

Sierra Leone Netherlands Business & Culture Council
(SLNBCC)

Energy Sector in Sierra Leone



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About SLNBCC

The Sierra Leone Netherlands Business and Culture Council (SLNBCC) is an affiliate of the GNBCC, Ghana. The SLNBCC has been officially registered and active since September 2017, and is currently building a network of companies from Sierra Leone and the Netherlands. The target being collaborations, investments or partnerships between companies from the two countries

Our network consists of both government and the private sector actors, and we work closely together with the Sierra Leonean Investment and Export Promotion Agency (SLIEPA) and the Sierra Leonean Chamber for Agribusiness development (SLeCad). The SLNBCC is currently expanding its membership base, these members receive:

- Monthly newsletters
- Quarterly networking and informative events
- Access to the Dutch network, to Dutch companies with interest in Liberia/ Sierra Leone and introductions
- Access to more information on the Netherlands Enterprise Agency's (RvO) financial instruments
- Workshops and seminars on business related topics
- The SLNBCC also offers paid business services to both members as well as non-members. These services include:
 - Assisting with travel arrangements for business investors from the Netherlands to Sierra Leone
 - Representing and assisting Dutch companies who do not have their own subsidiary, partner or office in Sierra Leone

This sector scan is part of the SLNBCC's efforts to attract foreign companies to engage in business with Sierra Leone.

Chapter 1 | Executive Summary

Sierra Leone is a country located on the Western fringe of Africa, bordering on the Atlantic Ocean. With its numerous rivers and streams, high sun hours per year, and a high demand for bio-fuel, Sierra Leone offers great opportunity for investment in renewable energy sources.

Sierra Leone's energy demand is currently not met, and companies and residents in rural areas who are not connected to the grid are underserved. Costly and pollution generators are filling this gap, but private consumers as well as companies, NGO's, and public institutions are increasingly demanding sustainable alternatives to meet energy consumption needs.

The GoSL and international agencies offer support for public-private partnerships and investments in the sector. The focus lies predominantly on solar and hydroelectric power, but attempts to harness wind energy and increase bio-fuel production are encouraged as well.

Sierra Leone has the potential to not only meet domestic demand, but to export to neighbouring countries as well. Furthermore, opportunities lie in supporting the sector through research and surveys, and offering logistical solutions to extending the main grid and the storage and deliverance of energy.

This document provides background information on the country, the current and historic state of the mining sector and areas of opportunity for Dutch companies to enter the sector locally. These opportunities include:

Energy Sub Sector	Opportunity
Hydroelectricity	Establishment of new hydroelectricity plants; 25 potential sites
Solar energy	Solar PV installations to support agriculture Pico PV systems for households in remote areas Mini grids for off-the grid communities Captive solar power systems for commercial enterprises and NGO's Solar thermal energy systems for heating and cooling
Wind energy	Establishment of wind engine turbines in mountainous areas (northern region) Surveys and independent studies to indicate potential sites for wind energy generation
Biomass	Increase biomass production to meet domestic demands by exploring alternative sources (e.g. sugarcane, cassava, and maize) Crop waste for biofuel (rice husks and straws, palm oil, cocoa husks)
Distribution	Expanding the grid to supply underserved communities with electricity, and increase reliability and sustainability of electric current
Surveying and research	A lack of data and surveying hampers sector development, but offers opportunities for consultants and geomapping companies.

Chapter 2 | Acronyms

DFID UK	Department for International Development United Kingdom
EDSA	Electricity Distribution and Supply Authority
EGTC	Electricity Generation and Transmission Company
EPA	Environmental Protection Agency
EU	European Union
EWRC	Electricity and Water Regulatory Commission
GDP	Gross Domestic Product
GDP	Gross domestic product
GoSL	Government of Sierra Leone
GW	Gigawatt
IPP	Independent Power Producers
JRS	Joint Research Centre
kW	Kilowatt
MW	Megawatt
NGO	Non-governmental organisation
ND	The New Direction
NSRPA	Nuclear Safety & Radiation Protection Authority
PPP	Public Private Partnership
PV	Photo Voltaic
SAC	Solar assisted cooling
SHS	Solar home systems
SLC	Sierra Leone Local Content Agency
SLeCad	Sierra Leonean Chamber for Agribusiness development
SLIEPA	Sierra Leone Investment & Export Promotion Agency
SLNBCC	Sierra Leone Netherlands Business and Culture Council
SWH	Solar Water Heater
SLPP	Sierra Leone People's Party
UN	United Nations
UNDP	United Nations Development Programme

Chapter 3 | The Sierra Leonean Context

Country Overview

Sierra Leone is found in the West Coast of Africa, bordered by Guinea, Liberia and the Atlantic Ocean. It has been experiencing annual GDP growth. Several years back, the country's GDP growth rate was one of the highest in Africa, but had a quick downward turn due to the twin shocks of a shrinking of the global iron ore price and the outbreak of the Ebola Virus Disease. However, Sierra Leone is actively reforming its business environment in order to facilitate the ease of doing business in the country.

Sierra Leone recently had a change of government, with Brig. Julius Maada Bio of the Sierra Leone People's Party (SLPP) as the new president of the country. His New Direction strategy promises an avid investment and development of the private sector, with one of its' goals to attract foreign investors and companies. Real GDP growth of double digits was a clear indication that the country was developing fast. Average GDP per capita has almost returned to its pre-2014 Ebola percentages and growth is registered in almost all sectors.

The mining and agriculture sector are the leading sectors in the country. The mining sector accounts for roughly 90 percent of annual export revenues. In 2016, Sierra Leone's exports were worth approximately US\$897 million, of which mineral resources accounted for approximately 75%, followed closely by cocoa (8.5%) and coffee.

History & Politics

Sierra Leone gained independence from Britain in 1961. From 1961 to 1998, the political system shifted between multi-party democracy, military rule and one-party rule. Sierra Leone has remained a multi-party democracy since 1998. The country emerged from a decade-long civil war in 2002. The constitution recognises three branches of government: legislative, executive and judicial. Parliamentary terms last for five years and the President may not serve for more than two terms, whether or not those terms are consecutive. After a two-term reign, former president Ernest Bai Koroma stepped down and was replaced by Julius Maada Bio of the opposing SLPP. Maada Bio won with a 51.8% of votes. However, APC still holds the majority of seats in parliament. The constitution, as currently drafted, does not allow an incumbent to stand for a third term. The peaceful, credible and stable transition of powers should increase investor confidence by providing a reduced risk of shock and greater predictability.

