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ENHANCING ELECTRICITY SUPPLY ACCESS IN CAMEROON THROUGH SOLAR ELECTRIFICATION

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ABSTRACT

This paper seeks to address electricity issues (reliability, accessibility and security) in Cameroon by bringing to limelight the potentials and possible meaningful contributions of solar electrification in supplementing and thereby resolving the electricity problems of low access rate and frequent interruptions. In order to achieve this objective, a review of the energy sector (energy balance, energy source, energy situation, electricity access, electricity demand and supply) is reviewed, as well as a review of the solar energy potential, policy, benefits and barriers in Cameroon. In addition, this paper introduces the electricity roadmap of Cameroon to achieve an improved electricity access rate which will pave the way for the country's emergence by 2035. It is found that the solar electricity sector of Cameroon holds promising possibilities for development and diversification, taking into consideration the country's solar irradiation resource. With adequate policy, standards, regulations, awareness, capacity building in off-grid renewable energy investments in the solar electrification domain, it is possible for Cameroon to meet the future electricity access target rates and ensure meaningful development throughout the country.

Keywords: Electricity interruptions, solar electricity, photovoltaic, electricity access, development.

1. Introduction

1.1 Country location and description

Cameroon is a sub-Saharan African country. According to the World Bank (2018), it is a lower-middle-income country with a population of over 25 million. Figure 1 shows its location along the Atlantic Ocean, sharing borders with the Central African Republic, Chad, Equatorial Guinea, Gabon and Nigeria. Two of its border regions with Nigeria (northwest and southwest) are Anglophone, while the rest of the country is Francophone.

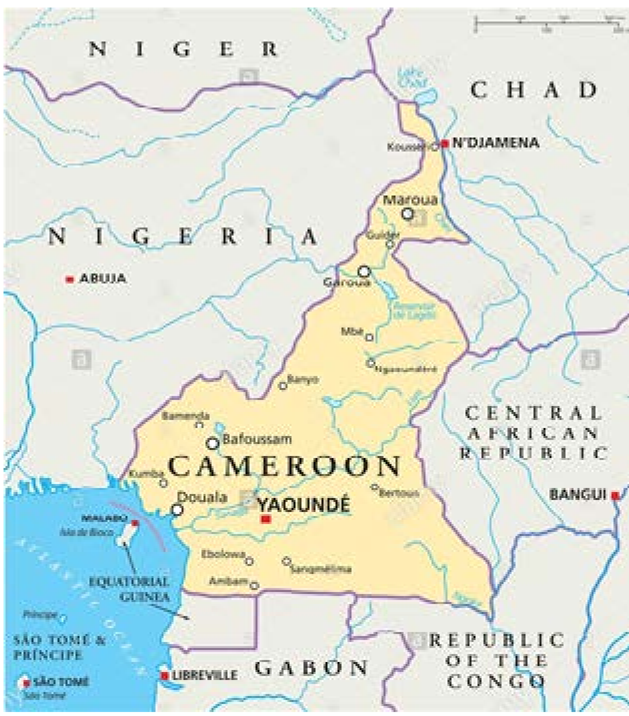

Figure 1: Geographical map of Cameroon

Cameroon is endowed with rich natural resources, including oil and gas, mineral ores, high-value species of timber, as well as agricultural products such as coffee, cotton, cocoa, maize, and cassava. According to the World Bank (2021), Cameroon is the largest economy in the Central African Economic and Monetary Community (CEMAC), a region experiencing an economic crisis triggered by the steep fall in oil prices. Along with its CEMAC partners, Cameroon has therefore had to put fiscal adjustment measures in place to adjust to the terms of the trade shock and restore macro-stability and confidence in its currency.

The World Bank's Country Economic Memorandum, issued in April 2017, notes that if Cameroon is to become an upper-middle-income country by 2035, it will have to increase productivity and unleash the potential of its private sector.

1.2 Overview of energy situation

Energy reserves like crude oil, natural gas, hydropower, biomass, solar, wind and geothermal energies are in abundance in Cameroon. However, these resources have not been adequately harnessed, especially the renewables (Erasmus, Sofiane & Fouzi , 2017). About 70% of the country's electricity is dependent on the hydropower source, characterized with persistent power interruptions throughout the entire country, especially in the dry seasons when water levels are low to operate the turbines for electricity generation. The remaining 30% are mainly thermal that depend on the burning of natural gas. In 2018, primary energy consumption for Cameroon was 0.16 quadrillion btu. The primary energy consumption of the country increased from 0.08 quadrillion btu in 1999 to 0.16 quadrillion btu in 2018, growing at an average annual rate of 4.14% (World Data Atlas, 2021). According to World data Info (2021), the energy balance of Cameroon compared to that of USA is reflected in table 1 below.

