b) education and creation of awareness about the potential of biomass highlighting the economic, environmental and social benefits, and c) development of the regulatory framework;
- ✓ Ensuring better management of woodlands and forests as sustainable sources through introduction and administration of penalties;
- ✓ Improving the technology for charcoal production and utilization of woodfuel ;
- ✓ Deployment and implementation of gender responsive policies and measure that involve women;
- ✓ Promoting appropriate alternatives to woodfuel and reduce its consumption. In this strategy, the use of LPG and cooking gel as household fuels are encouraged, and switching to electric

stoves partially using generated electricity from forest waste and residues is also encouraged;

- ✓ A Sustainable Agriculture Programmes seeking to promote conservation/smart agriculture activities leading to adaptation benefits and enhancing climate resilience especially in rural areas;
- ✓ A Renewable and Energy Efficient Programme seeking to promote the switching from conventional and traditional energy sources to sustainable and renewable energy sources. Implement the NAMA for increasing efficiency in harvesting, processing and charcoal usage;
- ✓ Auditing all programmes on modern cooking and undertake data collection to inform policy interventions to support the development of the sector.

The Zambia SEforALL AA goes on to present the risk management for Increasing Access to Clean and Modern Cooking Solutions along with some mitigation actions (Table 13, pages 49-50). The risks include:

- a) Low end user acceptance and adoption of new methods, and their safety. To mitigate this, education and an awareness/communication strategy backed by policy and financing have been proposed. The mitigation actions will be the responsibility of both Government and private sector, including the standards body, ZABS.
- b) Constraints in the expansion of the distribution infrastructure for LPG to serve customers in rural and peri-urban areas. The mitigation action for this is allowing for some financial compensation for LPG distribution beyond urban areas which will be the responsibility of the government.
- c) Inability to supply end user customers. The mitigations for this include offering financial incentives for producers to improve ICS quality and scale up production, and issuing of quality standards.
- d) Competition and high establishment costs. To mitigate this, consumer financing of products and delivery channels allowing consumers to switch to modern and clean cooking solutions will be offered by government and the private sector.
- e) Failure to provide customer care. The main mitigation action will be to improve the business environment along the supply chain from production to after sales service and maintenance.

Despite having these strategies in place, it is the belief of the MECS programme that facilitating the uptake of 100% clean cooking solutions would reduce deforestation rates much more quickly than improved biomass stoves. The clean cooking solutions such as cooking with electricity do not produce any emissions.

Targets for the quality of clean cooking solutions

There are currently no standards to ensure quality for ICS (information obtained from ERB and ZABS during 2015 Barriers study). This finding is also supported by the Zambia SEforALL AA report which states that production of ICS is currently carried out by local artisans without assurance and consistency on minimum standards. The document also states that there are no monitoring and evaluation mechanisms in place, making it difficult to ascertain outcomes

and their sustainability. The Vision 2030 policy indicates that the aim is to reduce the share of people using woodfuel as their primary cooking fuel to 40% by 2030.

Outcome 4 of the 7NDP recognizes the need to shift Zambia’s energy mix away from charcoal to more sustainable sources of energy. It focuses specifically on “improved energy production and distribution for sustainable development” and has a target of reducing the percentage of households using charcoal energy for cooking by 7.9% from 32.9% in 2015 to 25% percent by the end of 2021.

In the SEforALL an urban ‘20-40-20-20’ cooking scenario has been used to delineate strategic options and the trajectories that could be considered for cooking solutions in urban areas. These are summarised in the table below.

Table 7: Targets for the cooking fuels by 2030

Energy Source	2015	2030
Electricity	34.5%	20%
LPG	<1%	40%
Charcoal, firewood	59% Charcoal 6% Firewood	20% Charcoal 20% Firewood

National biomass energy or cleaner cooking strategy

The NEP (2019) set an objective to “Promote efficient and sustainable exploitation of biomass for household utilization”. And according to the implementation plan, the biomass strategy was to be developed between 2020 and 2021. One of the roles of the Clean Cooking subcommittee under the newly relaunched ESAG is to recommend the formulation of a clean cooking strategy²¹. This is yet to be effected as the committee is still in the process of developing a workplan for 2022(by the time of reviewing this report).

2.1.10 Charcoal production/transportation/wholesale/retail

Is it taxed and by how much? If not, how does the sector get around the law?

Charcoal production, transportation in-country and sale are legal in Zambia. However, due to lack of man-power and other resources, the charcoal production, transportation and taxation are not well monitored (by the Forestry Department) resulting in a lot of leakages.

The charcoal value chain has several levies which are meant to be paid to the Forestry Department for production and transport, and when the product reaches the market, levies have to be paid to the council for trade. The Charcoal Taskforce which has been convened (2022) and is co-chaired by Forest Department and A2C will be looking to address the monitoring and enforcement of the levies that are already in place.

Are there national targets to reduce the incidence of acute respiratory infections? If so, which policies have been developed to enable this and are there a government budget assigned to it?

National targets to reduce the incidences of acute respiratory infections are available and have a government budget assigned.

²¹ ESAG Clean Cooking subcommittee TORs

The Seventh National Development Plan (7NDP), Vision 2030, and the Zambia National Healthy Strategic Plan 2017- 2021 are policies which address reduction of incidences of acute respiratory infections.

2.1.11 Cooking and its contribution towards national targets for nutrition, maternal health, etc.

Cooking is not directly linked to attainment of national targets for nutrition, maternal health, etc. However access to energy is linked to national target for nutrition, maternal health, etc. The perception is that with access to energy, there is improved food security since the shelf life of foods is prolonged if facilities for food processing and storage can be operated. The same applies to the target of achieving good maternal health where access to energy improves service delivery in health centres by allowing for operation of equipment/appliances. Observing access to energy in reference to food security and service delivery is limited in that it does not integrate the domestic implications of cooking with dirty fuels which significantly affects the health of women and children (usually). Indoor air pollution will cause sickness and under-performance in the affected people and therefore lead to unproductivity both at household and national level. Lambe et. al. (2015) reports that in sub-Saharan Africa, household air pollution was the second-highest risk factor for disability-adjusted life years (DALYs) and third-highest driver of premature deaths in 2010. Across these illnesses, it contributes to at least 581,000 premature African deaths per year and the loss of more than 26 million DALYs (Lim et al. 2012). If no action is taken, by 2030, an estimated 870,000 people will die each year from acute lower respiratory infections and chronic obstructive pulmonary disease linked to solid fuel cooking (Rysankova et al. 2014). Based on this evidence, promotion and adoption of modern energy solutions (such as electricity and LPG) becomes cardinal if the achievement of SDG 3-relating to good health and well-being-is to be met.

2.1.12 National carbon emissions reduction targets and the policies which have been developed to enable this

The Zambia Nationally Determined Contributions (ZNDC) has set a target for the reduction of carbon emissions of 38,000Gg by 2030. Some proposed projects/programmes in the ZNDC are being implemented with funding from the government and cooperating partners.

The implementation of clean and efficient cookstoves is among the proposed activities. More specifically, the activity relating to clean and efficient cookstoves is the implementation of improved/efficient biomass cookstoves. This activity is currently being implemented under the ZIFLP which is a World Bank funded project in Eastern province.

2.1.13 Retail price of kerosene and LPG

Petroleum is wholly an imported commodity in Zambia. The retail price of kerosene is fixed by the government. The pricing is based on international oil prices and the exchange rate between the Zambian kwacha and the United States dollar. The New Dawn government removed the subsidised that were on petroleum and introduced a pricing system which is monitored monthly. In this new system, the price of petroleum products reduces or increases depending on the international market prices. The price for LPG is not fixed but is regulated by ERB. In 2016, ERB approved the regulatory framework on pricing LPG which recommended a light-handed regulation by monitoring wholesale and retail prices for both imported and locally sourced LPG (Energy Sector Report, 2016). Retailers set their own price, considering a variety of factors to determine the final cost, and the ERB is responsible for preventing customers being exploited. The pricing of LPG in August 2017 was 2.270 ZMW/kg. A report that documents average prices of LPG in Zambia by the ERB summarized the prices as shown in the table below.

Table 8: Average price of LPG cylinders as at 31st December 2017²²

Description	Mean (ZMW)
Average Retail price for 6kg cylinder as at December 2017	100.68
Average Retail price for 9kg cylinder as at December 2017	149.33
Average Retail price for 15kg cylinder as at December 2017	244.76
Average Retail price for 19kg cylinder as at December 2017	316.36
Average Retail price for 38kg cylinder as at December 2017	714.94
Average Retail price per kg as at December 2017	16.81

Since the 2017 report, the prices of LPG have gone up but there is no recent publication of the new prices. One of the factors that has contributed to the raise in pricing is that the main refinery, INDENI has faced some challenges over the last two years and is currently under “Care and maintenance” (since November 2021). The Oil Manufacturing Companies were advised to import the commodity, thereby affecting the retail price. The other contributor to the increase in price is the exchange rate, where the Zambian kwacha has not been performing well against the United States dollar.