Governance

The Government of Sierra Leone is led by a President elected directly by the people and who is also the Head of State and Commander-in-Chief of the armed forces. Within the Government of Sierra Leone, the Ministry of Trade and Industry has oversight over policies relating to domestic and international trade. The Sierra Leone Investment & Export Promotion Agency (SLIEPA) is responsible for policies to improve the investment climate, promote local and export trade, and encourage the development of small-to-medium-sized businesses. SLIEPA has thus far focused on Foreign Direct Investments in key economic sectors including the agriculture, marine resources, mining, energy, and tourism sectors. A system of local government was established by the Local Government Act 2004, which is comprised of 19 councils. Five city councils, one municipal council, and 13 district councils form the total of this local government structure. The Decentralization Secretariat was established under the World Bank's Institutional Reform and Capacity Building Project to promote decentralisation.

Core industries

Agriculture: key crops are rice, sugar, oil palm and cocoa, as well as agribusiness functions relating to trading and/or processing;

Diamonds: over 600,000 carats exported in 2013;

Iron ore : Sierra Leone has one of the world's largest iron ore deposits;

Rutile: the world's largest reserves, producing an estimated 120,000 tons of contained titanium dioxide in 2014;

Gold : producing approximately 141 kilograms worth of gold in terms of mine output in 2012 and 193 kilograms in 2014. In 2017, this figure dropped by 24.31% compared to 2016, totalling 142.06 kg. The exports of 2017 were worth USD5.2 million.

Bauxite mining: including the country's Port Loko deposit, which contains 100 million tons of bauxite reserves)

Key exports and imports

Sierra Leone's main exports are in the mining and agriculture sectors. Until 2012, diamonds were Sierra Leone main export product. Iron ore has since taken its place, accounting for 55.7 percent of total exports in 2013. The mining sector accounts for roughly 90 percent of annual export revenues. In 2016, Sierra Leone's exports were worth approximately US\$897 million, of which mineral resources accounted for approximately 75 percent, followed closely by cocoa (8.5 percent) and coffee. Sierra Leone's main imports are machinery and transport equipment (largely relating to mining and oil investment projects and accounting for approximately 50 percent of total imports) and fuel (10 percent).

Foreign Aid

The country remains largely dependent on foreign aid. The current account deficit was estimated to be US\$511.8 million in 2013 and US\$466.9 million in 2014. The deficit was reported to be around US\$582 million in 2015. Sierra Leone benefits from the support of various international agencies, including the United Nations Development Programme (UNDP), the World Bank, and the UK Department for International Development (DFID).

The Ports

Freetown boasts one of the largest deep water natural harbours in Africa. The existing Queen Elizabeth II Quay (QE2) Freetown container port is currently managed by Bolloré Africa Logistics under a 20-year concession agreement awarded by the Sierra Leone Port Authority (SLPA) in 2010. The agreement includes plans to renovate the port's bulk handling terminal and expand its capacity. GoSL is also considering developing a "dry port" to ease congestion at QE2 and facilitate the transportation of containers destined for rural areas. Further efforts to involve private partners in the ports system have seen the SLPA award a 20-year concession for the Marine Slipway and Ship Repair facilities to Holland Shipyard.

To support the needs of the mining sector, the GoSL plans to develop a new deep water port and associated rail infrastructure with the capacity to export between 30-50million tonnes of ore and other minerals each year. A pre- feasibility study to review options for the new deep water port was commissioned by the GoSL in 2014. The World Bank is carrying out the study as part of a project to develop a "Ports Master Plan" assessing the need for the expansion of the Freetown Port and the feasibility of the proposed deep water port.

Chapter 4 | Country Overview

Population	7,7400,000 ¹
Urbanisation	42.06% ²
Situated	West Africa, coastal, Sub-Sahara
Bordered by	Guinea (North/NorthEast), Liberia (South/SouthEast), Atlantic Ocean (West)
Area	71,740 square kilometres
GDP	US\$ 3,706 billions ³
Real GDP growth	4.6% ⁴
Official languages	Krio, English
Ha of arable land	5.4 million
Rainfall	3,800mm annually
Climate	Tropical
Seasons	Rainy season (monsoon): May to October & Dry Season (Harmattan) October to May
Electrifications	
Total population	23.4%
Urban areas	48.7%
Rural areas	5.3%
Installed generating capacity	154.1mW ⁵
Percentage installed capacity	
Biomass	9.7%
Hydroelectricity	38.9%

¹ IMF Population Data 2020

² World Bank, 2018

³ IMF GDP of 2020

⁴ IMF Real GDP Growth 2020

⁵ World Bank, 2017

⁶ Konneh et al. 2019. "A Multi-Criteria Decision Maker for Grid-Connected Hybrid Renewable Energy Systems Selection Using Multi-Objective Particle Swarm Optimization

Chapter 5 | The Energy Sector

Introduction

The energy sector in Sierra Leone plays a vital role in the general development of the nation, and affects the subsequent development of sectors reliant on a strong energy infrastructure. This includes the attempted digitalisation of Sierra Leone to participate in the Fourth Industrial Revolution, the development of the agricultural, medical, and the mineral sector. Currently, the energy sector is underdeveloped, serving therefore as a hindrance to realising the countries' potential. On the other hand, it also serves as an investment opportunity for the public and private sector in establishing reliable, sufficient, and nation-wide energy supply. If the sector grows, Sierra Leone even has the opportunity to outsource its' supplies, especially when tapping into the renewable energy potential of the country. For example, by 2030, Sierra Leone can expect to export hydropower to Guinea⁷.

Before exploring potential export opportunities, Sierra Leone's domestic market is in dire need of being satiated with a robust energy infrastructure. In 2018 Sierra Leone produced approximately 105mW of electricity for more than 7 million inhabitants⁸. More optimistic figures show a total generation of 154.1mW, excluding solar power, which still does not meet domestic demands, and cannot account for growth in other sectors.