Table 1: Energy balance of Cameroon compared to USA (Source: World data info, 2021)

Electricity	total	Cameroon per capita	USA per capita
Own consumption	6.41 bn kWh	247.75 kWh	11,887.66 kWh
Production	8.11 bn kWh	313.34 kWh	12,475.65 kWh
Import	55.00 m kWh	2.13 kWh	221.55 kWh
Crude Oil	**Barrel/day**	**Cameroon per capita**	**USA per capita**
Production	69,000.00 bbl	0.003 bbl	0.033 bbl
Import	36,480.00 bbl	0.001 bbl	0.024 bbl
Export	96,370.00 bbl	0.004 bbl	0.004 bbl
Natural Gas	**Cubic meters**	**Cameroon per capita**	**USA per capita**
Own consumption	906.10 m m³	35.02 m³	2,338.54 m³
Production	910.40 m m³	35.18 m³	2,354.38 m³

The most important measure in the energy balance of Cameroon is the total consumption of 6.41 bn kWh of electric energy per year, with an average of 248 kWh per capita. Cameroon can provide itself completely with self-produced energy. The total production of all electric energy producing facilities is 8 bn kWh, which is 126% more than its own total consumption. The rest of the self-produced energy is either exported into other countries or unused. Other energy sources such as natural gas or crude oil are also used (World data info, 2021). The production capacity per energy source of Cameroon compared to the USA is reflected in table 2 below.

Table 2: Production capacity per energy source of Cameroon compared to USA (Source: World data info, 2021)

Energy source	total in Cameroon	percentage in Cameroon	percentage USA	per capita in Cameroon	per capita USA
Fossil fuels	7.10 bn kWh	52,0 %	70,0 %	274.27 kWh	20,306.77 kWh
Nuclear power	0.00 kWh	0,0 %	9,0 %	0.00 kWh	2,610.87 kWh
Water power	6.41 bn kWh	47,0 %	7,0 %	247.89 kWh	2,030.68 kWh
Renewable energy	136.48 m kWh	1,0 %	14,0 %	5.27 kWh	4,061.35 kWh
Total production capacity	13.65 bn kWh	100,0 %	100,0 %	527.43 kWh	29,009.67 kWh
Actual total production	8.11 bn kWh	59.40%	43.00%	313.34 kWh	12,475.65 kWh

The given production capacities for electric energy have a theoretical value, which could only be obtainable under ideal conditions that measures the generatable amount of energy that would be reached under permanent and full use of all capacities of all power plants. In practice this isn't possible, because e.g. solar collectors are less efficient under clouds. Also wind- and water-power plants are not always operating under full load, thus all these values are only useful in relation to other energy sources or countries (World data info, 2021).

1.3 Electricity sector reforms

The electricity sector of Cameroon has undergone some institutional evolutions in the history of the country from the period before and after the independence of the country. Table 3 describes the evolution of the sector before the independence of the country.

Table 3: History of Cameroon's electricity sector before independence (Source: ENEO Cameroon S.A, 2020)

Part of Cameroon	Year	Created Plants/Events	Area of operation	Comments
English speaking Cameroon *(Independence on 1st October 1961)*	1929	Lueman and Malale Hydro-electric plants	Muyuka area	Intended for homes and factories of colonists
	1946	Public Electricity Utility entity	English speaking Cameroon	Private plants installed by colonists
	1958	Yoke Power plant	English speaking Cameroon	-
French speaking Cameroon ***(Independence** on 1st January 1960)*	Before 1939-1945 war	First electricity plants in Nkongsamba, Douala and Yaounde	French speaking Cameroon	Created by the administration and operated through private
	1948	Energie Electric du Cameroun (ENELCAM)		Created to develop the Edea I and Edea II plants on the Sanaga

After the independence of the country, the electricity sector of the country moved through another remarkable evolution as described in table 4. This evolution has been strongly characterized by a shift from a national electricity company to a public-private one. The sector experienced unique transitions for two reasons. The first is linked to the financial structure of the formal state owned electricity company SONEL that started degrading in 1994, and the second is linked to the tariffs applied to the different consumers, as well as insufficient investment (Kamdem, n.d.). As documented by ENEO Cameroon (2020), the sector moved from a public company that originated with the creation of POWERCAM in 1962, which was later transformed to SONEL in 1975 and later to a public-private company that originated with the creation of AES-SONEL in 2001, that was transformed to ENEO in 2014 with 51% shares formally owned by AES Corporation (now by ENEO), 44% by state of Cameroon and 5% by personnel.