2.2 Electrification, renewable energy and energy efficiency

2.2.1 Grid electrification

The state of the national grid

Who has access and who does not, what are the key generation sources, how efficient is the transmission & distribution infrastructure, how frequent are blackouts/load shedding, does peak time demand exceed supply?

The Ministry of Energy informed the audience at the relaunch of the ESAG that Zambia has a total installed capacity of 3,223MW. This is generally generated from hydro and 84.2% is generated by large hydro. Hydro, as a resource, is increasingly vulnerable to climate change. Zambia has recently been experiencing erratic rainfall patterns which have led to low water levels in the large hydro. The worst experience was in 2019 when the utility had to enforce load management in order to ratio the power supply. This situation resulted in no electricity supply for at maximum 15 hours per day.

The major consumers of electricity are the mining sector, consuming over 51%. Households account for 33% consumption. The access rates of electricity are given below:

- National level- 34%
- Urban- 75%
- Rural- 8.4%

The annual demand growth stands at 6% (i.e. 150- 200MW)²³.

²² https://www.erb.org.zm/downloads/Demand_and_Market_Structure_for_LPG_in_Zambia_2019_1.pdf

²³ Presented by the MoE at the relaunch of the ESAG in December 2021

It should be noted that, the access rates recorded in the rural areas are from both on and off grid solutions. Electrification in rural Zambia has been a challenge because of the population densities which can be very low in most cases. And in such cases, off-grid solutions have proven to be more cost effective. The off-grid solutions are stand-alone-systems (which include solar home systems (SHS), solar lanterns and diesel generators) and mini-grids (i.e. micro and small hydro, solar PV, large and small wind, biomass, etc. which are all renewable). When it is cost effective, grid extension is also used for electrifying rural areas as well.

The Rural Electrification Master Plan of 2008 projected the three modes of rural electrification as presented in the table below:

Table 9 REMP 2030 Projected modes of rural electrification

Mode of electrification	% of Households electrified
Grid extension	80
Off-grid/stand alone (SHS, solar lanterns, diesel generator sets)	18
Mini grids	2
TOTAL	100

*Source: SEALL AA pg. 32

The figure below illustrates the passage of the ZESCO grid. It follows the major road networks in Zambia and supplies urban populations and many rural regions are too far removed from the grid to gain access.

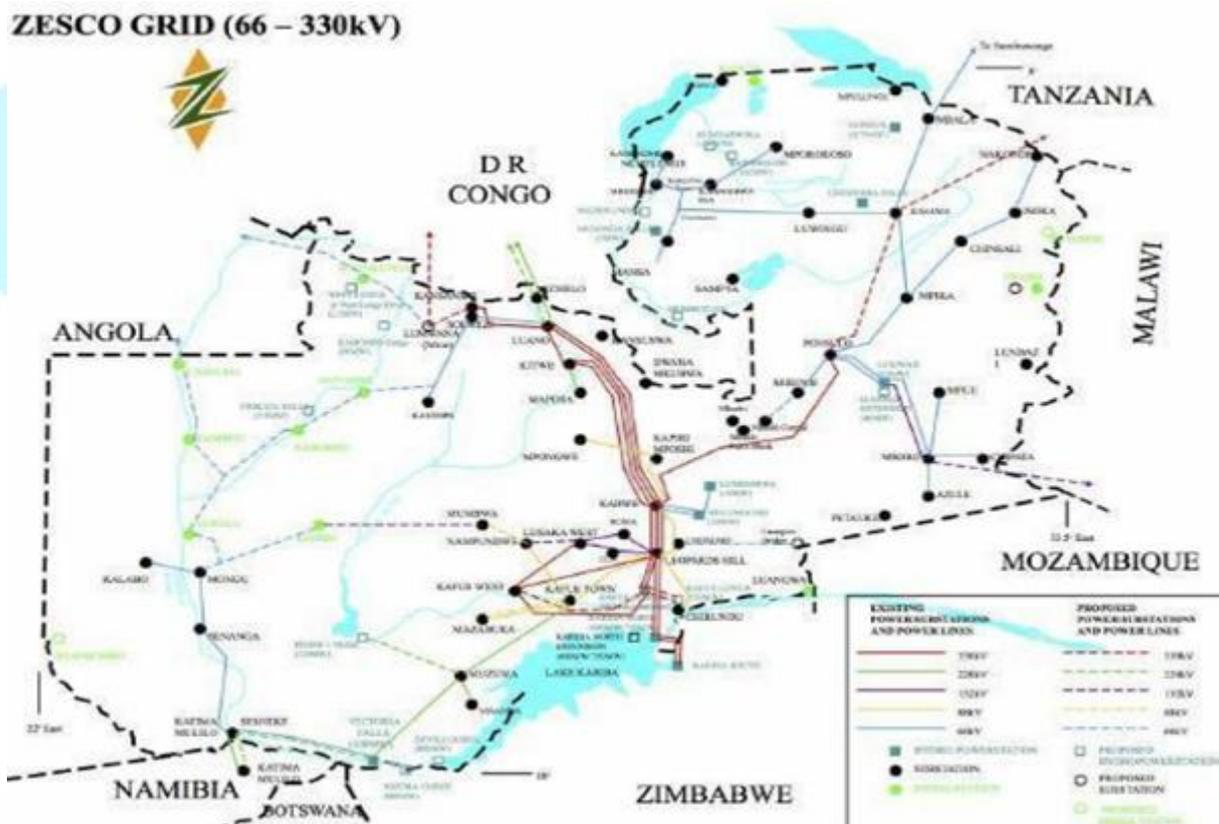


Figure 4: Existing and proposed power stations and transmission lines in the ZESCO grid²⁴.

²⁴ Source of map: Power Instability in Rural Zambia, Case Macha (PDF Download Available).

The electricity supply industry in Zambia mainly comprises of a vertically integrated state utility, ZESCO, and an energy service company CEC that purchases power from ZESCO and supplies it to the mines. In addition one independent power producer, Lunsemfwa Hydro Power Company, and some small- scale solar based energy service companies supplying power to some rural areas also participate in the industry²⁵.

The ZESCO transmission grid comprises transmission lines and substations at 330 kV, 220 kV, 132 kV and 66 kV voltage levels. The backbone of the grid is built on a robust 330 kV system from the southern part of the country where the major generating stations are located through Lusaka and Central provinces to the Copperbelt.

Transmission losses have increased over the last few years (six to seven percent in 2015 versus an ERB target of five percent) and distribution losses are high (eleven percent based on ZESCO’s 2015 and 2016 operational key performance indicators (KPIs) and stakeholder estimates)²⁶

2.2.2 Policies that currently enable/inhibit sustainable grid electrification

The policies that currently enable sustainable grid electrification include the following:**NEP 2019:** The Policy provides guidance for the continued development of the energy sector essentially on the security, affordability, supply and utilisation of energy. The NEP also has a specific objectives “to increase exploitation of renewable energy in order to diversify the energy mix” and “to increase access to electricity in order to improve the livelihoods of citizens”.

The NEP guides Ministries and Institutions in the Zambian economy to meet the challenges of achieving access to reliable, sustainable and affordable energy services.

—
7NDP: This document outlines broad strategies and reforms to enhance the supply of electricity for economic development. The objective is to expand and improve electricity generation, transmission and distribution, as well as encouraging the development of small and micro hydro power stations.

The **Electricity Act of 2019**²⁷: Serves to

- ✓ regulate the generation, transmission, distribution and supply of electricity so as to enhance the security and reliability of the supply of electricity;
- ✓ facilitate the achievement of the efficient, effective, sustainable development and operation of electricity infrastructure;
- ✓ provide the roles and responsibilities of various participants in the electricity sector;
- ✓ facilitate adequate levels of investment in the electricity sector;
- ✓ promote transparency in the identification and allocation of risks, costs and revenues within and between participants in the electricity sector; to mention a few.

²⁵ <http://www.erb.org.zm/content.php?viewpage=eezps>

²⁶ Zambia Power Sector Assessment 2018. (https://pdf.usaid.gov/pdf_docs/PA00SWZM.pdf)

²⁷

<https://www.parliament.gov.zm/sites/default/files/documents/acts/The%20Electricity%20Act%20No.%2011%20of%202019.pdf>

Mini grid Regulation Framework:

This framework is not yet in effect because there are components which are not well aligned with the Electricity Act of 2019. Currently, the framework is undergoing some work which will see it being aligned with other policies and ensuring the participation of more private sector actors.