Reports state that only 10-12% of the population has access to the grid, of which only 2% represents the rural populations⁹. In addition, the grid is not a reliable source of energy, resulting in frequent power outages and unstable currents. Alternatively, Sierra Leone has independent power suppliers of varying scopes. The mineral sector relies mainly on in-house energy production, whereas private consumers either use private generators (33,000 diesel generators¹⁰ of 180MW), biofuel (80% of total energy consumptions¹⁰) and small amounts of solar energy¹¹.

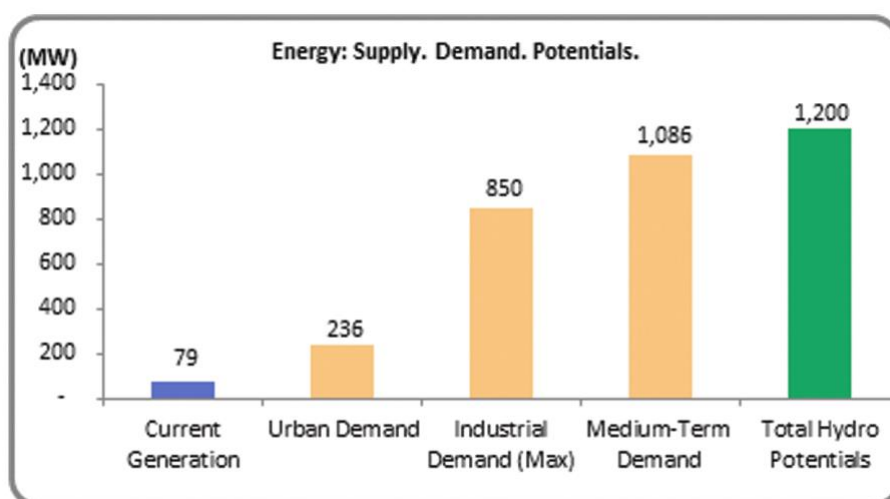


Figure 1 | Energy output and demand. Source: GoSL Ministry of Energy (2016).

⁷ IRENA (2018) analysis, incorporating data from WAPP (2011), Update of the ECOWAS Revised Master Plan for the Generation and Transmission of Electrical Energy, www.econvapp.org/en/documentation.

⁸ Government of Sierra Leone-. "Sierra Leone's Medium-Term National Development Plan 2019-2023 volume I." (2019), p. 93.

⁹ Herbert Smith-Freehill, Investing in Sierra Leone

¹⁰ UNDP, National Energy Profile of Sierra Leone, June 2012, p 11.

¹¹ Although the IRENA report estimates this output at 0 in 2017, the installation of solar power grids throughout the country and import of solar power panels suggests a different output. Specific data lacks to support this claim in wattages.

Renewable Energy

With the destruction of a large part of the energy grid during the civil war (1992-2001), previous efforts to develop the sector have focused on restoring the grid and the energy distribution system. The last few years have included a focus on developing the renewable energy sector in the country. This falls in line with the global efforts pushed by the Sustainable Development Goals to shift production to sustainable development of energy and decrease the exploitation of finite resources. Sierra Leone has a favourable climate to support, especially in the building frameworks to produce solar and hydropower. Excluding the potential for solar power, According to the 2017 IRENA report, Sierra Leone has the capacity to produce 88 megawatts of renewable energy, (56MW hydropower, 33MW bioenergy¹²). Other sources, such as the online world data repository, produce more optimistic figures. Estimating a capacity of 506MW of hydro power, and 258MW of other renewable energy sources¹³. However, it is unclear where these figures are based on, and there is need for accurate and reliable sources regarding consumption, distribution and creation of energy within Sierra Leone.

Efforts to develop the sector

As the energy sector is vital for furthering the development of the country, the Government of Sierra Leone (GoSL) is actively aiming to improve the sector. In 2018, the Sierra Leone People's Party (SLPP) under presidency of Julius Maada Bio came to power. Later that year, the party introduced the New Direction, of which the National Development Plan 2019-2023 outlines plans and policies for the reforms the government aims to execute.

As outlined in this plan, the GoSL aims to “produce/generate and distribute adequate electricity and power from renewable and clean sources for increased access by the majority of populations.” (page 93). To reach this strategic objective, the GoSL has offered three key policy actions, which will be elaborated on in Chapter 6 on opportunities.

In addition, Sierra Leone is part of a number of initiatives that are backed by agencies such as the UN, World Bank, and participates in pan-African initiatives to increase the sustainable production of energy. See chapter 7 for an elaborate overview.

¹² IRENA (2018) analysis, incorporating data from WAPP (2011), Update of the ECOWAS Revised Master Plan for the Generation and Transmission of Electrical Energy, www.ecowapp.org/en/documentation.t

¹³ <https://www.worlddata.info/africa/sierra-leone/energy-consumption.php>


Chapter 6 | Opportunities

The current underdevelopment of the sector provides opportunities for (foreign) investments in the sector. Developing and supplying the main grid, increasing access to the grid, enforcing and elaborating on current projects, as well as the creation of new access to renewable and sustainable energy sources are low-hanging fruits for investing in the sector. Although serving the domestic demand for energy seems as a focal point for development and investment, private and public parties must consider the medium and long-term socio-economic developments of the country. This includes but is not limited to: growth in the mineral sector, the agriculture sector, and the national efforts to participate in the global digital economy. Furthermore, Sierra Leone follows the continents' trend in a rapid and steady population growth. With a current population of approx. 7.1 million people, it is estimated that by 2025 this will rise to 8.87 million, and 10.5 million people by 2035, following a $\pm 10\%$ growth every 5 years.¹⁴ As the primary energy consumption of the country lies within the capital, and the urbanization of Sierra Leone is expected to increase, the expectations are that the current energy demand will rise significantly in the following years.

Table 1. Existing generation facilities.