Table 4: History of Cameroon's electricity sector after independence (Source: ENEO Cameroon S.A, 2020)

Year	Created Plants/Events	Area of operation	Comments
1962	Cameroon Electricity Corporation (POWERCAM)	Nation wide	Created in west Cameroon
1963	Electricite du Cameroun (EDC)		Created with intention to manage all public distribution of electricity
1974	Cameroon National Electricity Corporation (SONEL)	Nation wide	Created after merging ENELCAM and EDC with mission to manage public power distribution, including that of former west Cameroon
1975	Absorption of POWERCAM by SONEL	Nation wide	-
2001 *(17 th July)*	Creation of AES SONEL	Nation wide	Privatization and takeover of SONEL by AES Corporation. (51% shares owned by AES Corporation, 44% owned by state of Cameroon, 5% owned by personnel)
2014 *(23 th May)*	Creation of ACTIS	Nation wide	Agreement signed granting ACTIS 56% shares of AES SONEL and its subsidiaries KPDC and DPDC
2014 (12 th September)	Unveiling ENEO Cameroon S.A.	Nation wide	New company name

According to ARSEL (n.d.), at the end of the 1990s, the electricity sector in Cameroon was one of the prime targets of the all-round restructuring of entire sectors of the national economy that was both suggested and decided by international donors and implemented locally. The objective was to reduce the number of problems faced by utilities in developing countries and to guide them towards cost recovery for pricing and improvements in metering, billing and collection. At the same time, the adoption of the required energy legislation was to provide a legal mandate for restructuring, as well as the legal framework for private participation in the sector. The reform that took place in 1998 (Law N ° 98/022 of 24 December 1998) allowed the opening of the production segment to competition.

1.4 Electricity demand overview

The vision of the Cameroon electricity utility company ENEO is "*Driving force of the electricity sector, catalyst for growth, we will supply reliable energy, provide service quality while being a governance model in Africa*" and one of the mission statements of the company is "*Satisfy the growth in electricity demand by supplying reliable and safe energy*" (https://eneocameroon.cm/index.php/en/l-entreprise-a-propos-d-eneo-l-entreprise-en/l-entreprise-a-propos-d-eneo-notre-vision-en). The attainment of this vision and mission is still a great challenge for the company. Cameroon's electricity sector has grown, but still needs to grow to meet the rapidly rising electricity demand in the country. Figure 3 shows electricity demand pattern in Cameroon (World Bank, 2014).

Figure 3: Electric Power Consumption (Kwh per capita)

The slope of this pattern has continued to grow with the growth of the industrial sector and the population of the country which is constantly demanding more electricity for their operations. Cameroon experienced a strong economic growth rate of 5.9% in 2015, accompanied by a rapid increase in electricity demand of 1455 MW in 2014 and electricity needs are expected to continue rising over the next decade to reach 6000 MW by 2030 (Erasmus, Sofiane & Fouzi , 2017).

As reported by ARSEL (2014), the demand in the industrial sector for example, is expected to double by 2025 due to increase in economic activities, particularly in the Kribi area. Tallied with the findings of Ngoh (2020), the industry in Cameroon consumes the majority of distributed energy (58%), the residential sector 20%, the public service sector 5%, the hospitality sector 2.5%, agriculture sector 1% and other services in the tertiary sector 13.5%. As recorded by Erasmus, Sofiane & Fouzi (2017), electricity access is about 65–88% within the urban areas of the country and only around 14% for rural areas.

2. The Potential of solar irradiation in Cameroon

The exploitation of solar energy is one of the most potentially viable sources among the renewable sources that can supplement and enhance a reliable supply of electricity in Cameroon. Solar irradiation is rich for most of the months to adequately produce energy that can be used in lighting, running of electrical equipments and recharging of batteries. Figure 4 below shows a comparison of the solar irradiation data from Meteotest (2004) of Yaounde (Cameroon) with solar irradiation data of Kassel (Germany).