2.2.3 Electricity access

National targets for electricity access and the policies that enable this

According to the Vision 2030, the targets are to increase access from the current 49% to 90% for urban, and from 4% to 51% for rural by 2030. All new connections in urban are expected to be grid based while in the rural areas it will be a combination of national grid, off-grid systems and mini-grids. According to the SE4ALL AA report, ZESCO did some extrapolation to estimate the number of connections they needed to reach the 2030 target. The approximated about 957, 762 customer in 2018 with an average of 102, 000 new grid connections required per annum. This meant that 73, 000 households would need to be connected by 2019. This number would drastically have to increase over time to 147, 000 annual household connections by 2030.

About 1,217 un-electrified growth centres were identified in the REMP for electrification by 2030 mainly through grid extension. The SE4ALL AA reports states that the targets set out in the REMP are considered ambitious and reaching them would require a significant scale-up to provide services to about 75, 000 rural households on average per year over the period 2016- 2030. The SE4ALL report goes further to say that the private sector would have to play a significant role, including the government and cooperating partners to mobilise resources.

A government budget is assigned annually towards activities for attainment of these targets. The Rural Electrification Fund (REF), established in 1994, by committing the sales tax on electricity where a levy of 3.45% on electricity consumption was introduced²⁸. This fund was created to supplement the national budget on capital expenditure for rural electrification. In the 2022 budget, ZMW 362,208,689 was allocated to the Rural Electrification Fund.

There programmes which are being funded by a mix of cooperating partners are as follows:

- ✓ The **Electricity Service Access Project (ESAP)**: This is a 26.8 million United States dollar project which meant to increase electricity access in targeted rural areas of Zambia. The 5 year project which was approved in 2017 will provide a connection of electricity to 22,000 low-income households and 1,000 medium and Small-Scale Enterprises in rural parts of the country.
- ✓ In 2017, the EU signed a €65 million grant with Zambia to improve access to energy. The programme is expected to provide access to reliable, clean and affordable electricity services to at least 63,000 households, or about 300,000 people, to social and public infrastructure and to eligible Micro Small Enterprises (MSEs). It is going to be done through the rehabilitation and expansion of the low voltage distribution network in selected low-income areas of Lusaka City with high population density. The programme is also part of a larger **Lusaka Transmission and Distribution Rehabilitation plan (2013-2022)**²⁹, co-financed by the European Investment Bank, the World Bank and ZESCO Limited.

²⁸ The National Energy Policy 2019

²⁹ The objectives of the Project are to increase the capacity and improve the reliability of the electricity transmission system in the Lusaka area.

- ✓ **Increased Access to Electricity and Renewable Energy Production (IAEREP)** programme³⁰ aims at increasing access to clean, reliable and affordable energy through promotion of use of renewable energy (RE) and energy efficiency (EE) technologies. It is a EUR 40 million EU-funded programme set to run up to 2022. The programme is being implemented through three parallel lines of action which are:
 - I. Support to public institutions to develop and/or revise the legal and regulatory framework for deployment of renewable energies and energy efficiency in Zambia;
 - II. Building capacity of both public and private organisations involved in the deployment of renewable energy and energy efficiency; and
 - III. Providing early stage seed finance in the form of grant funding, through this call for proposal, for stimulating the emergence of sustainable business models for energy services to promote the use of renewable energy and energy efficiency at national level and incentivize private sector participation in the rural electrification programme.
 - ✓ Scaling solar
 - ✓ GETFiT programme

Specific targets for service level (hours of availability, maximum power/energy, etc.)

The government in 2021 adopted a new definition for access that will be used in the country. Access has been defined as “sufficient, reliable electricity from any energy source for lighting, phone charging, powering appliances, and operation for a minimum of 4 hours per day”³¹.

The SE4ALL AA states that “for urban areas, the selected trajectory assumes universal access by 2030, fully reflecting the global SE4All objectives. However, for the rural areas, preliminary modeling shows that such a universal target may not be realistically achievable within that timeframe. An access to electricity target of 51% in rural areas, including access provided by individual systems (i.e. SHS, solar lanterns), is more attainable in view of the specific challenges of rural electrification”.

According to World Bank's Multi-Tier Framework (MTF) Energy Access Household Survey:

- 56% of off-grid system (OGS) households fall in Tier 0 because of the limited capacity of their devices (less than 3W per day)
- One-third HHs in Tier 1 can power very low load appliances such as lighting and phone charging
- Majority of the OGS HHs can use electricity for 4 – 16 hours

The tier system reveals an opportunity of using energy efficient appliances like the rice cooker under Tier 3 (low power approx. 400-1000W); and a mix of rice cooker and an electric pressure cooker (1000W) under Tier 4 and 5.

The Ministry of Energy, through the Acting Director of Department of Planning and Information at the Energy Sector Advisory Group (ESAG) relaunch informed the audience that the ministry would undertake the first energy survey in 2022 and thereafter, undertake yearly surveys. It can be assumed that as more information will be collected during the annual energy surveys, and it will provide some more details about the hours of availability, maximum power/energy from the different energy sources their use and performance.

³⁰ <https://www.nao.gov.zm/2019/05/the-iaerep-programme/>

³¹ Definition revealed at the relaunch of the ESAG on 13 December 2021

Outlook of connection fees

The utility, Zesco, removed subsidizes on connection fees which resulted in an upward increase from ZMW1,700 to ZMW6,995 for high-density un-demarcated townships in 2021³². Further, Zesco also increased the cost of meter separation from ZMW750 to ZMW6,000. The ERB issued a call for the public to comment on the connection fees increment and this is still on-going (at the time of revising the report).

Subsidies, tax exemptions, utility loans/on-bill financing or micro-loans available to support connection fees for poorer/rural households

Subsidies are available for poorer/rural households under the Electricity Service Access Project (ESAP) with support from the World Bank. The objective of the project is to increase electricity access and enhance the enabling environment for accelerated electrification in Zambia. The 5 year project which was approved in 2017 will provide a connection of electricity to 22,000 low-income households and 1,000 medium and Small-Scale Enterprises in rural parts of the country. The beneficiaries will be connected to electricity through the main grid, at a subsidized rate of ZMW250.

Tariff structure for residential customers (e.g. fixed rate, rising block, declining block)

There are standard tariff structures in place for residential customers which were revised in 2019 for 2020-to-date. The tariff structure is as follows:

Table 10: Residential electricity tariffs³³

Tariff band	Units	Cost in ZMW
Residential 1 R1)	1-100kWh in a month	0.47
Residential 2 R2)	101-300kWh in a month	0.85
Residential 3 R3)	Above 300kWh	1.94

*Please note that the monthly fixed charge was abolished after 2019.

The electricity tariffs are set to be adjusted to be more cost reflective in the coming weeks in December 2021 or by January 2022.

Cross-subsidies/social/lifeline tariffs for poorer households

During the Covid-19 lockdown of 2020, the utility supported poorer households to buy electricity units by giving them 100units extra with whatever amount they were able to purchase that time. One criterion they used to identify these households was their purchase records. Therefore, households which normally purchased units below 100 units were given extra units.

Types of grid connections- pre-paid, post-paid or a mixture of the two

Residential grid connections in most locations around the country are pre-paid. An exceptional few are post-paid, never a mixture of the two.

³² <https://www.lusakatimes.com/2022/02/15/zesco-confirms-connection-fees-have-gone-up-from-k1700-to-k6000/>

³³ <https://www.nbventures.com/wp-content/uploads/2020/01/ERB-statement-on-tariff-revision.pdf>

2.2.4 Renewable energy

National targets for increasing the proportion of renewable energy and the policies that have been developed to enable this

There are targets/goals to generate 100 MW from solar, 200 MW from small hydro and 100 MW from biomass by 2030. In addition, it is envisaged that 500,000 solar home systems will be disseminated and 350,000 solar water heaters installed (SEforALL AA).

Policy and key reform: For the renewable and alternative energy sources, the Government aims to continue putting in place appropriate measures to promote the role of these energy sources in the national energy mix. And financing is premised on the roll out of investment in programmes such as Scaling Solar, and GETFIT.

Is there a feed-in-tariff that is applicable to residential-scale generation?

The Renewable Energy Feed-in-Tariff (REFIT) Strategy (of 2017) does not specifically mention residential scale generation but has an objective ‘to harness the renewable energy sector’s potential to drive economic growth and improve the quality of life for all Zambians which will be achieved through the promotion of small and medium-sized renewable energy projects of up to 20 MW.

2.2.5 Energy efficiency

Are there national targets for energy efficiency? If so, which policies have been developed to enable this and are there a government budget assigned to it?

The National Energy Policy (2019) is the guiding document on energy efficiency. This has also been emphasized in the SEforALL document.

The aim is to “promote efficient energy use through energy conservation and substitution”. Zambia is implementing energy efficiency initiatives which include promotion of efficient utilisation of energy services and switching to other alternative types of energy sources and technologies. Specific efforts have been on the development of energy performance standards developed for lighting, lamps, electric motors, and solar water heaters. Other standards such as for refrigeration are in the process of development. The Minister of Finance in his 2022 budget speech to parliament indicated that “In the electricity sub-sector, we will implement a Renewable Energy Investment Plan that will improve the energy mix. This will reduce our vulnerability to climate shocks by leveraging the declining cost of technologies to harness our vast solar resources, complemented by wind and geothermal energy”³⁴.