No.	Source	Capacity (MW)	Location
Existing Sources			
1	Bumbuna Hydro	50	Bumbuna
2	Goma Hydro	6	Kenema
3	Charlotte Hydro	2	Western Area
4	Bankasoka Hydro	2	Port Loko
5	Diesel (Government)	27.6	Western Area
6	Diesel (Government)	26.7	Provincial
7	Diesel (IPP1)	20	Western Area
8	Diesel (IPP3)	4.8	Provincial
9	Addax Bio-energy	15	Makeni(Low availability)
10	Total Diesel	139.1	
11	Total Hydro	60	
12	Total Biomass	15	
13	Total Generation	154.1	
Projected National Mining Power Demand[MW] (Approximated)			
1	Sierra Rutile	23(15)	Moyamba
2	Octea mining	8	Kono
3	London Mining	50	Marampa
4	Stella Diamonds	3	Tongo
5	African minerals/Shandong Iron and steel group	20 (150 PhaseII)	Tonkolili
6	Gold Mining and Others	20	Various locations
7	Total Expected Generation	296	
Research Scope [MW]			
2	Approximated Industrial Demand	380	
3	Approximated Commercial Demand	150	
4	Approximated Domestic Demand	120	

Figure 2 | Existing generation facilities. Source: Konneh et al. 2019. "A Multi-Criteria Decision Maker for Grid-Connected Hybrid Renewable Energy Systems Selection Using Multi-Objective Particle Swarm Optimization"

¹⁴ United Nations Department of Economic and Social Affairs: Population Division 

Renewable energy sources: Hydroelectricity

Sierra Leone is richly endowed with hydroelectric potentials and is the main energy source in the country to date. Current output is estimated at 56MW hydropower, with 749MW of hydropower projects currently being implemented¹⁵.

There are four hydroelectric plants in Sierra Leone.

1. Bumbuna* (50MW)- Freetown Urban and Rural.
2. Bankasoka (3MW) - Port Loko
3. Charlotte (2.4MW) - Western Area Peninsula
4. Goma (6MW)- Kenema and Bo

*The Bumbuna II hydro project will increase production to 1.062GWh per year, and is currently in the implementation stage.

According to the UNDP, Sierra Leone has more than 25 potential hydropower sites with a combine total capacity of 1,513 MW of electricity generation (see table). This figure can be higher, as it does not include potential hydro systems between 5kW-10MW, of which the <2MW category is of interesting potential for public private partnerships. ¹⁶

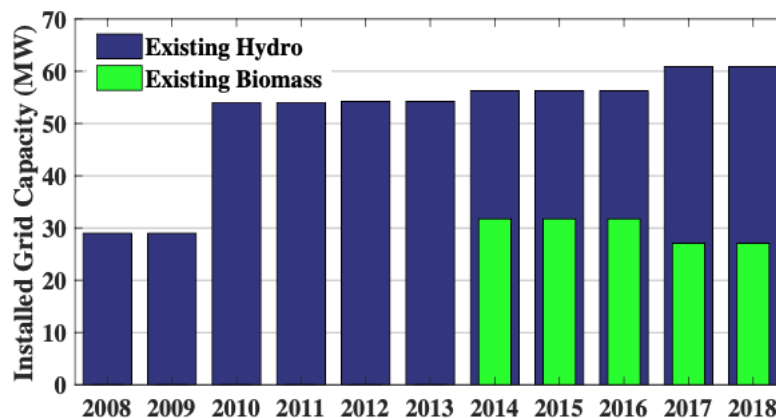


Figure 3 | Installed grid capacity. Source: Konneb et al. 2019. "A Multi-Criteria Decision Maker for Grid-Connected Hybrid Renewable Energy Systems Selection Using Multi-Objective Particle Swarm Optimization"

¹⁵ IRENA (2018) analysis, incorporating data from WAPP (2011), Update of the ECOWAS Revised Master Plan for the Generation and Transmission of Electrical Energy, www.ecowapp.org/en/documentation.

¹⁶ UNDP, National Energy Profile of Sierra Leone, June 2012, p 40.

Project	River	Potential Capacity (MW)	Installed Energy Generation (GWh/year)	Specific Energy Cost (USD cents/kWh)
Benkogor III	Sewa River	85,5	513,1	3,7
Benkogor II	Sewa River	80,0	413,8	6,8
Benkogor I	Sewa River	34,8	237,2	7,2
Mange I	Little Scarcies	35,2	244,1	5,7
Mange II	Little Scarcies	12,8	108,6	7,2
Tendata	Little Scarcies	28,6	211,4	6,5
Kuse I	Little Scarcies	28,0	99,3	32,1
Kuse II	Little Scarcies	91,0	679,7	5,9
Maka	Little Scarcies	21,0	113,5	11,1
Kumba	Little Scarcies	48,9	302,8	8,1
Kambatibo	Little Scarcies	65,7	322,1	4,9
Kabala Falls	Seli River	2,4	7,6	29,0
Rokon	Seli River	31,8	136,5	14,0
Bumbuna Falls	Seli River	26,8	205,8	5,7
Yiben I	Seli River	61,5	442,9	5,7
Yiben Falls II	Seli River	62,1	430,2	3,9
Komoia	Seli River	10,8	61,6	11,9
Betmai III	Pampana River	36,6	249,5	4,9
Betmai I	Pampana River	52,5	268,5	5,9
Betmai II	Tala River	60,0	269,9	8,1
Titana	Sewa River	22,2	95,9	13,0
Levuma	Sewa River	7,8	59,0	14,9
Banda Karafain	Sewa River	7,8	54,1	8,6
Goma	Sewa River	9,8	49,6	14,9
Baraka	Moa River	39,6	233,8	8,2
Nyandehun	Moa River	6,4	49,4	7,4
Moyamba	Gbangbai River	4,4	21,8	19,5

Figure 4 | Potential sites for the installation of hydroelectricity. Source: UNDP 2012.

Renewable Energy Sources- Solar Energy

Sierra receives a great amount of sunlight yearly, providing attractive opportunities for solar power generation and investments. A report published by the Ministry of Energy in 2011 revealed that Sierra Leone experiences about 1460 kWh/m of solar radiation annually. The Joint Research Centre (JRS) of the European Commission estimated the solar potential of the country to be as high as 2200 kWh/m.¹⁷

