

SIERRA LEONE COUNTRY REPORT PRESENTATION

JICA ENERGY POLICY TRAINING

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West Africa

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MDA: Ministry of Energy

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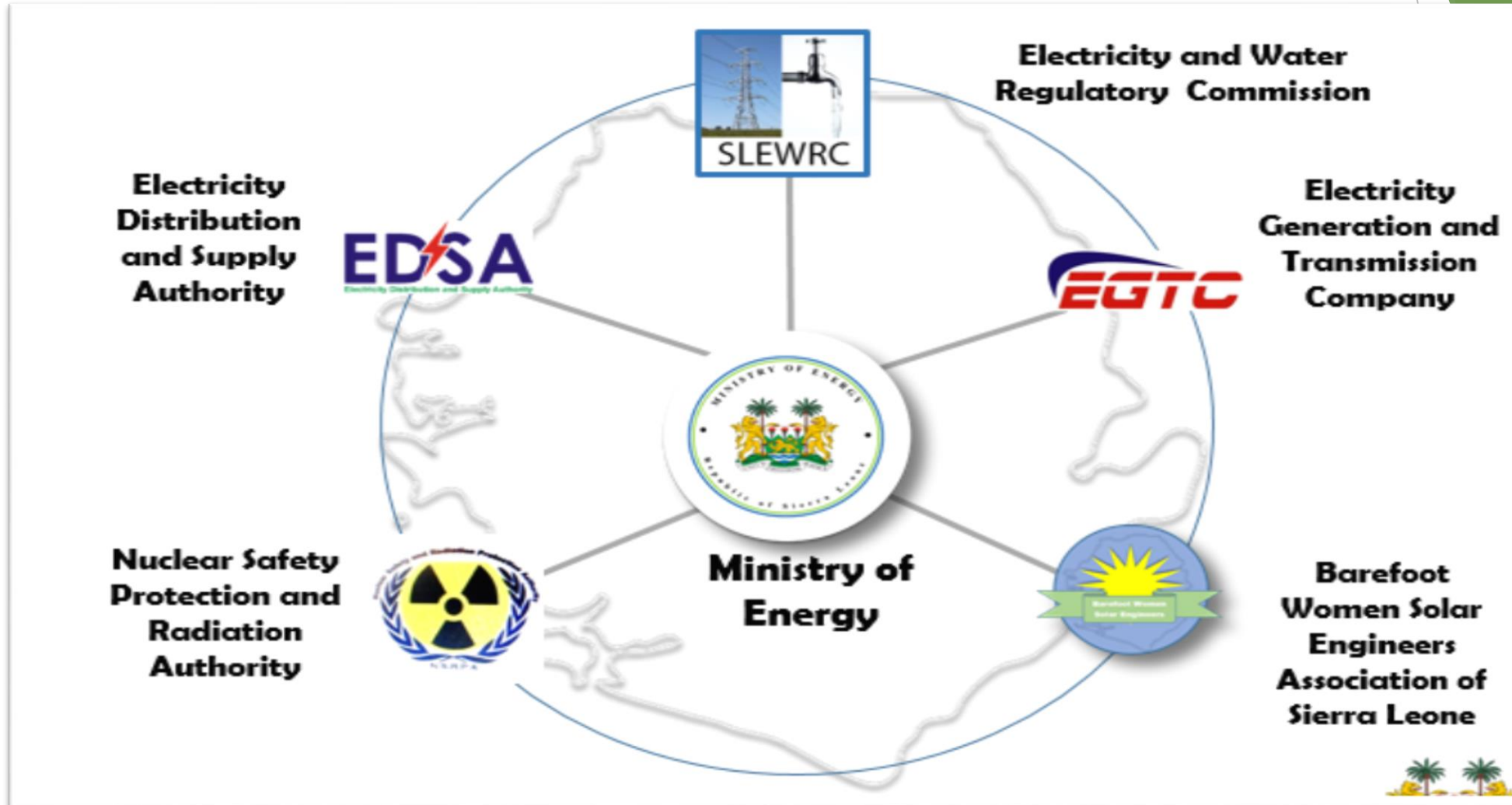
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1. GENERAL INFORMATION OF SIERRA LEONE