The following initiatives/activities related to energy efficiency at national level are currently been implemented:

- ✓ phasing out the use of incandescent bulbs in the country (Status: completed);
- ✓ Tax waivers have been introduced on importation of energy efficient equipment (Statutory Instrument 32 & 33 of 20080;
- ✓ introduction of prepaid metering system for public and private buildings;
- ✓ free distribution of Compact Fluorescent Lamps by ZESCO Limited (1million bulbs each year).
- ✓ So far in excess of 94MW realised;

³⁴ https://www.parliament.gov.zm/sites/default/files/images/publication_docs/BUDGET%20SPEECH%20_%202022.pdf

- ✓ Free Energy audits by ZESCO limited;
- ✓ Introduction of low power factor surcharge for large power users (industry, mining, agriculture); and
- ✓ Energy saving awareness campaigns, e.g. commemoration of annual energy Week.

These initiatives/activities are accounted for in the government budget.

Demand side management department/s in the national utility

The national utility, ZESCO has a demand side management unit under the Energy Efficiency department. Activities of the unit include:

- managing CFL distribution program;
- conducting energy audits and consumer awareness on energy usage;
- promotion of solar water heaters for households, SHS and Solar plants.

Time-of-use tariffs

Time of use tariffs are in place and are charged for maximum demand clients (MD 1 to MD4), and these tariffs were increased by 75% in September 2017. The maximum demand clients include farmers and industries that may be able to shift a significant portion of their daily electrical use to off-peak hours in exchange for a lower rate per kWh.

ZESCO proposed to maintain the TOU periods as follows:

- a) 18:00 hours to 22:00 hours Peak Time;
- b) 22:00 hours to 06:00 hours Off-Peak Time; and
- c) 06:00 hours to 18:00 hours Standard Time.

Subsidies, tax exemptions, utility loans/on-bill financing or micro-loans available to support consumer purchasing of energy efficient appliances (especially cooking appliances)

Solar and battery technologies were exempted from both import duties and zero-rated for VAT in 2008 with the enactment of two statutory instruments, SI 31 and 32. However, there have been a lot of inconsistencies in the application of the two SI and some companies operating in the market have reported having to pay taxes on occasional imported shipments. This is partly a result of the exemptions not being well defined. This led the association of solar dealers, acting with SAEP³⁵ and ACE-TAF³⁶ to develop a handbook which will aid the customs agents at border points when applying the instruments. The handbook was launched on 24th May. It should be noted that SI 31 and 32 were revoked and new SI amended and effected³⁷.

In terms of cooking appliances which have been considered for VAT exemption are the solar cookers/ovens.

LPG products specified as HS Codes 2711.11.00, 2711.12.00, 2711.13.00, 2711.14.00 and 2711.19.00; and gas stoves and other appliances that use gas of HS Codes 7321.11.00 and 7321.81.00 have zero rating relief in terms of taxes.

³⁵ Southern Africa energy Program

³⁶ Access to Clean Energy- Technical Assistance Facility

³⁷ Customs handbook For Solar PV Products in Zambia, April 2022

The Off Grid taskforce (OGFT) through their subcommittee on bioenergy have been engaging with various stakeholders to lobby for tax exemptions on clean cooking appliances that are imported into the country. This effort if successful will result in reduced prices on clean cooking appliances making them affordable for consumers.

The A2C project are also engaging the government for introduction of fiscal incentives for ATFs they are promoting in the country (on-going).

2.2.6 Mini-grid & off-grid systems

State of the mini-grid and off-grid electrification sectors

How many mini-grids/standalone systems are in operation, what are the key generation sources, who developed/operates them, how many people do they serve, what level of service do they offer, what tariffs do they charge?

There were 16 public, private and non-profit diesel, hydro and solar PV mini-grids installed or under construction in Zambia at the end of 2017.

Until recently ZESCO operated seven isolated diesel-based mini-grids (Table 6) but only two remained operational at the end of 2017. The two mini-grids are run from 06:00 – 24:00hrs. Older diesel stations have been decommissioned as the national grid is extended while newer isolated diesel systems may still be installed in off-grid load centres. ZESCO has undertaken two pre-feasibility studies for hybridisation of the diesel stations with solar PV²⁷

Table 11: ZESCO isolated diesel mini-grids as at end 2017²⁷

SITE	SIZE MW	MWh	STATUS
Luangwa	2.6	3,300	Operational
Shang’ombo	1.0	900	Operational
Kabompo	2.0	–	Recently decommissioned due to grid arrival
Zambezi	1.8	–	Recently decommissioned due to grid arrival
Lukulu	0.5	–	Recently decommissioned due to grid arrival
Mufumbwe	0.8	–	Recently decommissioned due to grid arrival
Chavuma	0.8	–	Recently decommissioned due to grid arrival

While Zambia has more than 10 years of experience with hydro- based mini-grids, only one is a private enterprise. A list of seven existing and one planned project is found in Table 12, with a total existing capacity of about 2.5 MW and less than 10,000 connections.

Table 12 Public and private hydro mini-grids²⁷

SITE	OWNER	STATUS	SIZE kW	DETAILS
Zengamina	ZPC	Operational since 2007	750	<ul style="list-style-type: none"> Supplies two RGCs in North-western Province Hospital, clinics, schools, telecom towers, farm, small businesses and 600 households 35 km of 33 kV and 10 km of 400 V network
Nyangombe	Church mission	Operational	73	<ul style="list-style-type: none"> Cooperative building, hammer mill and main residences
Lwawu	Church mission	Unknown	50	<ul style="list-style-type: none"> Mission building, hammer mill and household customers
Luena	UNHCR	Not functional as of 2015	24	<ul style="list-style-type: none"> Refugee camp, 64 household customers
Mangongo	Church mission	Operational	17	<ul style="list-style-type: none"> Church, clinic and 54 household customers
Shiwangandu	ZESCO	Operational since 2012	1,000	<ul style="list-style-type: none"> Targeted to supply 25,000 people in Chinsali 1,600 MWh generation in 2016
Kasanjiku	REA	Construction	640	<ul style="list-style-type: none"> Targeted to supply 12,000 people in Ntambu
Multiple	HEP Ltd	Planning	5,000	<ul style="list-style-type: none"> Development of a cluster of sites is planned

Note: ZPC = Zengamina Power Company, HEP = Hydro Electric Power

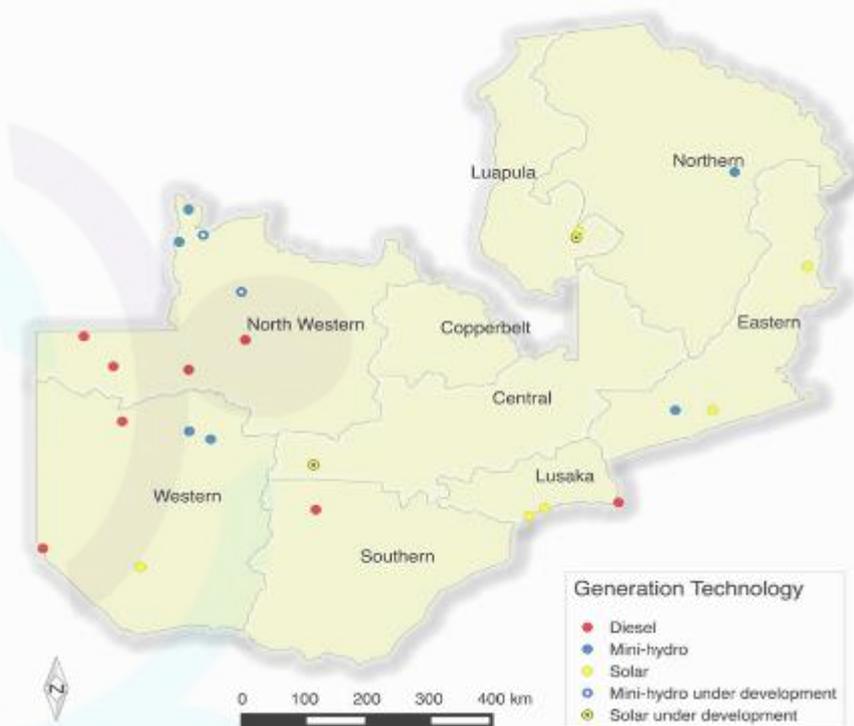


Figure 6: Map of existing and most advanced planned mini-grids in Zambia³⁸

³⁸ GETinvest Market Insights ZMB Mini-grid Guide 2019

Some solar PV mini grids have been setup by private sector companies, namely: Standard Microgrid, Engie PowerCorner and Muhanya Solar. Standard microgrid has 10, Engie PowerCorner has 1 and Muhanya solar has 1, bringing the number to 12 mini-grids. Other mini grids were/are been developed by the government through REA.