Average daylight / Average sunshine Freetown, Sierra Leone

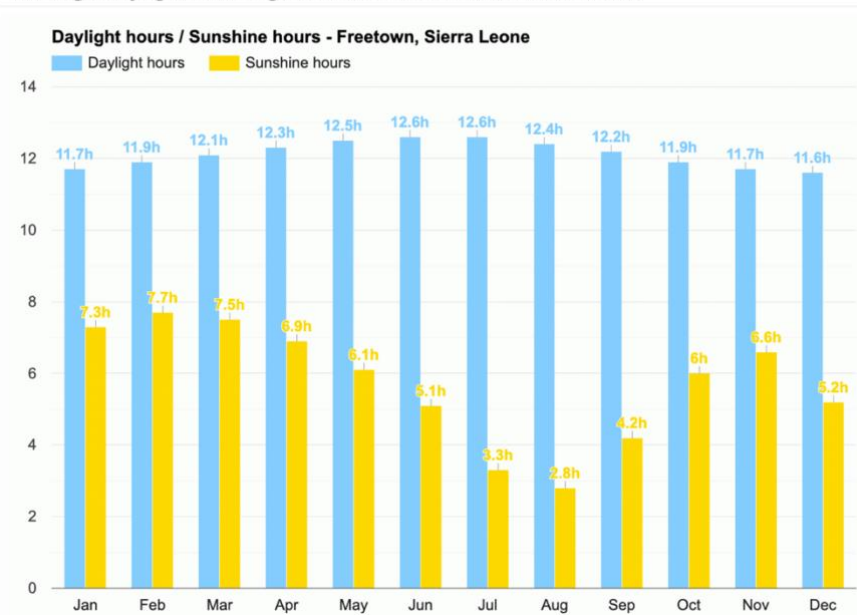


Figure 5 | Source: Weather-Atlas.com (accessed March 2020) ¹⁸.

The use of solar power facilities is quite popular in the country so far. There are over 5,000 installed solar powered street lights all around the country, and small-scale solar enterprises are tapping into the rich enterprises the demand for energy has created. “The current installed capacity of solar PV in the country is about 25 kW, which provides solar systems for hospitals, schools, domestic and commercial use.”¹⁹

Types of solar systems

There are several types of solar installations interesting for the Sierra Leonean market. With only 12% of Sierra Leoneans having access to the grid²⁰, and remote areas hugely underserved, stand-alone solar systems are increasing in demand. Furthermore, residents in urban areas are looking for green, clean, and cost-effective alternatives to supplement grid energy supply. Currently, generators are serving this purpose.

With the growing agriculture sector (located outside urban areas), solar systems also serve solutions for remote farms.

¹⁷ Photovoltaic Solar Electricity Potential in the Mediterranean Basin, Africa, and Southwest Asia. Suri M., Cebecauer T., Huld T., Dunlop E.D., Wald L., Albuissou M, Joint Research Centre. 2008

¹⁸ Source: <https://www.weather-atlas.com/en/sierra-leone/freetown-climate>

¹⁹ John Angel Turay and Rev.Ing.Paul Charles Saffa, mainstreaming of energy policy within sustainable development goals (sdgs) in Sierra Leone, June, 2016, P,10

²⁰ African Solar Designs Ltd. (2017) MRU Sub-Region Energy Context and Regional Economic Integration Analysis.

Off-grid (small scale)

This includes pico photovoltaic (PV) solar systems (lamps, radio's, phone chargers, etc.) and Solar Home Systems. These products are mainly used for residents living in remote areas with no access to the grid, or urban clients whom aim to reduce electricity costs or decrease dependency on energy supply.

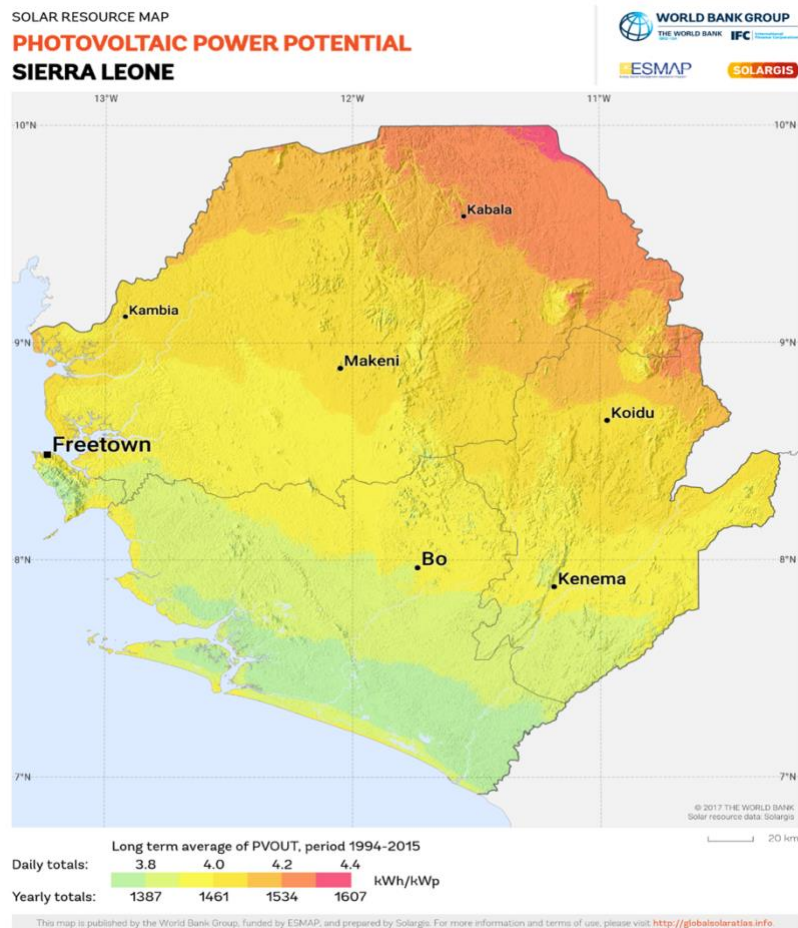


Figure 6 | Source: The World Bank (2019) Global Solar Atlas 2.0, resource data: Solargis

Mini- grids (small-medium scale)

Used for residences, commercial and industrial purposes, mini-grids are small electricity generators that supply electricity to a group of users (households, stores) connected to this grid. This grid is used mainly in remote areas.

Captive Solar Power Systems (medium-large scale)

These are larger solar panels used commercially and for non-governmental organisations (NGO's). These also serve as alternatives to grid electricity, and are deployed mainly in urban areas. In addition, they are used in the agricultural industry, used for solar pumps to irrigate soils.

Solar thermal energy

Solar thermal technology is used for the heating or cooling of spaces and products. Solar water heaters (SWH) and solar assisted cooling (SAC) are attractive alternatives to using grid electricity.