- ▶ Sierra Leone is located on the West Coast of Africa along the Atlantic Ocean
- ▶ Sierra Lowa meaning Lion Mountain
- ▶ Capital City: Freetown
- ▶ Total Area: 72.300 Square Kilometers
- ▶ Population: 7.9 million
- ▶ Life Expectancy: 55 Years
- ▶ Corona Cases : 5,811
- ▶ Deaths cases: 107
- ▶ Mineral Resources: Gold, Diamond, Bauxite, Iron Ore, Rutile, Copper, Zircon oil, etc.
- ▶ Foreign Reserves: Gold & USD 707,703,898.1
- ▶ Inflation Rate: 15.5%
- ▶ Employment Rate: 6%
- ▶ Interest Rate: 14.0%
- ▶ GDP Per Capita (Current USD): USD 541.87
- ▶ GDP (Current USD): USD 4.12 Billion
- ▶ GDP Growth Rate: 5.51%
- ▶ Access to Electricity: 23%
- ▶ Percentage of Rural Population with Access to Electricity: 1.5%
- ▶ Access to Electricity, Urban Population: 51.4%
- ▶ Regions in Sierra Leone: North-West, North, South and East

KEY ENERGY SECTOR PLAYERS



2. Current Energy Policy and Measures

Energy Policies, Acts, Strategy, Action Plans and Measures

- ▶ The National Renewable Energy and Energy Efficiency Action Plans
- ▶ The National Renewable Energy and Energy Efficiency Policies
- ▶ The National Electricity Act of 2011. Amendment of Electricity Act aiming at unbundling EGTC in EGC and ETC and enabling Eligible Customers to set-up bilateral contracts as exception to the single buyer market model
- ▶ The National Bioenergy Action Plan is under formulation
- ▶ The National Energy Policy 2009 Revised and validated
- ▶ The National Energy Strategic Plan (2010-20125)
- ▶ Sustainable Energy for All (SE4ALL) Action Agenda
- ▶ Sierra Leone Electricity sector Roadmap
- ▶ The Africa Energy Compact
- ▶ Electricity theft, illegal connection and spontaneous check on households and businesses
- ▶ Encouraging the private sector participation both national and foreign investment in the energy sector
- ▶ The Grid Code
- ▶ The Finance Act of 2017 Guaranteeing duty waivers for imported solar products
- ▶ Gender mainstreaming in Energy Access
- ▶ Energy Conservation campaigns