The successful interventions that have facilitated uptake of mini-grid and off-grid systems

There have been a number of funding opportunities for projects/programs to support implementation of mini-grid and off-grid systems. Among them are:

- African Development Bank is financing renewable energy projects
- *Beyond the Grid Fund for Africa (BGFA) which builds on the success of the pilot programme Beyond the Grid Fund for Zambia (BGFZ).*
- REA with assistance from UNIDO, the World Bank, etc. has been installing solar panels and SHS in selected places in Zambia. Their main targets are government clinics/hospitals and staff houses, chiefs palaces, schools and staff houses, offices and business entities.
- 100MW of solar photo –voltaics (PV) power project at Lusaka South Multi- facility Economic Zone (MFEZ). The project is being implemented through the Scaling Solar Programme spearheaded by Industrial Development Corporation (IDC)³⁹.
- One initiative that has seen some level of failure is the **Energy Service Companies (ESCOs)** in the Eastern Province of Zambia. Brief background is that the government had subsidised the capital cost for rural electrification. Some selected households in Nyimba, Chipata and Lundazi were given 400 Solar PV Home Systems on a loan basis and were expected to pay back at a discounted rate after which they were to assume ownership of the systems. It was envisaged that the proceeds would be used by government as a revolving fund to procure more solar PV systems.

2.2.7 Business models



Figure 6: Electricity units are sometimes sold at small booths in Zambia, alongside airtime vouchers for mobile phones.

³⁹ <http://www.idc.co.zm/article/zambia-be-net-exporter-energy-18-months-president-lungu>



Figure 7: Charcoal is often sold in small quantities by roadside food vendors. If they were to sell vouchers for just enough units to cook the beans they are selling, the difference in cost between the amount of charcoal and the amount of electricity you need to end up with the same tasty cooked beans would be much clearer.

Savings groups have become a popular trend in Zambia. These groups involve people (usually women) with the aim to save, borrow and learn. They are informal groups but have laid down rules which are followed to the latter. No collateral is required. Women contribute an agreed amount of money and when the funds have matured, they can get some loans just like in the banks. Some groups have added value to the way they ran their groups by recruiting people with ideas on how to conduct business activities such as poultry, sewing, crafts, etc. Others teach fish farming and cookery.

The savings groups provide an opportunity for dissemination of the ecook message if they have activities like cookery and facilities of providing loans. This is so because when the members learn about ecook, they can get loans from the group to enable them purchase the appliances/fuels. The savings groups are in churches, workplaces, business places and communities.

Policies which currently enable/inhibit mini-grid/off-grid electrification

Are mini-grids legally allowed to operate? If so, can they be privately owned and are they allowed to charge a different tariff to the national grid?

Mini-grids are allowed to operate and can be privately owned. For example, Zengamina Power Limited (ZPL) in Ikelenge, North Western Province and Chitandika solar mini grid are privately owned. Privately owned mini grids are allowed to charge a different tariff but it has to be approved by the Energy Regulations Board (ERB). Off-grid systems are also allowed to operate and can be privately owned.

National targets for mini-grid/off-grid electrification and the policies that have been developed to enable this

The following information is derived from SDG7 Energy Compact for Zambia: A next decade Action Agenda to advance SDG7 on sustainable energy for all, in line with the goals of the Paris Agreement on Climate Change document⁴⁰.

⁴⁰ Zambia Final Compact Template 2308

Table 13: Actions to achieve the ambition focus, outcomes and financial needs³⁷.

AMBITION	OUTCOME	REQUIRED RESOURCES AND SUPPORT	PERIOD
Ambition 7.1 & 7.2 - Scaling up access to electricity. Energize Zambia, Installation of 50,000 Solar Home Systems (2.5 million people)	Energize Zambia, Installation of 50,000 Solar Home Systems	Total Funding required \$2,500,000 Funding Secured: \$400,000 Gap finance: \$2,100,000	2018-2022
Ambition 7.1 & 7.2 - Pay as You go Solar Home Systems has spread to 10 provinces with the aim of providing high quality solar home systems to off-grid rural Zambian households	100,000 installations	Total Funding required \$2,300,000 Funding Secured: \$300,000 Gap finance: \$2,000,000	2017-2021
Ambition 7.2 - GET FiT Zambia is designed to assist the Zambian Government in the implementation of its REFIT Strategy and aims to procure and support Independent Power Producer (IPP) projects up to 200 MW, 100 MW solar PV, 100 MW small hydro & providing for a 3-year REFIT micro-generation allocation of initially 5 MW	120 MW solar 100 MW hydro	Total funding required: Aprox. 100 million Euros, funding secured 33.5 Million Euros, financing Gap: Aprox. 60 Million	2017 - 2024
Ambition 7.1-7.3 - The Increased Access to Electricity and Renewable Energy Production (IAEREP) project is in its final stage, providing early-stage seed finance in the form of grant funding to stimulate the emergence of sustainable business models for energy services to promote the use of renewable energy and energy efficiency at the national level and encourage the private sector to participate in the rural electrification programme.	Financing of six projects, improving the electricity supply to 200,000 Zambians. Provide over 50,000 people and 500 small and medium-sized enterprises with access to energy.	Total funding required:\$112, 616,200 Funding secured: 40 million euros	2016-2024
Ambition 7.1, 7.2: The Beyond-the-Grid Fund, Zambia -aims to accelerate off-grid renewable energy electricity access to at least one million Zambians by 2021 targeting rural and peri-urban areas. It is an initiative for renewable energy investments outside the national power grid in Zambia. BGFZ aims to speed-up market access and market development,	300,000 off-grid electricity connections bringing clean energy access to 1.6 million people across Zambia. Report outlining the efficacy of Results-	Funding secured: 20 million euros	2017-2025

AMBITION	OUTCOME	REQUIRED RESOURCES AND SUPPORT	PERIOD
<p>promoting the development of energy services targeted to poor consumers who already spend a high proportion of their disposable income on substandard forms of energy.</p> <p>BGFZ provides results-based financing to de-risk companies' entry into the Zambian market. To do this, the project works with the Zambian government and other stakeholders to build a more off-grid business-friendly regulatory environment.</p> <p>The Scaling of Clean Cooking Solutions programme. The first phase is to carry out a detailed scoping in Zambia looking into ways to test the use of Results-Based Financing (RBF) to incentivise the development and sales of innovative clean cooking solutions at scale. The second phase will include proposals for the detailed design of publicly financed instruments to incentivise the clean cooking sector to offer higher tier cooking solutions whilst mobilising private financing sources</p>	<p>Based Financing to incentivize the development and sales of innovative clean cooking solutions at scale.</p> <p>Proposals developed for the detailed design of publicly financed instruments to incentivize the clean cooking sector to offer higher tier cooking solutions whilst mobilizing private financing sources.</p> <p>GOAL, number of cooking stoves?</p>		
<p>Ambition 7.1 Scaling biogas installations, Installation of 3500 domestic digesters</p>	<p>3,500 4m2 domestic digesters</p>	<p>Total funding required:\$3,454,000 Funding secured: \$0</p>	<p>By 2025</p>
<p>Ambition 7.1 & 7.2 - Electrification - this is an EU-supported financing mechanism aimed at supporting the market development and private sector initiatives for affordable, sustainable, and reliable energy solutions. The facility is flexible in its ability to provide a range of financing instruments at several stages of investment maturity, and offers investments of up to €10 million.</p>	<p>(Target TBD)</p>	<p>Total funding required: Funding secured: 40 million euros</p>	<p>By 2025</p>
<p>Ambition 7.1 REACT Window of the Africa Enterprise Challenge Fund (AECF)-this is an FCDO-supported program that aims to increase access to clean, affordable energy for low-income people in Africa, by promoting a market-based approach for private sector delivery of solar home system products and services in the target countries. With a commitment of US\$ 10 million (£8 million), REACT Round 1 was launched in May 2017, and</p>	<p>(Target TBD)</p>	<p>Funding secured: \$10 million</p>	<p>By 2025</p>