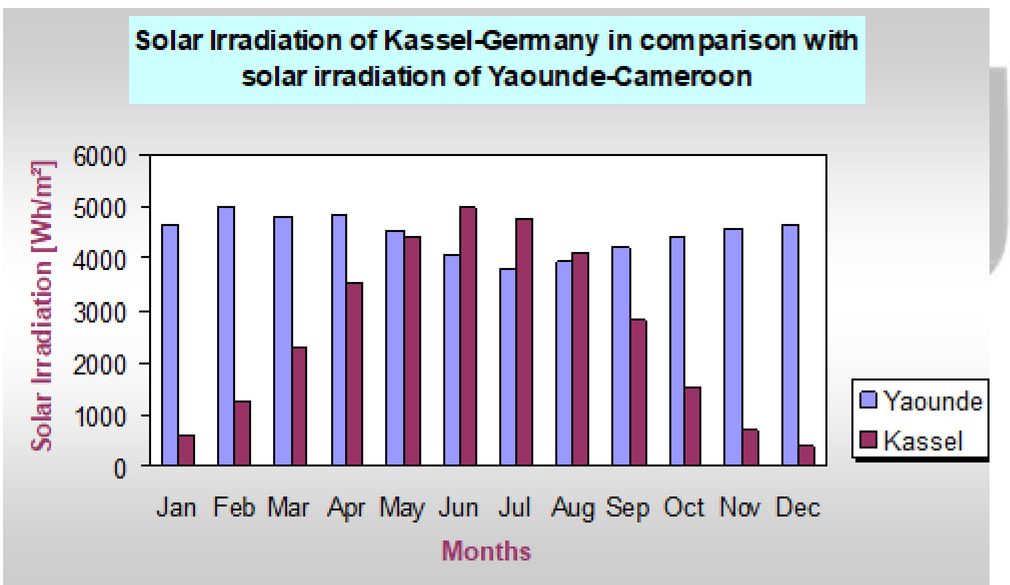

Figure 4: Solar Irradiation of Yaounde (Cameroon) in comparison with solar irradiation of Kassel (Germany)

The figure reveals the rich solar resource in Yaounde (Cameroon) which can be exploited throughout the year, whereas in Kassel (Germany), the solar resource is only optimal during the summer months and very insignificant during the winter months. The solar irradiations of the northern regions of Cameroon are even higher, while the rest of the regions of the country are also rich with the solar irradiation resource.

2.1 Perspectives for solar energy in Cameroon

2.1.1 Perspectives for electrification purpose

In order to boost the current electricity access rate of about 65–88% within the urban areas and about 14% for rural areas (Erasmus, Sofiane & Fouzi (2017), the rich solar resource of the country could be of great importance. The un-electrified regions, particularly rural areas can be electrified using solar photovoltaic technology. Figure 5 represents a schematic diagram of a photovoltaic solar system that can be configured to supply both Alternating Current loads (AC loads) and Direct Current loads (DC loads).

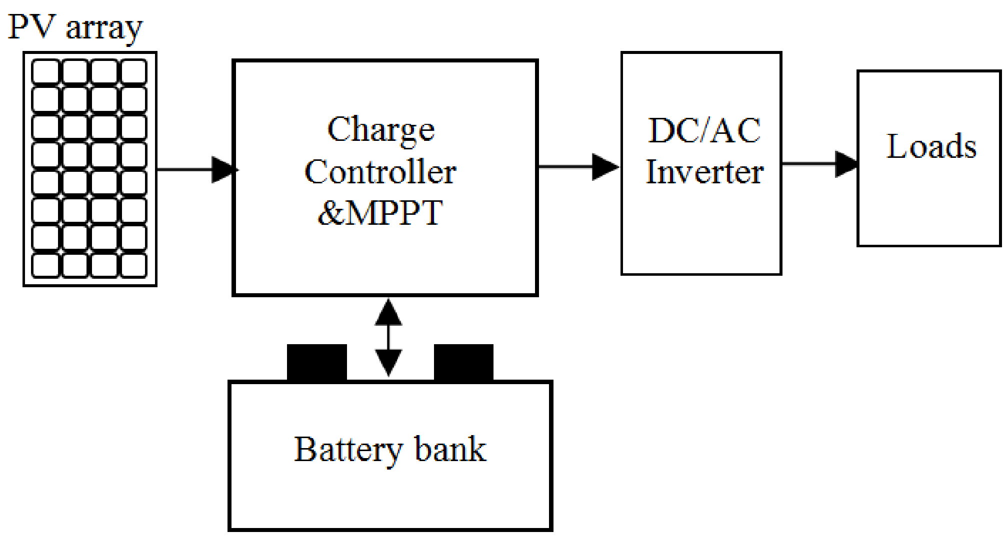

Figure 5: Schematic diagram of photovoltaic solar system

For the supply of AC loads, the stand-alone photovoltaic solar system in figure 6 can be most optimal. It however requires accurate sizing of the system components to supply the specific AC load profile of the consumer. Knowledge on establishing load profiles and the solar irradiation data of the geographical location of the installation are parameters that must be considered to ensure that the system is neither over-sized, nor under-sized.