3. Past Energy Demand and Supply Statistics

Energy Demand and Supply Statistics

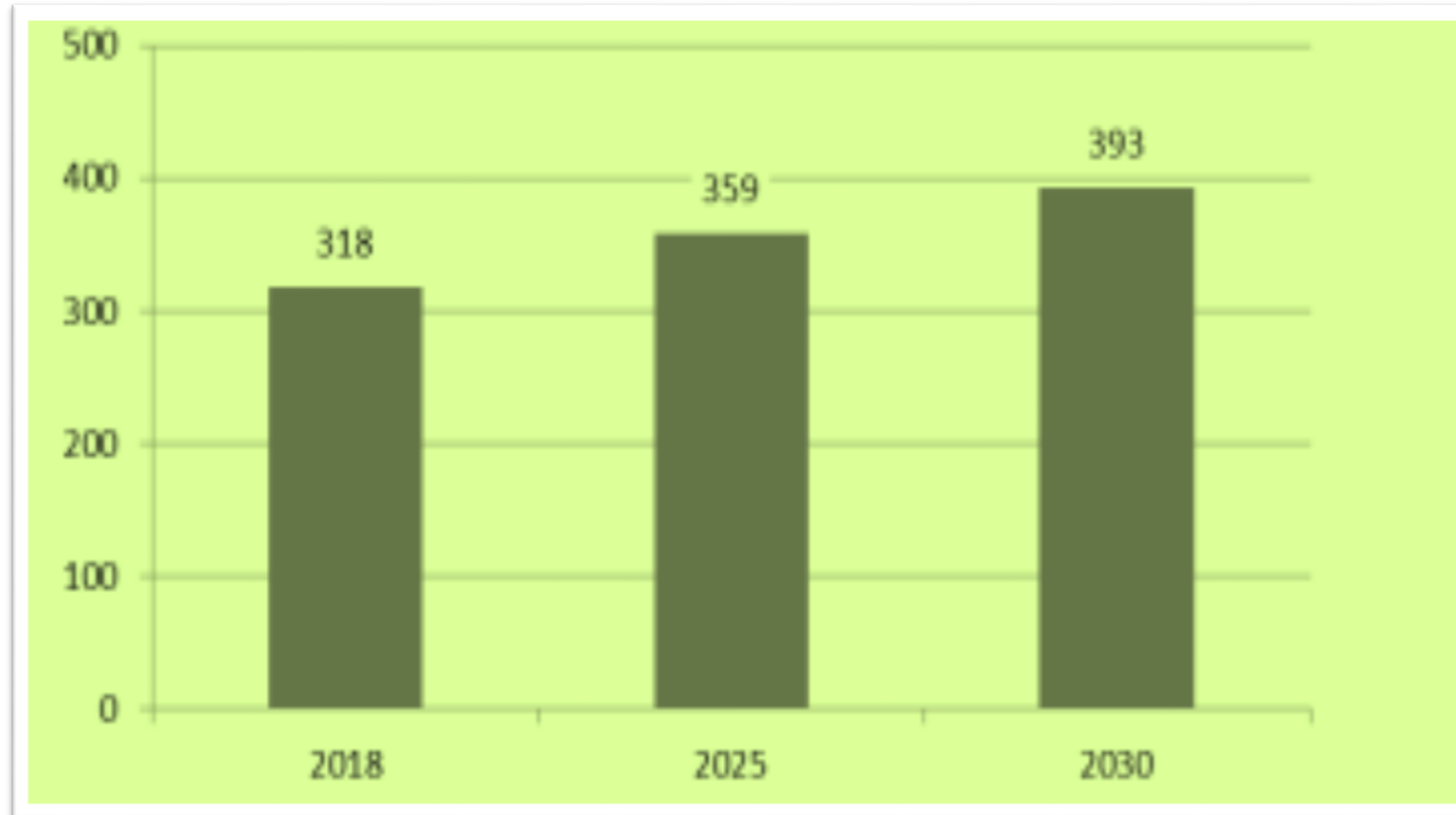
- ▶ The country's energy demand are massively underserved with conservative estimates of previously and currently unmet demand constantly increasing
- ▶ According to EGTC generation statistics in 2019, the generation capacity accounted for is 213.5 MW and an available capacity of 87.5MW which is inclusive of the 6 MW Newton Solar Park project in Freetown and the 194 minigrids project implemented by UNOPS and the 3 minigrids project implemented by WHH/COOPI.
- ▶ The demand forecast only provides estimates for peak demand, there are no estimates for electricity consumption.
- ▶ The forecast assumes all households in Sierra Leone are connected to an integrated distribution and transmission network based upon population estimates from 2015 to 2030 while assuming a consumption level of 50 Watts per person. The projection does not account for any growth in specific consumption over the 15 year period.

Generation capacity



Locations	Installed	Available(A s at present)
• <u>Kingtom & Blackhall Rd.</u>	26.5 MW	0 MW
• <u>Newton</u>	6 MW	
• <u>Lungi_MAN</u>	6 MW	2 MW
• <u>Kono_DFO</u>	2 MW	1 MW
• <u>Kono_HFO</u>	6 MW	6 MW
• <u>Port Loko</u>	0.4 MW	0.4 MW
• <u>Bo</u>	6 MW	2 MW
• <u>Makeni</u>	3.6 MW	2 MW
• <u>Magburaka</u>	0.8 MW	0.8 MW
• <u>Lunsar</u>	1 MW	1 MW
• <u>Bumbuna</u>	50 MW	12 MW
• <u>Goma</u>	6 MW	1.5 MW
• <u>Karpower</u>	100 MW	60 MW
• <u>Sunbird (ADDAX)</u>	25 MW	10 MW
• <u>Mini Grids</u>	6 MW	6 MW
TOTAL	213.5 MW	87.5 MW