AMBITION	OUTCOME	REQUIRED RESOURCES AND SUPPORT	PERIOD
has funded ten companies operating in four countries, including Zambia.			
Ambition 7.2: (Scaling- Up Renewable Energy Programme, SREP) - 100 MW, Scaling-Up Renewable Energy Programme (SREP) is a funding window of Strategic Climate Fund with a budget of up to USD 40 million, which operates under the Climate Investment Funds (CIF) and aims to support scale up of green energy programs and increasing access to electricity, including wind and geothermal	Wind 100 MW, Geothermal 2.2 MW, energy access in rural and peri-urban area	Total funding required: \$62 million, Funding secured: \$1.12 million, Funding Gap: \$60 million	By 2030
Ambition 7.1 & 7.2: The Electricity Services Access Project (ESAP), supported by the World Bank. The objective of the project is to increase electricity access in targeted rural and peri-urban areas and enhance the enabling environment for accelerated electrification in Zambia. The project will comprise three components namely; on-grid electricity access expansion, off-grid electricity access expansion and technical assistance	Will provide a connection of electricity to 22,000 low income households and 1,000 medium and Small Scale Enterprises in rural parts of the country.	Total funding required: \$ million, Funding secured: \$2.5 million, Funding Gap: \$ million	2017-2025
Ambition 7.1 & 7.2: Solar for Health (S4Health) - UNDP's Solar for Health initiative supports governments to increase access to quality health services through the installation of solar energy photovoltaic systems (PV), ensuring constant and cost-effective access to electricity, while also mitigating the impact of climate change and advancing multiple Sustainable Development Goals.	Electrification of approximately 941 health clinics with solar energy by 2030	Total funding required:\$4.7 Million USD Secured: 0 Gap: \$4.7 Million USD	2030
Ambition 7.2: Bwengwa River Geothermal Project	48,881MWh per annum over 20 years (Geothermal)	Total Funds required: \$60 Million; Funding Secured: \$5.5 Million	By 2030
Ambition 7.2 Alternative Renewable Energy Programme (AREP) is run by the Industrial Development Corporation, which is the continuation of the Participation in IFC Scaling Solar, a World Bank Group program that is	400MW (solar and wind)	Total Funds required: \$600 Million Funds	By 2030

AMBITION	OUTCOME	REQUIRED RESOURCES AND SUPPORT	PERIOD
<p>helping developing countries procure low cost, privately financed, solar power. The Industrial Development Corporation. It is designed to get fast, affordable, utility-scale power up and running within two years of engagement</p>		<p>secured \$30 Million Gap: \$570 Million</p>	
<p>Ambition 7.1 & 7.2 Increased Access to Electricity and Renewable Energy Production (IAEREP) is supported by the European Union and is aimed at increasing access to clean, reliable and affordable energy and promoting renewable energy production and energy efficiency across Zambia</p>	<p>20MW (mini grid and off-grid solutions)</p>		<p>By 2025</p>
<p>Ambition 7.2 Mini hydro projects - feasibility, construction, commissioning, upscaling of small hydropower and mini grid development</p>			<p>2030</p>
<p>Ambition 7.3 Power Factor Correction Programme DESCRIPTION - German funding GIZ, 40 million usd, need more funds to actualise, in design phase, offsetting carbon project</p>	<p>194,331 MWh/year distribution savings, 2,596 MWh/y transmission savings</p>	<p>Total funds required: Approx. 100 Million euros; Funding Secured: 40 Million Euros</p>	<p>By 2030</p>

The National Energy Policy (2019) is the guiding document for mini-grid/off-grid electrification. The REMP provides a blue-print for their development. The Rural Electrification Fund provides part of the resources for renewable energy development projects (from government budget and international funding).

Service level (hours of availability, maximum power/energy, specific energy services, etc. of target mini/off grid systems) The targets which are usually specified are the population that the project envisages to reach and the size of the plant as shown in Table 12 on Public and private hydro mini-grids.

Subsidies or tax exemptions exist for mini-grids/off-grid systems or key components (solar panels, batteries, controllers, inverters, chargers etc.

Tax waivers for importation of energy efficient equipment such as Solar Photovoltaic modules; deep cycle batteries, solar water heaters, energy efficient lights, solar lights and solar pumps used for irrigation are currently in place.

2.3 Cross cutting issues

2.3.1 Electrification/clean cooking crossover

The overlap between the clean cooking and electrification sectors (e.g. SHS suppliers also selling improved cook stoves, energy efficiency programs targeting electric cooking)

There are many opportunities for integrating clean cooking with electricity into ongoing electricity sector reforms. Taking, for example, stated objectives from the NEP2019:

- Promote alternative energy to wood fuel – although the narrative in the Zambian context focuses on sustainable biofuels, there is an obvious opportunity to promote the use of electric cooking as an alternative;
- Exploitation of renewable energy – mini-grids is an example of the implementation of renewable energy described, and there is interest among mini-grid developers to promote electric cooking as a ‘productive’ use of electricity to increase demand and revenue. From the households’ point of view, transition to the use of renewable energy offers many benefits such as relieving people, particularly women and children of the time spent completing household activities manually without the aid of electricity, and the drudgery and health problems associated with the collection and use of woody fuels⁴¹
- Increase access to electricity (especially in rural areas) – the last customers to be connected tend to yield lowest revenue; utilities have an interest in promoting electric cooking as a means of maximizing impact of access to electricity as well as increasing revenue.

⁴¹ Mudenda et al. 2018

- Gender, climate change, health and safety – although not specified in the narrative, all four of these issues are directly impacted by electric cooking.

The Integrated Resource Plan report describes a number of electrical demand assessment activities, each of which recognizes the potential impact of adoption of electric cooking on demand and its implications for infrastructure planning:

- Cost of Service study
- Least-cost geospatial electrification plan
- National electrification strategy

A few solar dealers are selling SHS alongside improved cook stoves. These solar dealers include Vitalite, Climate Management Limited and Supamoto (formerly Emerging Cooking Solutions, ECS). But in most cases, solar dealers are only specialized in solar products.

Currently, there are no energy efficiency programs that are targeting electric cooking but efforts are being made to promote efficient use and production of charcoal, improved cook stoves, LPG for cooking and heating⁴²

2.3.2 Gender

Cooking is typically a task that women engage in, and understanding the barriers to and opportunities of a transition to electric cooking from a woman’s perspective helps to shed more light on the pattern of uptake and use of electric cooking appliances. Taking a gender perspective means we can look at how decision-making around purchase and use is distributed between the sexes and how access to resources and aspirations influence the adoption of electric cooking by disaggregating between men and women as both customers and users of electric cooking appliances.

Roles of women and men in society

Zambia has made significant strides in mainstreaming gender over the past decade; and has a woman as vice president, as well as women ministers in several strategic portfolios such as the Ministries of Information and Broadcasting, Health, Community Development and Labour. Women have also been taking seats in quasi-public institutions and in the private sector. This includes the banking sector, as well as the Anti-Corruption Commission office, among others.

Overall in Zambia, women’s decision-making power in daily household purchases is relatively high. 57% of married women age 15-49 make decisions alone and 29% make decisions jointly with their husbands. However, when it comes to decisions on major household purchases, women’s participation in decision-making drops sharply. Although the majority of women make decisions jointly with their husbands (56%), there are significantly more husbands that make decisions alone (32%) compared to wives (12%)⁴³. In female-headed households, the women make all the decisions.

⁴² zambia_-_workshop_energy_efficiency_nairobi.pdf 2015

⁴³ Zambia Statistics Agency, Ministry of Health (MOH) Zambia, and ICF. 2019. Zambia Demographic and Health Survey 2018.

Gender differences in the decision to purchase improved cookstoves is more contextual and dependent on residence. In urban areas, female members (58%) tend to make decisions regarding purchasing cookstoves, while in rural areas male members (56%) usually make the decision⁴⁴

Education levels of women and how this compares to men

The Gender Status Report- Zambia 2017- 2019 reports on the gross enrolment rate which is an indicator of the total enrolment of learners in a specific level regardless of age, in a particular year, expressed as a percentage of the official school-age population for that level. A negative gender gap value indicates that girls' enrolment was lower than that of boys and vice versa. Ideally, the gender gap is supposed to be zero; indicating that there are no enrolment inequalities between the sexes. In 2017, the national GER for primary education enrolment was 90.3 per cent for girls and 93.4 per cent for boys, giving an absolute gender gap of 3.1 percentage points; whereas the secondary enrolment gap was 3.1 and -1.7 percentage points in 2017 and 2018, respectively

Initiatives to empower women

The National Gender Policy (2014) ensures the attainment of gender equality in the development process by redressing the existing gender imbalances. It also provides for equal opportunities for women and men to actively participate and contribute to their fullest ability and equitably benefit from national development.

Several measures have been put in place to promote women's empowerment notable among these is Gender Equity and Equality Act No. 22 of 2015, which is aimed at domesticating international human rights instruments such as the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) (adopted in 1979); the SADC Protocol on Gender and Development (2008); and the Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa (2003) .

Empowering women in agriculture is one way of enhancing food security and increasing household incomes and agricultural productivity. Several programmes are underway with the aim of empowering women to participate in agricultural activities, including the Agriculture Development Through Value Chain Enhancement project. The ADVANCE project started in 2015 and is still ongoing. The project aims to empower women in rural agriculture, encouraging them to leverage existing social capital schemes by joining or forming cooperatives and to use mechanized forms of agriculture⁴⁵.