There is no data available on the status of using such systems in Sierra Leone. Nevertheless, it is an interesting opportunity for the growing agriculture and hospitality sector in areas with poor (or no) grid connectivity.

There are a number of commercial enterprises currently active in the Sierra Leonean solar subsector. These include Easy Solar, BBOX SL Ltd, and Energen. These companies focus mainly in pico PV, SHS and mini grids. In addition, there are Chinese-made products of low cost (and quality) widely available in local stores and markets.

Renewable Energy Sources- Wind Energy

The generation of wind energy has attracted little interest over the years in Sierra Leone. The available information about the wind velocities reveal that the country experiences on average 3-5 m/s each year, with the potential of 12m/s in mountainous areas²¹. A 2019 study revealed that the northern region (Kabala) is more suitable for wind energy than the southern region (Kenema), with wind speeds reaching as high as 14m/s at 100 meters altitude²². Their conclusion is that the Northern mountainous region is suitable for wind energy generation.

The Ministry welcomes independent studies that will disclose areas where wind energy can be successfully harnessed. “The advent of wind turbines capable of operating with low wind speeds, there is a greater potential for the system to be set-up in rural areas. Potential may also exist for off-shore wind generation facilities.”²³ Another 2019 study revealed that Sierra Leone has a gross resource capacity of 480GW²⁴. As such, there are opportunities generating wind energy and providing additional data to current surveys and studies.

Renewable Energy Sources- Biomass

Biomass is the main energy source used in Sierra Leone (80%). Excluding petroleum (13%), charcoal and fuelwood are the dominant renewable biomass sources, used predominantly for household uses²⁵. Other biomass sources, such as sugarcane, are limited but offering significant investment opportunities.

It is estimated that yearly consumption of biomass lies at 1,262,000 toe of biomass. This quantity is equivalent to 14, 674GWh.²⁶ According to the 2016 IRENA report, Sierra Leone has the potential to produce 587 of biofuel²⁷.

Other agricultural produce with the potential to produce biofuel include maize and cassava, and crop waste such as rice husks and straws, palm oil, and cocoa husks.²⁸

Government of Sierra Leone Projects

The GoSL, under presidency of Julius Maada Bio, has outlined their four-year strategy in the “*Sierra Leone’s Medium-Term National Development Plan 2019-2023 volume I-2*”. The second volume

²¹ GoSL (2016) *Renewable Energy Policy of Sierra Leone*

²² Konneh, David A, et al. 2019. "A Multi-Criteria Decision Maker for Grid-Connected Hybrid Renewable Energy Systems Selection Using Multi-Objective Particle Swarm Optimization."

²³ UNDP, *National Energy Profile of Sierra Leone*, June 2012, p 37

²⁴ Elsner, Paul. 2019. 'Continental-Scale Assessment of the African Offshore Wind Energy Potential: Spatial Analysis of an under-Appreciated Renewable Energy Resource'. *Renewable and Sustainable Energy Reviews* 104

²⁵ GoSL (2016) *Renewable Energy Policy of Sierra Leone*, p 10

²⁶ *Ibid* p 37

²⁷ IRENA (2018) *analysis, incorporating data from WAPP (2011), Update of the ECOWAS Revised Master Plan for the Generation and Transmission of Electrical Energy*, www.ecowapp.org/en/documentation.

²⁸ UNDP, *National Energy Profile of Sierra Leone*, June 2012, p 37,38,39

specifies aims and project per sector. As the GoSL is actively encourage (foreign) private sector engagement, this will provide plenty of opportunities for the coming four years. The policy actions below were extracted directly from this plan:

"to produce/generate and distribute adequate electricity and power from renewable and clean sources for increased access by the majority of the population."

Key targets

1. By 2023, restore electricity in all district headquarters and cities.
2. By 2023, increase electricity generation from 25 to 60 percent.
3. By 2023, increase installed electric capacity from the current 100 megawatts to 350 megawatts²⁹.

Logistics, supply and demand

With only 23.4% of Sierra Leoneans who can access the grid (48.7% urban, 5.3% rural), expanding the current energy distribution infrastructure is of great importance to the GoSL. In 2017, the government published the to aim for a restructuring of the energy infrastructure by 2030. The government actively encourages public private partnerships, and foreign investments to contribute to this development. Extensive details on this can be found in the strategy.

Read here: <https://rise.esmap.org/data/files/library/sierra-leone/Energy%20Access/EA%2014.1B.pdf>

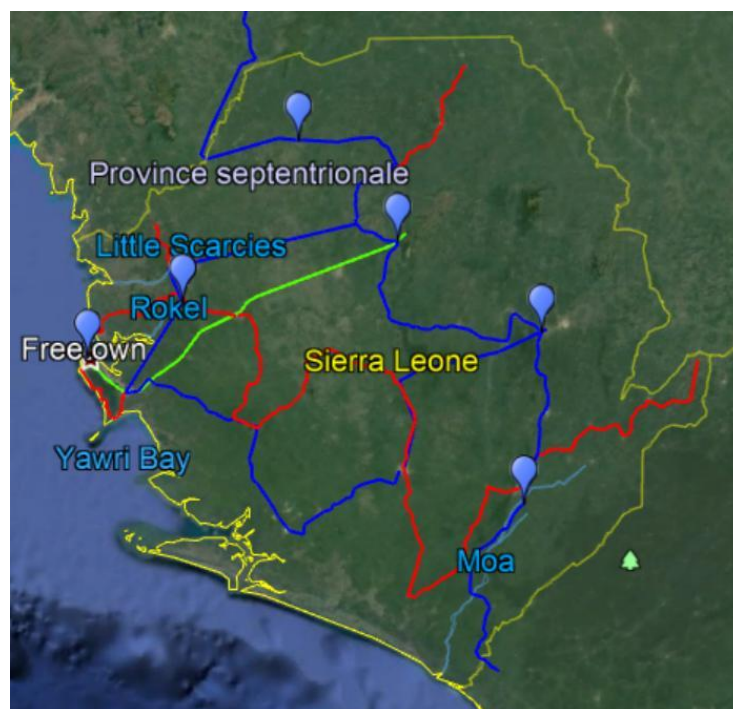


Figure 7 | Planned expansion of the transmission grid. Colour code: green= 161kV; blue=225kV; red=66kV. Source: GoSL (2017)³⁰

²⁹Government of Sierra Leon-. "Sierra Leone's Medium-Term National Development Plan 2019-2023 volume I." (2019).