Ministry of Energy Demand Forecast for Residential customers (in MW) 2018



Demand Forecast for the Mining sector in 2018

Minining project	Location	Mineral	Status	Demand - MW
Timis Mining Company (Ex-London Mining)	Iron ore	Marampa	Existing project	40
Tonkolili Iron Ore Ltd/ Shandong Steel (Ex African Minerals)	Iron ore	Tonkolili Pepel	Existing project	174
OCTEA Ltd./ Koidu Holdings	Diamonds	Koidu	Existing project	18
Sierra Rutile Ltd.	Rutile	Sembehun	Existing project	37
Sierra Minerals Ltd.	Bauxite	Moyamba	Existing project	7
Nimini Mining Ltd.	Gold	Koidu	Applied for mining license.	10
China Kingho	Iron ore	Tonkolili / Sulima	Applied for mining license.	8
Marampa Iron ore	Iron ore	Marampa / Pepel	Applied for mining license.	121
Port Loko Bauxite	Bauxite	Port Loko	Applied for mining license.	180
Amara Mining Sierra Leone Ltd.	Gold	Baomahun	Applied for mining license.	10
Others - Kono			Feasibility stage	5
Others - Port Loko			Feasibility stage	30
Others - Tonkolili			Feasibility stage	30
Others				15
Total				685

Total Past Installed Capacity of EGTC

Hydroelectric Power (HEP) (MW)

Name of Town/City	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Bumbuna	50	50	50	50	50	50	50	50	50	50
Port Loko	--	--	--	--	--	--	--	--	2	2
Kenema	--	--	--	--	--	6	6	6	6	6
WAR/Charlotte	--	--	--	--	--	--	--	--	2.2	2.2
Total	50	50	50	50	50	56	56	56	60.2	60.2

Thermal Electric Power (MW)

Name of Town/City	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Freetown/WAR	10	26.4	26.4	26.4	26.4	26.4	26.4	26.4	26.4	26.4
Lungi	--	--	--	--	--	6	6	6	6	6
Port Loko	--	--	--	--	--	--	--	--	0.44	0.44
Lunsar	--	--	--	--	--	--	1.06	1.06	1.06	1.06
Makeni	--	--	--	--	--	6.2	6.2	6.2	6.2	6.2
Magburaka	--	--	--	--	--	--	0.8	0.8	0.8	0.8
Kono	--	--	--	--	--	6	6	6	6	6
Bo	--	--	--	--	--	9.15	9.15	9.15	9.15	9.15
Total	10	26.4	26.4	26.4	26.4	53.75	55.61	55.61	56.05	56.05