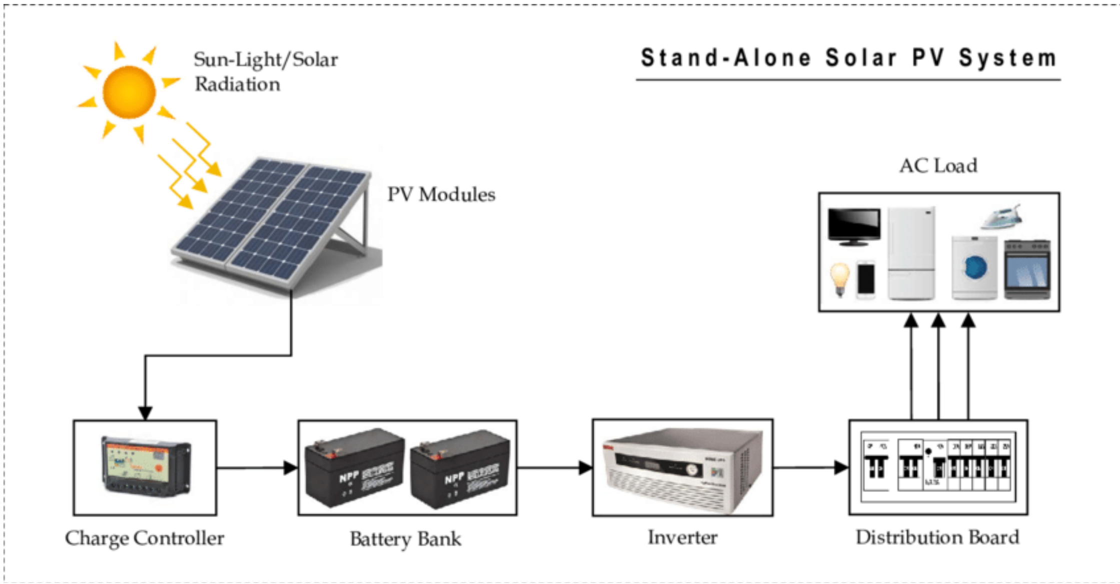

Figure 6: PV diagram of stand-alone systems for AC loads

Figure 7 shows the required stand-alone photovoltaic solar system most optimal to supply DC loads. It requires the same pre-knowledge as in AC systems, with the only difference of the absence of an inverter.

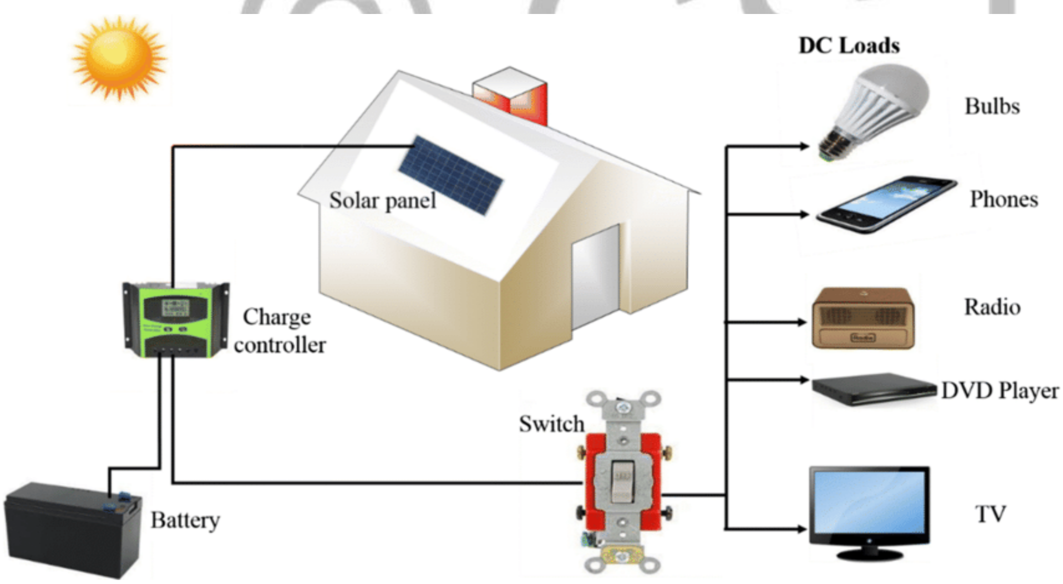

Figure 7: PV diagram of stand-alone systems for DC loads

The major advantages and disadvantages of AC and DC systems are represented in table 5 below.

Table 5: Major differences between AC and DC Photovoltaic systems

No	Item	AC Systems	DC Systems	Preferred system
1	Availability of appliances	AC appliances can be easily found locally	DC appliances are difficult to be found locally. Most need to be imported	DC system
2	Cost	AC systems are generally expensive	DC systems are cheaper	DC system
3	Maintenance	AC systems require more maintenance	DC systems require less maintenance	DC system
4	Supply of local appliances	AC systems can power locally acquired appliances	DC systems supply only DC appliances that are not easily acquired locally	AC system
5	Connection to grid	AC systems can be tied to the electricity utility grid	DC systems cannot be tied to the electricity utility grid	AC system

2.1.1.1 Photovoltaic solar applications in Cameroon

With the limited access to the electricity grid and recurrent electricity interruptions with long durations, the use of solar electrification is gradually gaining grounds in Cameroon due to the rich solar irradiation in the country. According to Erasmus, Sofiane & Fouzi (2017), about 50 Photovoltaic (PV) installations currently exist in Cameroon. According to these authors, the country has installed energy-keep it simple and safe (e-kiss) PV mobile off-grid systems from Antaris solar ESI-Africa, which generate electricity on a standalone basis. Stand-alone systems can supply up to 3KW of electric power which is sufficient to supply loads of a typical Cameroonian family house.