³⁰ GoSL (2017) Electricity Sector Reform Roadmap.

Chapter 7 | Existing Projects

Project	Location	Sponsors	Contractors	Status	Beneficiaries
Rural Renewable energy (6-36kW SPV, A total of 50 plus 40 mini-grids)	Nation-wide	UK-Aid	Ministry of Energy, UNOPS	2017-ongoing	Community Health Centres (CHC)
Installation of SHS and 3 mini grids	Kenema, Kailahun, Kono, Port Loko, Kambia, Bombali	EU	ENFO, COOPI, WHH, Oxfam	2014- 2018	Charging Centres, Energy Hubs, Agricultural Business Centres, Clinics, Community Banks and Schools
Installation of 8471 solar street lights	Nation-wide	Ministry of Energy		until 2017	district headquarter towns
Implementation of solar water pumps for decentralized water supplies	Freetown	DFID	Oxfam, Concern, Save the Children, Action against Hunger	ongoing	
Installation of Solar systems	Nation-wide	USAID	JICA, JSI, ACF	2014-2017	health facilities
Solar Charging Centres to support Biodiversity Conservation	Outamba Kilimi National Park, Loma Mountains National Park, Kangari Hills Non-Hunting Forest Reserve	World Bank	GEF	2011	
Apex Bank Solar Systems (Provision of SHS)	Nation-wide	IFAD	Kafeibu Constructions	2017	Financial Service Associations and Community Banks
Provision of SHS systems	Kono, Kailahun	Playhouse Foundation, EnDev	Playhouse Foundation, EnDev	ongoing	health facilities and schools
Improving charcoal production and dissemination of improved cook stoves (300 industrial, 700 institutional, 14,000 models)	Nation-wide	GEF	UNDP	2012-2019	
Installation of over 900 solar powered fridges for cooling vaccinations	Nation-wide	Ministry of Health	UNICEF	2003-ongoing	
Regional Off-Grid Electrification Project (ROGEP)	19 Countries including Sierra Leone	World Bank	ECREEE	ongoing	West Africa and Sahel countries
316MW SPV Plant	Newton	GoSL/ADFD	E-Consortium	ongoing	
32Bumbuna Phase II	Bumbuna	GoSL/Joule Africa	Seli Hydropower	2020-2024	Sierra Leone
33CLSG Electricity network interconnection project	Ivory coast, Liberia, Sierra Leone and Guinea	World Bank, African Development Bank, KfW, EIB	TRANSCO CLSG	2014-ongoing	Ivory coast, Liberia, Sierra Leone and Guinea

³¹ [http://energy.gov.sl/6MW Solar Park Implementing Agreement signed.html](http://energy.gov.sl/6MW%20Solar%20Park%20Implementing%20Agreement%20signed.html)

³² <http://www.jouleafrica.com/projects/bumbuna-phase-ii>

³³ <https://www.transcoclsg.org>

Chapter 8 | Policy Framework

Policy Framework

The strategies and policy's framework of the Government of Sierra Leone for the energy sector focuses on the establishment of a sustainable, clean, safe, effective and efficient distribution and consumption of energy. Furthermore, they aim to generate revenues, draft and regulate energy policies and frameworks, and create opportunities for investment, private and public sector partnership, and create job opportunities for its subjects. In order to foster proper regulatory mechanisms, the GoSL and its relevant agencies, institutions and organisations have created/enacted the following policies and structural frameworks that governs the establishment, sustainability and operations of energy and energy related investments.

Acts and licenses regarding energy

The Sierra Leone Electricity and Water Regulatory acts of 2011

The acts established the electricity and water regulatory commission which is meant to regulates all electricity and water services to the consumers.

<https://www.google.com/url?sa=t&source=web&rct=j&url=http://www.sierra-leone.org/Laws/2011>

National electricity acts of 2011

The national electricity act of 2011 is an act formulated to establish the electricity generation and transmission commission and the electricity distribution and supply authority and other related matters. <http://www.energy.gov.sl/National%20Electricity%20Act.pdf>

Nuclear Safety & Radiation Protection Authority act of 2012

The act establishes the Nuclear Safety and Radiation Protection Authority which in turn will regulate and supervise and control the use of radioactive substances and their applications, including licensing, inspection and throughout Sierra Leone.³⁴

<http://www.energy.gov.sl/NSRP%20Act.pdf>

Renewable Energy Policy.

The energy policy of Sierra Leone specifically addressed the electricity sector in the context of the on-going electricity reforms, access to renewable energy resources and utilization of renewable energy sources. The policy focus on hydropower, bioenergy (biomass), solar and wind power plants and co-generation plants for energy production.³⁵

le%20Energy%20policy%20of%20SL_FINAL%20for%20Print.pdf

Energy Efficiency Policy

The Energy Efficiency Policy aims to enhance energy access while transforming the energy sector towards greater sustainability³⁶

[http://www.energy.gov.sl/PR_ENERGY%20EFFICIENCY%20POLICY%20of%20SL_FINAL%20for%20Print%20\(002\).pdf](http://www.energy.gov.sl/PR_ENERGY%20EFFICIENCY%20POLICY%20of%20SL_FINAL%20for%20Print%20(002).pdf)

³⁴ *Nuclear Safety & Radiation Protection Authority act of 2012, p11*

³⁵ *Renewable Energy Policy of Sierra Leone 6th January, 2015, p,12*

³⁶ *Energy Efficiency Policy of Sierra Leone, 2015,*

SLEWRC Mini-grid Draft Regulation

This regulation is meant to regulate the establishment, operation and sustenance of a mini-grid project. See, for further details. <http://ewrc.gov.sl/mini-grid-regulations/>

Acts and licenses regarding the environment

Environmental regulations: ‘Coordinated Implementation of the Bamako, Basel, Rotterdam and Stockholm Conventions in Sierra Leone’ (December, 2016). Environment Protection Agency Sierra Leone.