PROPOSED EDSA DEMAND FORECAST FOR 2020 TO 2025

SOURCES	Years											
	2020		2021		2022		2023		2024		2025	
	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy	Dry	Rainy
Freetown:												
Bumbuna Hydro: (2 x 25 MW available capacity Avg.)	8	45	8	45	8	45	8	45	8	45	8	45
Charlotte Hydro: 2 x 1 MW	0	1	0	1	0	1	0	1	0	1	0	1
Thermal Plants: Niigata (Kingtom); 2 x 4.5 MW	0	0	9	9	9	9	9	9	9	9	9	9
Wartsila(Black Road); 2 x 7.5 MW	5	0	15	15	15	15	15	15	15	15	15	15
Newton Solar PV	0	0	4	1	4	1	4	1	4	1	4	1
Total EGTC Freetown	13	46	36	71	36	71	36	71	36	71	36	71
IPP												
Karpowership	65	35	65	35	65	35	65	35	65	35	65	35
Sunbird SL	0	0	10	5	10	5	10	5	10	5	10	5
CLSG	0	0	14	14	14	14	14	14	14	14	14	14
Current total IPP for Freeetown	65	35	79	49	79	49	79	49	79	49	79	49
Total Freetown (IPP Plus EGTC)	78	81	125	125	125	125	125	125	125	125	125	125
Network Status												
Network Demand Forecast (Peak)	82	75	94.3	86.25	113.2	103.5	135.8	124.2	149.4	136.6	164.3	150.3
Network Average Demand Forecast	65	55	74.75	63.25	89.7	75.9	107.6	91.08	118.4	100.2	130.2	110.2
Provincial Operations:												
CLSG												
Bo	6	6	7	7	8	8	10	10	12	12	15	15
Kenema	4	4	5	5	6	6	9	9	10	10	12	12
Kono OCTEA Mining	0	0	0	0	6	6	6	6	6	6	6	6
29 CLSG Towns and Villages	0	0	0	0	3	3	4	4	4	5	5	5
New Projects CLSG (Kailahun, Pujehun, Kabala etc.)	0	0	0	0	0	0	5	7	8	8	8	8
CLSG Total	10	10	12	12	23	23	34	36	40	41	46	46
Bumbuna Shield wire												
Makeni	4.4	4.4	5	5	7	7	8	8	9	9	11	11
Magburaka	0.5	0.5	1	1	1.5	1.5	2	2	3	3	4	4
Kono Township	2	2	3	3	4	4	5	5	6	6	7	7
Lunsar	1	1	1.5	1.5	2	2	3	3	4	4	5	5
Portloko	0.5	0.6	1	1	2	2	3	3	4	4	5	5
Makali	0.01	0.12	0.15	0.15	0.15	0.15	0.15	0.17	0.17	0.17	0.2	0.2
Lungi	2.5	2.5	3.5	3.5	4	4	5	5	6	6	7	7
Kailahun	1	1	1.5	1.5	2	2	2.5	2.5	3	3	4	4
Kambia	0	0	0	0.5	1	1	1.5	1.5	2	2	3	3
Moyamba	0	0	0	0.5	1	1	1.5	1.5	2	2	2.5	2.5
Pujehun	0	0	0	0.5	1	1	1.5	1.5	2	2	2.5	2.5
Bonthe	0	0	0	0.5	1	1	1.5	1.5	2	2	2.5	2.5
Kabala	0	0	0	0.5	1	1	1.5	1.5	2	2	2.5	2.5
Kamakwie	0	0	0	0.5	1	1	1.5	1.5	2	2	2.5	2.5
Falaba	0	0	0	0.5	1	1	1.5	1.5	2	2	2.5	2.5
Total Provincial Operations	11.91	12.12	16.65	20.15	29.65	29.65	39.15	39.17	49.17	49.17	61.2	61.2
Freetown Demand Forecast (Peak)	82	75	94.3	86.25	113.2	103.5	135.8	124.2	149.4	136.6	164.3	150.3
National Power Requirement 2020 - 2025	93.91	87.12	111	106.4	142.8	133.2	174.9	163.4	198.5	185.8	225.5	211.5