The Cameroon electricity utility company ENEO had started implementing the installation of solar plants to boost the electricity gap in the country. On the 25th January 2018, the company commissioned its first hybrid solar electricity plant with a capacity of 186KWp in the city of Djoum in southern Cameroon as seen in figure 8a. The solar plant in Djoum is combined with another thermal power plant with a total production capacity of 1115 kW. "*The choice of the hybrid for this first experiment is based on the fact that this solution both saves on operating* *costs and guarantees security of energy supply*," said Joël Nana Kontchou, former ENEO's general managing director. ENEO also recently installed a new photovoltaic solar power plant with a capacity of 125 kWp in the community of Lomié in eastern Cameroon (Magoum, 2020). This new solar power plant in figure 8b supports the local thermal power plant to ensure stability and better continuity of the electricity utility.

Figure 8a : 186KWp installed by ENEO in Djoum (Southern Cameroon)

Figure 8b : 125KWp installed by ENEO in Lomié (Eastern Cameroon)

Figure 8c : Panel installed in northern Cameroon

According to Eco News (2021), in order to relieve households and businesses in the northern regions of Cameroon which have been experiencing unprecedented power cuts for several months due to drop in the water level of the lagdo dam, the government of Cameroon and the electricity utility company ENEO are working on a project with mobile emergency solar panels, planned to deliver a total of 30MW in the cities of Maroua, Guider and Kousseri.

Also, there is significant development for solar traffic lighting systems in many cities in Cameroon as seen in the examples of figures 9a, 9b and 9c below.

Figure 9a: Traffic light supplied by solar technology at Santa Barara Douala

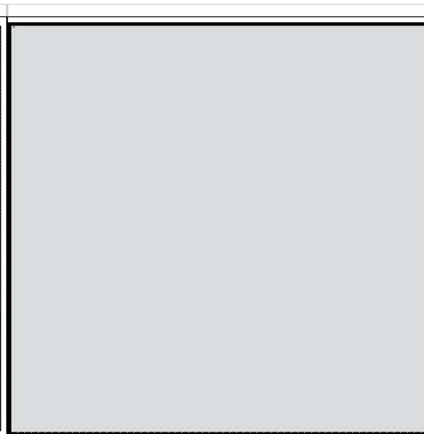

Figure 9b: Traffic light supplied by solar technology at Malingo Junction Molyko Buea

Figure 9c: Traffic light supplied by solar technology at Biaka Junction Bunduma Buea

Figures 10a, 10b and 10c represent a few examples of the utilization of solar photovoltaic in street lighting found in many cities of Cameroon.

Figure 10a: Solar Street Light Fako Ship Buea

Figure 10b: Solar Street Light Bongo Sqaure Buea

Figure 10c: Solar Street Light Grand stand Bongo Sqaure Buea

Some international organizations have also promoted the use of solar energy for lighting in the rural areas of Cameroon. The International Solar Energy Research Centre ISC based in Constance (Germany) launched the initiative captioned « Strom und Licht für die Armen in Kamerun » (Power and Lighting for the Poor in Cameroon), which is an initiative aimed to make ecological, sustainable solar energy accessible to the people in developing African nations by installing solar home systems. Centrosolar provided the initiative with 30 solar modules having a total capacity of 5.4 kWp for the Botbadjang village in the district of Ndom and each home as seen in figure 11a, has a small photovoltaic solar system which has the capacity of supplying up

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to seven energy-saving lamps (Centrosolar, 2011). Also, the advisolar company in the UK (http://www.advisolar.com/) allocates 5% of their profit and 5% of co-worker time within the framework of their social responsibility program to provide solar education services to primary and secondary schools, finance and develop solar projects in developing countries. Within this framework as seen in figures 11b and 11c, the advisolar company installed a stand-alone hybrid solar PV system to electrify the Babungo village Integrated Healthcare Centre (Advisolar, 2011)

Figure 11a: A home in the Botbadjang village with a solar panel

Figure 11b: Mounting of the solar panel at Babungo village

Figure 11c: System completely mounted at Babungo village

2.1.2 Perspectives for traffic purpose in the future

Traffic services are at the center of a cycle that enhances the development of the country's economy. Figure 12a shows harmful emissions into the environment from traffic services which are a contributing aspect to global warming. To contribute in reducing these emissions, emerging new technologies with electric vehicles powered through solar technology as seen in figure 12b are preferred alternative which contributes to the environmental benefits of zero emissions.