The Girls' Education and Women's Empowerment and Livelihood (GEWEL) project is an economic empowerment programme, aimed at empowering 75,000 women in 51 rural districts with entrepreneurial skills and start-up capital worth \$225 per beneficiary. The purpose is to contribute towards increasing women's access to finance and enhancing their participation in the economy; and to alleviate women's poverty. Since its inception, a total of 74,998 women in 51 districts have benefited from this programme⁴¹.

The government continued facilitating the Microcredit Scheme for vulnerable women, to empower them to develop and grow business skills for survival, while stimulating savings and financial inclusion at the community level⁴¹.

⁴⁴ World Bank. 2018. ZAMBIA | Beyond Connections: Energy Access Diagnostic Report Based on the Multi-Tier Framework

⁴⁵ Zambia Gender Report 2017-2019

The U.S government set up the Women’s Entrepreneurship Access Center (WEAC) Zambia aimed at promoting entrepreneurship and women’s empowerment to help Zambia create a better economic future.

The New Dawn Administration which came into power in 2021 stated in their budget speech that under “Social Protection, interventions that will be scaled up include the Girls Education and Women’s Empowerment and Livelihood Programme”⁴⁶. Also in the 2022 budget, the government allocated ZMW 803,085,220 for Youth and Women Empowerment.

Electrification or clean cooking initiatives specifically targeting women as entrepreneurs, as well as end users

Electrification or clean cooking initiatives have targeted women particularly as end-users.

The Draft Gender Strategy and Action Plan of 2021 reports that “there is limited data on women’s participation as entrepreneurs in the energy sector in Zambia. The ERB, the institution mandated to issue licenses to energy operators and conduct regular compliance monitoring, does not collect sex-disaggregated data on majority shareholding (female/male owned) and management (male/female headed) of energy operators and other licensees in the electricity and petroleum sub-sectors. There is currently no known developer or Cooperating Partner (CP) that applies the gender supportive provisions in the procurement laws to promote the participation of energy companies owned or managed by women”. But what is documented is “men and women’s role in charcoal production and distribution, which provides job opportunities for close to 218,000 persons in Zambia. Whereas men are predominantly involved in charcoal production (95%), women tend to be overrepresented on the supply side. The majority of the wholesalers were women (58.1%) as well charcoal retailers (70%).”

The Draft Gender Strategy report goes further to indicate that “The challenges to women’s entrepreneurship in the energy sector are in many ways similar to other sectors such as discrimination due to the dual legal system (customary and statutory law), lack of voice and influence, limited business skills and access to finance, and sexual harassment and gender-based violence.”

National gender equity targets and the policies that have been developed to enable this

The national vision set out in the Zambia Vision 2030 is the achievement of “Gender equity and equality in the socio-economic development process by 2030”. The targets/goals are focused on the reduction/elimination of gender imbalances and inadequacies associated with provision of services such as education, health, credit facilities and land ownership.

The Integrated Resource Plan Inception report (2021) states that a gender and inclusive energy sector is essential noting that “Access to clean and efficient cookstoves improved women’s and their families’ health due to a reduction in air pollution from burning biomass as fuel”.

The NEP (2019) has an objective of mainstreaming gender, climate change, health and safety into the energy sector and the development of a strategy and action plan are listed as activities. The Gender Strategy and Action Plan for the energy sector was developed in 2020/2021 and is due to be launched in 2022. The Strategy has a specific action plan on the access and use of clean energy (for domestic and productive use) which targets women, as the uses of the fuels/technologies, and men, who in most

⁴⁶ https://www.parliament.gov.zm/sites/default/files/images/publication_docs/BUDGET%20SPEECH%20_%202022.pdf

cases are the decision makers. Activities, including indicators for tracking progress have also been mentioned accordingly.

The Zambia Renewable Energy Financing Framework project, funded by African Development Bank (AfDB) and Green Climate Fund (GCF), is the only known initiative in Zambia that might be incorporating a gender perspective on energy financing. The framework, which will finance 100 MW RE projects and provide technical assistance (TA) to finance institutions to improve RE financing, has a gender action plan of the project that among other things includes training of financial institutions in gender responsive climate finance⁴⁷.

There are many opportunities which exist to influence policy programmes and projects with the aim of meeting the targets/goals that have been set in the NEP (2019). The activities outlined in the Draft Gender Strategy, speak more to addressing clean cooking and need to be encouraged.

2.3.3 Business & finance

Key contextual factors that enable and constrain the development of new and existing businesses

- **Financing:** This is a major factor that enables or constrains development of businesses. This is because of high interest normally charged by the banks making it difficult for individuals to acquire loans. In other cases, the collateral sought by the commercial bank is not in the possession of the individual. Micro-financing institutions could finance all kinds of small businesses but need guarantee to keep running.
- **Lack of advertising:** businesses do not put much effort and to some extent money into advertising their products and services. Well-advertised products and services have a wider market.
- **Consistence:** Some businesses are not consistent with operation and supply of products and services. This somewhat discourages the customer.
- **After-sale service:** Most customers warm up to follow-ups and any after-sale service offered, especially on electrical products. Follow-up which include new technology information or ways to better use an appliance keep the customers and business running.
- **Flexible payment scheme:** Pay-as-you-go, instalments, etc. systems which allow the customer to 'breath' is most preferred. But these can be damaging to small businesses as income needs to be constantly flowing to keep the business afloat.
- **Taxes:** It has been noted that most imported products are taxed while local products are not. This is true for ICS. Maybe a fair playing field on such products could make the products more competitive.

Government or market-based financing facilities designed to support developers of mini-grids/off-grid systems and/or manufacturers/retailers of cleaner cook stoves

Table 13 above shows some programmes and projects that are currently taking place which are providing some financing facilities designed to support developers of mini-grids/off-grid systems and/or manufacturers/retailers of cleaner cookstoves.

⁴⁷ Draft Gender Strategy and action Plan 2021

Notable among the examples listed in Table 13 is the Electricity Services Access Project (ESAP) which is supported by the World Bank with an objective of increasing electricity access in targeted rural and peri-urban areas and enhance the enabling environment for accelerated electrification in Zambia. The project will accomplish this through on-grid electricity access expansion, off-grid electricity access expansion and technical assistance. This is an example of a project that has subsidised the cost of connection to allow low income households and small scale enterprises to access electricity

Specific government or market-based financing facilities designed to support consumers of cleaner cook stoves/mini-grids/off-grid systems (e.g. village banking systems, community revolving funds, pay-as-you-go solutions, nationally subsidy programmes)

There are a number of specific government or market-based financing facilities available for mini-grid/off-grid systems. However financing facilities for consumers of cleaner cookstoves only started with programmes supported by the BGFZ programme allowing consumers to purchase on PAYGO. This is still a growing market which needs to spread to other cleaner cookstoves like for electricity and LPG which have been sold on cash basis since time in memorial.

How developed is the mobile money industry?

Mobile money is well developed and is becoming more popular as a means to transfer money, make payments, save and borrow money. The off-grid market has been using the mobile money facility to enable customers make payments for their products and services. Currently, the utility has a provision that allows customers to purchase their electricity units using mobile money services on most networks. This also provides an opportunity for the ecook to allow customers pay for their products and services on PAYGO using mobile money facility.

Organisations using mobile money to allow their customers to make repayments on cleaner cook stoves/mini-grids/off-grid systems

The table below shows the companies which are currently using mobile money to allow customers make repayments on cleaner cook stoves/mini-grids/off-grid systems

Table 14:

Company name	Service
Fenix International/Engie PowerCorner	SHS
Vitalite Zambia	SHS, agro- products and stoves
Supamoto	SHS and stoves

Mobile money is more popular in the SHS market as the solar companies first saw this as an opportunity to provide financing models to enable their customers, especially poorer households, to acquire the systems which have been perceived to be expensive.

Mobile money is the only means by which Fenix/Engie customers are allowed to make repayments. Fenix/Engie also own the majority share of the off-grid solar market in Zambia.

2.3.4 Demographics

Number of people living in urban/rural areas and how this balance is changing

The population of Zambia in 2016 was 15, 510, 711. Of this, 58.62% was reported to be rural population (World Bank).

The table below shows the population of people living in rural and urban Zambia since 2017. The urban population is calculated using World Bank population estimates and urban ratios from the United Nations World Urbanization Prospects. The rural population is calculated as the difference between total population and urban population. Aggregation of urban and rural population may not add up to total population because of different country coverages⁴⁸

Year	Rural	Urban	Total population	Growth rate ⁴⁹
2022			19,470,234	2.9
2021			18,920,651	2.92
2020	10,179,380	8,204,576	18,383,955	2.93
2019	9,989,319	7,871,715	17,861,030	2.94
2018	9,800,075	7,551,639	17,351,714*	2.87*
2017	9,610,601	7,243,007	16,853,608*	8*

Value with (*) have been calculated to complete the table and estimate growth rate.

It can be seen from the table that there was a high increase in population between 2016 and 2017. The growth rate started reducing from 2018 to 2022. Another observation is that there are more people in the rural compared to urban areas.