Proposed Generation Project and Capacity

Name	Type	Capacity (MW)	Location	Region	Comments
CEC Africa - Phase 1	HFO	50	Kissy	West	Confirmed - Commissioning in 2017
CEC Africa - Phase 2	HFO	39	Kissy	West	Commissioning by 2020
CEC Africa - Phase 3	HFO	39	Kissy	West	Commissioning by 2022
Newton	Solar	6	Newton	West	2018
Charlotte	Hydro	2.2	Regent	West	2016 - 80% completed by Oct 2015
Floating Barge	HFO	48	Freetown	West	Envisaged for dry season. Financial viability concerns
Kingtom	HFO	105	Freetown	West	Envisaged for dry season. Financial viability concerns
Bumbuna II	Hydro	132	Bumbuna	North	4x33MW - 2022 If financial closure is completed by 2017.
Yiben	Hydro	66	Yiben	North	2x33MW - 2022 If financial closure is completed by 2017.
Mange	Hydro	100	Mange	North	4x25MW - Pending hydro and enviro. Studies. 5 years to develop
Port Ioko	Hydro	2.2	Port Ioko	North	2016
Port Ioko	Diesel	2	Port Ioko	North	(*)
Kambia	Diesel	2	Kambia	North	(*) - List as 2x3 MW in (**)
Lunsar	Diesel	2	Lunsar	North	(*)
Pepel I	Coal	250	Pepel	North	Pending feasibility studies. 4 years to develop
Pepel II	Coal	200	Pepel	North	Pending feasibility studies. 4 years to develop
Heron energy	Solar	5	Makoth	North	(*)
Makali	Hydro	0.65	Makali	North	2016 - 60% completed by Oct 2015
Makeni	Diesel	6	Makeni	North	(*)
Kabala	Diesel	2	Kabala	North	(*)
Magburaka	Diesel	2	Magburaka	North	(*)
Koidu	HFO	6	Koidu	East	(*)
Bekonghor	Hydro	160	Kono	East	4x40MW - Enviro. Study completed. 5 years to develop.
Kailahun	Diesel	2	Kailahun	East	(*)
Kenema	Diesel	6	Kenema	East	(*)
Bo	HFO	6	Bo	South	(*)
Bo	Solar	5	Bo	South	(*)
Pujehun	Diesel	2	Pujehun	South	(*) - List as 4 MW in (**)
Moyamba	Diesel	2	Moyamba	South	(*)
Bonthe	Diesel	1	Bonthe	South	(*)
Mano river	Hydro	180	Liberia	South	Bi-national project. 8 years to develop
Singimi	Hydro	12	Lanti	South	Feasibility studies for serving mining sector. 4 years to develop
Total		1443			

4. Outlook of Energy Demand and Supply

- ▶ **Transmission and Distribution Network:** Transmission and distribution network need to be improved, most parts of the country have no access to any grid, several distribution lines are old with over 60 years old and power losses are normal with well over 40%, old equipment is in place and needs to be replaced, poor energy efficiency, generation capacity does not cover the demand, especially in the industry many companies are forced to rely on diesel generators , service standards of EDSA are poor, use of inefficient cook stoves /3-stone-fires in the rural areas are common and kerosene lights/battery torches (Chinese lights).
- ▶ We only have one National Grid which is the 161Kv Transmission line with the 225Kv transmission line coming up under the International Transmission Line Project called the West African Power Pool (Cote d'Ivoire, Liberia, Guinea and Sierra Leone)
- ▶ The intervention of the World Bank, JICA, European Union, African Development Bank and other partners has helped the energy sector in achieving its mandate
- ▶ We have 161Kv, 225Kv and 66Kv as transmission lines. Recently, we have classified 33Kv and 11Kvin to be distribution lines in Sierra Leone for proper planning scenario.

Planned Transmission and Distribution network System

Southern Corridor Transmission Line

Voltage	To	From	Type	Length [km]	Description
225kV	Waterloo	Moyamba	Single circuit	75	400 mm ² bundled ACSR conductors
225kV	Moyamba	Lanti	Single circuit	59	400 mm ² bundled ACSR conductors
225kV	WAPP Bikongor	Bikongor power house	Single circuit	25	400 mm ² bundled ACSR conductors
225kV	Bikongor power house	Baomahun	Single circuit	50	400 mm ² bundled ACSR conductors
225kV	Baomahun	Bo	Single circuit	56	400 mm ² bundled ACSR conductors
225kV	Bo	Lanti	Single circuit	72	400 mm ² bundled ACSR conductors
66kV	WAPP Bikongor	Koidu	Single circuit	15	240mm ² ACSR conductor
66kV	WAPP Bikongor	Nimini	Single circuit	20	240mm ² ACSR conductor
66kV	Koidu	Kailahun	Single circuit	70	240mm ² ACSR conductor
33kV	WAPP Kenema	Kenema town	Double circuit	5	240mm ² ACSR conductor
33kV	Kenema town	Bo	Double circuit	70	240mm ² ACSR conductor