Figure 12a: Harmful traffic emmissions in Douala

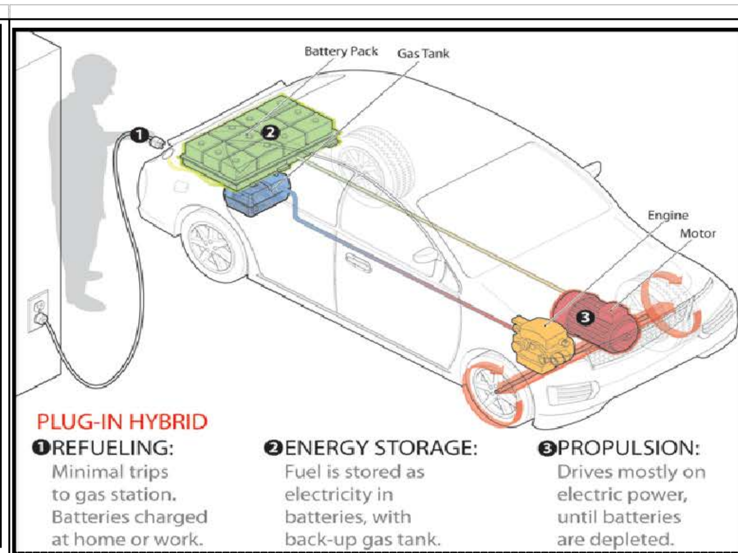

Figure 12b: Emmission solution through solar electric hybrid car technology

In Cameroon, electric cars are not yet in use. With the problem of environmental pollution from traffic, there is need for electric car usage to be encouraged. Table 6 below shows the electric vehicle technologies available today.

Table 6: Electric vehicle technologies

ELECTRIC VEHICLE TECHNOLOGIES	
Technology	**Description**
Full electrics	Solely battery-powered
	Battery recharged by plugging into main electricity source supplied by a solar system
Plug-in hybrids	Combined batteries which allow them to run in electric mode
	Have combustion engines which use gasoline or other liquid fuels to power the vehicle on longer trips when battery power has depleted
	Battery recharge by plugging into main electricity
	source supplied by a solar system

3. The Future and challenges of solar electrification in Cameroon

3.1 Government actions to promote solar electrification

The government of Cameroon is now encouraging the construction of solar energy projects in the electricity-starved rural communities across the country as part of its ambitious plans to become an emerging economy by 2035 (Ntungwe, 2019). According to Ntungwe (2019), the rural solar power drive that has already taken off in some local councils is geared at bringing new development stimulating perspectives to change the livelihood of rural communities. In promoting this drive, Cameroon's current president Paul Biya said in his end of year address to the nation on the 31st December 2018, "*We will continue to provide our country with energy infrastructure to meet the needs of our agro-industry as well as the demands of our people. In addition to hydroelectric dams and thermal power, solar energy plants are being constructed for rural electrification*". Within this framework, the government of Cameroon has committed to achieve 25% new renewable energy by 2035 as part of its Nationally Determined Contributions (NDC) and a Master Plan for the Development of Renewable Energy in the country is currently being developed with the goal of stepping up electrification rates to 54% for rural households in 2035 (https://energypedia.info/wiki/Cameroon_Energy_Situation).

Historically, to boost the development of renewable energy (RE), Cameroon had relied on reforms on the electricity sector, led by hydroelectricity which is largely developed compared to other RE sources such as wind, solar and biomass. According to Kidmo & Bogno (2021), initially, the law n°98/022 of 24 December 1998 governing the electricity sector, focused on hydroelectricity development only. Afterwards, the electricity Law 2011/022, governing the electricity sector and promulgated on 14th December 2011, clearly defined RE sources. Key changes under this new legislation included the role of the government in:

- ✔ ensuring the promotion and development of renewable energy
- ✔ establishing the opportunity for the transmission system operator or any local distributor to purchase the surplus of electricity generated from renewable energy sources
- ✔ fixing tax benefits for products, goods and services intended for renewable energy exploitation
- ✔ Creating an agency responsible for the promotion and development of renewable energy.

As recorded by Kidmo & Bogno (2021), this new law precisely shapes the legal and institutional supervision for RE promotion, by creating the Department of Renewable energy within the Ministry of Energy and Water Resources. To cope with the growth of electricity demand, several government plans and programs for energy development have been announced and deliverables are highly expected.

3.2 Challenges of solar electrification in Cameroon

Solar electrification is gradually developing in Cameroon, due overall, it is still at an infant stage. There are several issues hindering the development of the sector. According to Wirba et al. (2015), the government of Cameroon has not taken necessary steps to significantly enhance the sector due to the high capital cost of solar technology and the lack of public sensitization on the benefits of solar energy.

There is also the challenge that most of the components used in solar electrification are expensive and are mostly imported from western countries. Importers are confronted with high customs duties before receiving their products. Recent investigations indicate up to 30% charges as custom duties depending on the nature of the goods imported (https://taxsummaries.pwc.com/republic-of-cameroon/corporate/other-taxes) and as of the 1st January 2018, instituted interests for late payments were at the rate of 1.5% per month (capped at 50%) for persons who failed to pay taxes and customs duties 30 days after the computation of their detailed declaration.