Find documents here: https://wedocs.unep.org/bitstream/handle/20.500.11822/13965/GOV_7_SierraLeone.pdf?sequence=1&isAllowed=y –

Environmental Protection Acts Of 2008 *Find documents here:*

*<https://sierralii.org/sl/legislation/act/2008/11> - **Land and water rights:** ‘Final National Land Policy of Sierra Leone: Version 6’ (August 1, 2015). Ministry of Lands, Country Planning and the Environment. *Find documents here: <http://extwprlegs1.fao.org/docs/pdf/sie155203.pdf>* ‘National Water and Sanitation Policy’ (July, 2010). Ministry of Energy and Water Resources.*

Find documents here: http://www.washlearningsl.org/wp-content/uploads/2015/03/National_WASHPolicy-with-Photos-Sept-2010.pdf

Acts and licenses regarding labor and local content

Sierra Leone Local Content Policy (SLLCP)

The Sierra Leone Local Content Policy (SLLCP) is a document born of the shared need to see that Sierra Leoneans take an active role in the establishment and running of private enterprises that are primarily owned by foreign nationals. The documents set out specific setup and performance requirements; especially the idea that all enterprises operating in any area of the country’s economy should employ **at least 20%** of Sierra Leoneans in managerial positions and **50%** of Sierra Leoneans in intermediate positions.

Find documents here: [Sierra Leone Local Content Policy – Diaspora PDF diasporaaffairs.gov.sl/uploads/2017/08](http://diasporaaffairs.gov.sl/uploads/2017/08)

Labor laws:

Employers and Employed Act (No.37 of 1965). Adopted in October 1965.

Read here: <http://www.sierra-leone.org/Laws/Cap212.pdf>

The Finance Act (No.3 of 2013). Adopted in December 2013.

Read here: <http://www.parliament.gov.sl/LinkClick.aspx?fileticket=5FAdEo13YPc%3D&tabid=79&mid=436>

Acts and licenses regarding licensing, foreign investment and permits

Permits, Licenses, and lease agreements are regulated by the National Revenue Authority (NRA)

Find list here: <https://www.nra.gov.sl/individuals-and-partnerships/licenses>

Rights of foreign investors:

The Investment Promotion Act (No.49 of 2004). Adopted in August 2004.

Read document here: <http://www.sierra-leone.org/Laws/2004-10p.pdf>

Chapter 9 | Institutional Framework

Ministry of Energy

The primary responsibility of the Ministry is to formulate and implement policies, projects and programmes on energy and provide oversight functions across the entire energy supply chain for all sub-sector agencies (which include electricity production, electricity transmission, electricity distribution and supply) and other forms of energy supply and utilisation.³⁷ for further information see <http://www.energy.gov.sl>

Sierra Leone Electricity and Water Regulatory Commission

To regulate the utility service providers in the electricity and water sectors in line with the provisions of the Sierra Leone Electricity and Water Regulatory Commission Act of 2011. For more details, visit <https://ewrc.gov.sl/>

Electricity Generation and Transmission Company (EGTC)

“The company is responsible for the generation and supply of electricity and sale of electricity to the authority, subject to a power purchase agreement approved by the commission.”³⁸

Electricity Distribution and Supply Authority (EDSA)

“The Electricity Distribution and Supply Authority (EDSA) was founded after the unbundling of the National Power Authority (NPA) in late 2014. EDSA is responsible for the distribution and supply of electricity in Sierra Leone, while most of its operations is centred in the western area, EDSA strives to extend its networks to reach the electrification of the whole country. With over 700 employees, EDSA is undergoing complete restructuring in its organization structure that will be centered on customer satisfaction and have a comprehensive vision of the entire business value chains with the Distribution Technical Services and Commercial Services, as the core of the business.”³⁹ Read more <https://www.edsa.sl>

Nuclear Safety & Radiation Protection Authority (NSRPA)

The object for which the Authority is established is to regulate, control and supervise the acquisition, importation, exportation, use, transportation and disposal of radioactive substances and devices emitting ionizing radiation.

Ministry of Lands, Country Planning and the Environment

The Ministry is primarily responsible for the management of land in Sierra Leone. This is especially important given the multiplicity of land ownership categories. The Ministry is expected to direct the government on matters relating to ownership, acquisition and use, as well as all the implications for sustainability. As the central authority for land use and management, the Ministry is required to set policy on the efficient and sustainable use of land. Therefore, the mandate of the Ministry is not limited to land surveying but extends to the formulation and implementation of 25 sustainable human habitat development policies, a process which includes land mapping. The ultimate goal of the Ministry, as reflected in its Mission statement, is to

³⁷ <http://www.energy.gov.sl>

³⁸ *The national electricity act of 2011*, p 8

³⁹ <https://www.devex.com/organizations/electricity-distribution-and-supply-authority-edsa-128034>

administer effectual policies for land use which contribute to overall socio-economic development. *Read more: <https://psru.gov.sl/sites/default/files/sites/default/files/reports/MIN%20OF%20LANDS%20and%20COUNTRY%20PLANNING%202010.pdf>* 26

Ministry of Finance

The ministry of finance is a vital arm of the government of Sierra Leone. It is responsible for the formation and implementation of all economic policies and financial managements in the country. It is the umbrella body for all the financial institutions and regulatory bodies in Sierra Leone. *Website: mof.gov.sl*

National Revenue Authority (NRA)

The NRA is charged with the responsibility of assessing and collecting domestic taxes, customs duties and other revenues specified by law, as well as administering and enforcing laws relating to these revenues. *Website: <http://nra.gov.sl/>*

Sierra Leone Local Content Agency (SLC)

The SLC is a semi-autonomous intervention under the Government of Sierra Leone (GoSL) to strengthen the local economy by creating linkages between Foreign Direct Investments in Sierra Leone. They focus on capacity development, systems coordination, SLLCA compliance, supplier & market development and community relations. *Website: <http://www.localcontent.sl/index.html>*

Environmental Protection Agency Sierra Leone

The Environmental Protection Agency (EPA) was established in 2008 through the Environmental Protection Agency Act (2008) and became operational in 2009. The EPA is housed within the President's Office and is the main government agency in charge of all issues concerning the environment and climate change. The EPA was established with the goal of creating and enforcing a strict regulatory framework for environmental regulation in Sierra Leone. It has the mandate to coordinate, monitor and evaluate the implementation of national environmental policies, programs and projects, including issuing Environmental Impact Assessment (EIA) licenses.

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