Planned Transmission Line in the Northern Corridor

Voltage	To	From	Type	Length [km]	Description
225kV	WAPP Yiben	Batkanu (bypass point)	Double circuit	80	400 mm2 bundled ACSR conductors
225kV	Batkanu (bypass point)	Mange	Double circuit	50	400 mm2 bundled ACSR conductors
225kV	Mange	Port Loko	Double circuit	18	400 mm2 bundled ACSR conductors
225kV	Port Loko	Waterloo	Double circuit	58	400 mm2 bundled ACSR conductors
225kV	WAPP Yiben	Yiben power house	Single circuit	5	400 mm2 bundled ACSR conductors
225kV	Pepel thermal plant	PL & Waterloo Line	Double circuit	26	400 mm2 bundled ACSR conductors
225kV	Mange	Mange power house	Double circuit	1	400 mm2 bundled ACSR conductors
225kV	Port Loko	Marampa	Single circuit	24	400 mm2 bundled ACSR conductors
225kV	WAPP Bumbuna	Tonkolili	Double circuit	8	400 mm2 bundled ACSR conductors
161kV	Waterloo	Freetown Bumbuna line	Double circuit	2	400 mm2 ACSR conductors
161kV	Marampa	Lunsar	Single circuit	7	400 mm2 ACSR conductors
161kV	Makeni	Magburaka	Single circuit	25	400 mm2 ACSR conductors
161kV	Bumbuna II	Bumbuna WAPP	Double circuit	8	400 mm2 ACSR conductors
66kV	Port Loko	Lungi	Single circuit	55	240mm2 ACSR conductor
33kV	Pepel	Pepel Port	Double circuit	5	240mm2 ACSR conductor
33kV	Waterloo	Jui (Freetown area)	Double circuit	14	240mm2 ACSR conductor
33kV	Jui	Wellington	Double circuit	6	240mm2 ACSR conductor
33kV	Jui	Regent	Double circuit	13	240mm2 ACSR conductor
33kV	Waterloo	Tombo	Single circuit	16	240mm2 ACSR conductor
33kV	Tombo	York	Single circuit	17	240mm2 ACSR conductor
33kV	York	Goderich	Single circuit	26	240mm2 ACSR conductor
33kV	Yiben power house	Kabala	Single circuit	35	240mm2 ACSR conductor
33kV	Mange	Kambia	Single circuit	30	240mm2 ACSR conductor
33kV	Makeni	Makeni Town	Single circuit	5	240mm2 ACSR conductor

5. Major Difficulties and Bottlenecks in Formulating Energy Policies

- ▶ Access to funding for the formulation of energy policies.
- ▶ Transmission and Distribution losses
- ▶ Energy supply reliability
- ▶ Lack of quality data for policy analysis
- ▶ Stakeholders participation in prioritizing the policy formation process
- ▶ Political and Administrative buy-in in the whole process of policy formulation
- ▶ Tariff structure to cater for the poor which cannot afford to spend compared to the rich
- ▶ Climate Change issues and economic considerations
- ▶ The neglect of educational and research institutions in energy policies
- ▶ Lack of technical and experienced expert to handle energy policies holistically
- ▶ Attractive incentives for Renewable Energy developers
- ▶ Gender mainstreaming in energy is another pivotal issue in policy formulation

6. Subjects you would like to study in the order of priority and the reason

- ▶ Energy planning and software
- ▶ Energy Database management and Data Analysis
- ▶ Power Purchase Agreement Negotiations
- ▶ Monitoring and Evaluation of Energy Projects for both locally funded and Donor funded projects
- ▶ Research and Development in the Energy Sector for developing a country

7. Conclusion

- ❖ The existing situation in electricity supply and use in Sierra Leone is untenable - economically, environmentally, socially, and financially the sector. The Government of Sierra Leone (GoSL) recognizes the impossibility of electricity supply continuing as it has. The public utilities understand most keenly that the status quo is not sustainable. Currently, there is: i) insufficient power to supply the whole rural and urban areas. Though, the current Minister of Energy is working tirelessly to salvage the situation but we still have insufficient generation capacity to meet the demand
- ❖ Few weeks ago, we had engagement with the Japanese Government, via JICA, for the implementation of Rural Renewable Energy Project minigrids in six locations in Sierra Leone and the project will soon kick-off.

THANK YOU FOR YOUR KIND ATTENTION!