The problem of maintenance also hinders the sustainability of solar electrification systems in Cameroon. It is common to see abandoned solar installations in Cameroon that are out of service due to the lack of maintenance. For example a standalone solar electrification system to supply AC equipments contains an inverter which is the weakest component in such systems and their maintenance is difficult in Cameroon.

The last challenge faced by the solar electrification sector is the lack of sufficient trained technicians in the simulation and proper sizing of photovoltaic system components, installation and monitoring of the systems, as well as maintenance of the systems. Under-sized photovoltaic systems fail in delivering the required energy to supply a specific load profile, while over-sized systems are economical wastes for the investor, since more energy than required is produced by the system that was first acquired at a higher cost than a well sized system.

4. The way forward for solar electrification in Cameroon

4.1 Creation of solar energy organizations in Cameroon

The way forward to achieve success in exploiting the potentials of Cameroon's rich solar irradiation to boost electricity production could be achieved by the creation of;

- ✔ Solar energy companies in Cameroon
- ✔ Solar NGOs in Cameroon

In order to achieve these, there is need for the creation of more partnerships with western manufacturers and western NGOs

4.2 Government support

Cameroon still does not have clear policies available to the public regarding the use of renewable energies. The present energy situation is at the origin of a new interest for renewable energies but implementation strategies are still very poor. With the liberalization of the energy sector, there is still a growing need for the emergence of competent private and public sector actors especially in the domain of solar electrification which requires the support of the government.

Government support in the area of custom duties reduction for components of solar electrification systems will boost the development of the sector as more investors will get interested. At same time it is necessary for both theoretical and practical training programs in solar electrification to be integrated into technical school curriculum to help qualify more young Cameroonians in the domain.

5. Conclusion and recommendations

Hydropower is presently the major source of electricity in Cameroon on which most Cameroonians depend. The other renewable sources are still very much unexploited, thus giving rise to the country's energy insecurity and the observed regular power shortages and interruptions around the country. From this study, it is evident that Cameroon has a rich solar electrification potential which can be a major constituent of a national energy mix that can improve the access rate of electricity, especially in the rural areas of the country. By exploiting and integrating the solar resource, the frequent power blackouts in the country will be reduced, as well as energy security and reliability reinforced.

Although the Cameroon government has put in some initiatives to encourage the solar electrification sector, the sector still finds itself at an infant stage which requires more efforts both from the government and private organizations to work together for meaningful developments to be achieved. In order to ensure meaningful impacts of solar electrification in the energy mix of Cameroon, the government should encourage the participation of the private sector by implementing attractive policies and an enabling favorable business environment. Further, awareness and capacity building in the sector should be increased through education in clean energies in general and solar electrification in particular with particular emphasis of its importance in rural areas.

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APPENDIX

Appendix I: Major Electricity Power Plants in Cameroon

Type	Name of station	Source	Capacity (MW)	Comments
Hydro Power Stations	Song Loulou Power Station	Sanaga River	384	Project completed in two phases (1981 & 1988)
	Edea Power Station	Sanaga River	264	Project completed in 1953
	Memve'ele Power Station	Ntem River	201	Project stated in 2011, not yet operational
	Lagdo Power Station	Benue River	72	Project completed in 1982
	Lom Pangar Dam	Lom River	30	Project stated in 2012, not yet operational
	Mekin Power Station	Dja River	15	Project completed in 2016
Major thermal Power Stations	Kribi Power Station (KPDC)	Natural Gas	216	Project stated in 2010 and completed in 2013
	Dibanda Power Station (DPDC)	Oil	88	Project completed in 2009
	Limbe Thermal Station	Oil	85	Project completed in 2004
	Yaoundé Thermal Station	Oil	60	
	Ebolowa Thermal Station	Oil	10	
	Mbalmayo Thermal Station	Oil	10	

Major power stations in Cameroon **(**Source: Wikipedia, The Fee Encyclopedia)

Appendix II: Regulation of electricity sector in Cameroon

Abbreviation	Name	Role/responsibility
MINEE	Ministry of Water Resources and Energy	Elaborates and monitors the implementation of a national energetic policy under the control of the Presidency of the Republic of Cameroon.
		The Direction of Electricity manages the electricity sector.
		The newly created Direction of Renewable Energy and Energy Efficiency ensures the promotion of RE and EE.
ARSEL	Electricity Sector Regulation Agency	Regulates electricity operations.
		Defines electricity tariffs
EDC	Electricity Development Corporation	Develops state owned hydroelectricity projects
AER	Rural Electrification Agency	Promotes rural electrification by elaborating and monitoring State projects while supervising private operators in the rural sector.
SONATREL	National Electricity Transmission Company	Manages the electricity transmission network for the State
ENEO	Energy of Cameroon	Managers the production, distribution and commercialization of electricity

Electricity regulation in Cameroon (Source: Ndongsok & Ruppel, 2017).