In the previous report, we had mentioned that 4% of the rural population access to electricity (possibly of different forms). According to the latest statistics presented in December 2021 by the MoE, the rural population with access to electricity stands at 8.4% and 75% for the urban areas.

2.3.5 Climate

Monthly average temperatures and how they vary across the country

Table 14: Average monthly temperatures for Zambia for the period 1991- 2015⁵⁰.

Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Temp	23.3	23.5	23.4	22.3	20.5	18.3	17.8	20.4	23.4	25.4	25.1	23.9

Zambia generally experiences 6-8hrs/day of sunlight. The country has an average 2000 - 3000 hours of sunshine per year And an average irradiation is 5.5 kWh/m²/day, with northern areas recording the highest global solar irradiation

⁴⁸ Zambia Rural Population 1960-2022 metrotrends.net/countries/ZMB

⁴⁹ Growth indicated as increase from the previous year which is the row below

⁵⁰ The dataset from which the table above was produced by Climatic Research Unit of University of East Anglia - http://sdwebx.worldbank.org/climateportal/index.cfm?page=country_historical_climate&ThisCCCode=ZMB

of 2300 kWh/m²/year. There are plans for developing renewable energy which is targeting on-grid 200 MW – Get Fit (supported by REFIT Strategy) and 600 MW in the Scaling Solar Program

Zambia experiences a predominantly sub-tropical climate characterized by three distinct seasons: a hot and dry season (mid-August to mid-November), a wet rainy season (mid-November to April) and a cool dry season (May to mid-August).

Zambia’s climate has been considered favourable and the heat/cold experienced may not cause damage to batteries in cases where households opt to use batteries for the electricity.

The cool season is characterized by space-heating while cooking is underway. In rural areas, families that stay up late after meal times gather outdoors around a fire for story time.

The introduction of eCooking however brings a new perspective where cooking is done indoors. The LPG stove normally heats up the room and can therefore keep the family warm while cooking is taking place. There is no heat lost to the surrounding when an EPC is used for cooking. But the comfort of preparing meals indoors saves the family from lighting or making fires to keep warm,

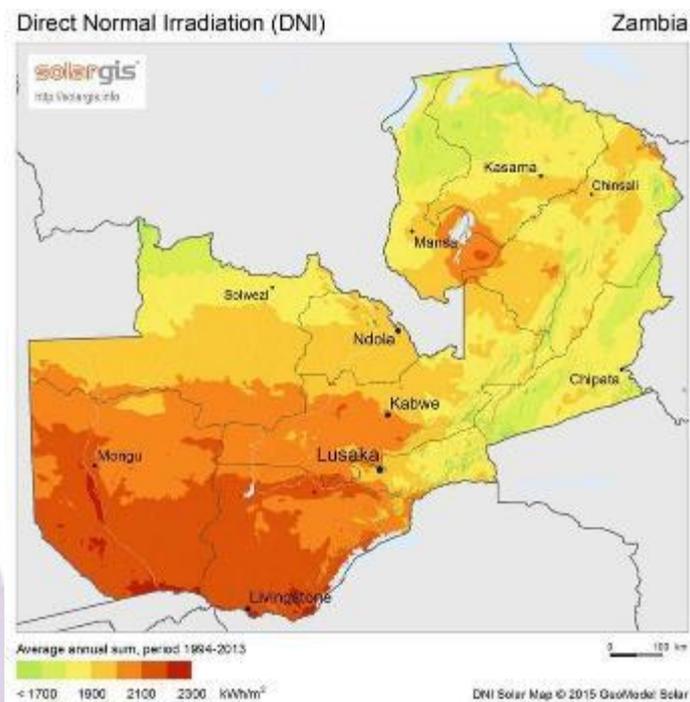


Figure : Solar Irradiation in Zambia (kWh/m²).

As shown in the figure above, Zambia generally has good weather and does not experience extended cloudy periods

The key hydropower resources

The key hydro power resources are located in the southern part of Zambia. These are Kariba dam, Itezhi-tezhi dam, Victoria Falls and Kafue gorge. And there are two main rivers that pass through these hydro power sources, namely Zambezi and Kafue.

The potential for micro-hydro powered mini-grids and what are the limitations due to seasonality

In the Rural Electrification Master Plan Study, development of micro hydro power plants was considered to be an option to enhance rural electrification in some remote areas in Zambia. According to the estimate of some preceding studies, Zambia has a potential of hydropower generation of more than 6,000 MW and only 1,700MW out of that has been developed so far.

Information was obtained from District Planners through the Rural Electrification Workshops held in each Provincial centre. There were two main conditions to determine the existence of hydropower potential, namely the certain volume of water flow and the effective elevation gain of waterfall thus the information regarding the existence of waterfall around the un-electrified rural growth centres (RGCs) indicating the possibility of electrification through micro hydropower.

- The proposed sites in the REMP suggest that North-western, Northern, and Luapula Province may have a lot of Micro-hydropower potential sites.
- The 3 proposed sites are situated in areas which have a lot of water from rivers and lakes. These areas also experience a lot of rainfall with minimum impact even when the country experiences erratic rain seasons.

3. Conclusion

Most recently, more international partners have joined the clean cooking campaign and are advocating for cookstoves of higher tiers starting from Tier 3, focusing on electricity, LPG and biofuels. The increase of stakeholders in the clean cooking realm has helped to re-establish important agencies such as the MoE's Energy Sector Advisory Group which are inclusive of key decision makers. The increased interest in clean cooking coinciding with the clean energy agenda provides an opportunity to change the narrative at top-down level for accelerated impact on the population. Nonetheless there continue to be barriers in the clean cooking sector, particularly when it comes to addressing past issues such as poor grid connectivity, while at the same time proposing an ideal fuel mix for Zambia. For example, to date, there have been few clean cooking projects looking at electric cooking, as ZESCO are actively encouraging their users to switch to LPG in an attempt to reduce the loading on the grid and prevent further load shedding. However, LPG is a fuel that is not accustomed to consumers meaning the 60% modern fuel target [with LPG as the majority percentage] a steep uphill climb. Moreover, due to the preceding electrification issues, overtime resource management had not run in parallel with cooking technologies- leading to lack of awareness of energy-efficient cooking devices, which could reduce cooking load on the grid, and allow consumers to cook in a cost-effective manner. There continues to be a barricade between energy and cooking, to which both must strongly associate with the other to attain government targets. Clean cooking crosscuts into various sectors of development agendas, such as gender, environment, health and energy; yet it lives in the shadows of government policies.

The findings from this national policy and markets review will be combined with those from the other activities that have been carried under the eCook Zambia Market Assessment. Together they will build a more complete picture of the opportunities and challenges that await this emerging concept. Further outputs will be available from <https://elstove.com/innovate-reports/> and www.mecs.org.uk.

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5. Appendix

.2 Appendix A: Policy/markets review framework

For all factors, what is their current status and what is the likely future direction? How do trends vary across the country, particularly from urban to rural areas?

.2.1 Clean cooking

What is the state of the clean cooking sector?

- Who are the key government, NGO, research & private sector actors in the clean cooking sphere and what are their roles?
- What is the national cooking energy mix (i.e. how many people primarily cook with firewood, charcoal, kerosene, LPG & electricity)?
 - o How is this changing?
 - Which successful interventions have facilitated transitions to cleaner cooking solutions? Which have failed and why?
 - How many biomass users have adopted improved stoves?
 - How and where are improved stoves manufactured?
 - o What are the most popular cooking appliances?
 - How compatible are the popular electrical appliances with battery- supported electricity?
 - o Are there national fossil fuel reserves? If so, how significant are they and how are they exploited?
 - What do people cook and how do they cook it?
 - o How does this vary across the country?
 - o Is this changing?
 - How many people are suffering from acute respiratory illnesses due to cooking on polluting fuels?
 - o What initiatives have addressed this? How successful have they been?
 - How severe is deforestation?
 - o What initiatives have addressed this? How successful have they been? Which policies currently enable or constrain the roll out of cleaner cooking solutions?
 - Are there any specific targets for the quality of clean cooking solutions and the number of people who should gain access to them by a certain date?
 - o If so, what policies have been developed to enable this and is there a government budget assigned to it?
 - Is there a national biomass energy or cleaner cooking strategy?
 - o Is charcoal production/transportation/wholesale/retail legal? If so, is it taxed and by how much? If not, how does the sector get around the law?

- Are there national targets to reduce the incidence of acute respiratory infections?
 - If so, which policies have been developed to enable this and is there a government budget assigned to it?
 - Does cooking contribute towards national targets for nutrition, maternal health, etc.?
- Are there national carbon emissions reductions targets?
 - If so, which policies have been developed to enable this and is there a government budget assigned to it? Do they specifically mention cook stoves?
- Is kerosene or LPG use for cooking encouraged or discouraged by current national policy?

