



# Project Information Document (PID)

Appraisal Stage | Date Prepared/Updated: 24-Nov-2020 | Report No: PIDA29533



**BASIC INFORMATION**

**A. Basic Project Data**

Country Sierra Leone	Project ID P171059	Project Name Enhancing Sierra Leone Energy Access	Parent Project ID (if any)
Region AFRICA WEST	Estimated Appraisal Date 30-Nov-2020	Estimated Board Date 28-Jan-2021	Practice Area (Lead) Energy & Extractives
Financing Instrument Investment Project Financing	Borrower(s) Republic of Sierra Leone	Implementing Agency Electricity Distribution and Supply Authority, Ministry of Finance	

Proposed Development Objective(s)

The Project Development Objective is to increase electricity access in Sierra Leone.

Components

- Electrification through grid extension
- Electrification through mini-grids and standalone solar systems
- Human capital development and implementation support

**PROJECT FINANCING DATA (US\$, Millions)**

**SUMMARY**

<b>Total Project Cost</b>	52.70
<b>Total Financing</b>	52.70
<b>of which IBRD/IDA</b>	50.00
<b>Financing Gap</b>	0.00

**DETAILS**

**World Bank Group Financing**

International Development Association (IDA)	50.00
IDA Grant	50.00



**Non-World Bank Group Financing**

Trust Funds	2.70
Japan Policy and Human Resources Development Fund	2.70

Environmental and Social Risk Classification

Substantial

Decision

The review did authorize the team to appraise and negotiate

Other Decision (as needed)

**B. Introduction and Context**

1. **The reestablishment of democracy over four elections since 2002 is an important achievement but worrying signs of fragility remain.** The 2018 election required intervention by the Economic Community of West African States (ECOWAS) to defuse the disputed outcome, and almost every by-election since has been marred by some violence and disputed outcomes. The dominant social contract is within ethnically aligned political structures with multiple centers of power in cultural authorities, which undermines social cohesion. The impact of natural hazards and climate-related shocks, as well as macroeconomic shocks and epidemics, is worsened in the presence of pre-existing vulnerabilities and fragility—notably, a youth demographic with low education and constrained employment opportunities, power asymmetry and elite capture, and limited institutional capacity.

2. **There has indeed been progress, reflected in significant poverty reduction from 66.4 percent to 52.3 percent between the end of the war and just before the Ebola epidemic and iron ore shocks.** The ample availability of fertile land facilitated growth in agriculture, which contributes half of the country’s Gross Domestic Product (GDP) (2018). Urban areas have become local trading and commercial centers, especially in the capital of Freetown (which accounts for a third of GDP). There has been Foreign Direct Investment (FDI) in mining and agriculture, though the contribution of mining to job creation and fiscal revenue has underperformed.

3. **The human capital situation in Sierra Leone is very challenging and is further complicated by the COVID-19 pandemic.** The population of 7.8 million has the fifth lowest life expectancy globally (51 years). These issues are further complicated by the COVID-19 pandemic, which, as the Ebola, could perpetuate the vicious cycle of poverty and gender inequality. Youth under 35 years of age account for 75 percent of the population but much of this cohort spent their formative years in the decade-long war. The youth bulge is, therefore, associated, in part, with low skills and some frustration around unmet expectations, and is an important source of fragility. On gender inequality, the country has a Gender Inequality Index (GII) value of 0.644, which reflects inequalities in three dimension, namely reproductive health, empowerment, and economic activity. With this GII Sierra Leone is ranked at 153 out of 162 countries in the 2018 index. Inequality is characterized for example



by low educational attainment (19.9 percent of adult women having at least a secondary level of education compared to 32.9 percent of men) and lower female participation in the labor market.

4. **The pace of poverty reduction has slowed in recent years.** Poverty fell by 1.5 percentage points annually over 2003-2011 and by 0.8 percentage points over 2012-2018, reaching 56.8 percent in 2018. While the share of food-insecure Sierra Leoneans decreased from 49.8 percent to 43.7 percent (2012-2018), 3.2 million people remain food-insecure. COVID-19 will likely put additional stress on poor households due to slowing food production, shortages in food imports and higher food prices. The Gini coefficient increased from 0.33 (2011) to 0.37 (2018). Poverty remains disproportionately high in rural areas (78.5 percent) and the largest reduction occurred in urban areas outside of Freetown (by 0.9 percentage points annually over 2012-2018). The major determinants of poverty are large household size, low education of the household head, and employment in agriculture and non-wage employment. Furthermore, poverty rates for households with access to electricity are between 13.5 and 20.2 percentage points lower than those without electricity access. Extreme poverty in rural areas increased by 4.3 percentage points (2012-2018); and three (out of 15) districts have poverty rates above 80 percent.

5. **Higher economic growth rates and higher poverty elasticity of growth are needed to meet future poverty reduction targets, and this will further be complicated by COVID-19.** Growth between 2012-2018 was less pro-poor than between 2003-2011. Starting in 2019, poverty will have to fall at an annual rate of 4.9 percentage points to achieve the Twin Goals target of 3 percent in 2030, and a growth rate of 16 percent per year will be needed.

6. **The economy struggles to create jobs because it is undiversified and trapped in subsistence agriculture and subsistence household enterprises.** The undiversified economy remains dependent on natural resources for revenue and on subsistence farming and petty trading for most employment. Informality with low productivity dominates both the agriculture and non-agriculture labor markets. The country not only has the lowest productivity levels, but with few manufacturing and value-addition activities, there is significant room for improvement in export performance.

7. **Weak governance and corruption have had cross-cutting implications: increased cost of doing business, low investor confidence and poor accountability for service delivery to citizens.** Governance constraints and coordination failures across ministries, departments and agencies (MDAs), and vertically with local administrative authorities, negatively affect private sector competitiveness and effectiveness of spending on social services. Furthermore, weak infrastructure governance in the power, mobility and digital sectors—in the form of lack of transparency, low accountability and cumbersome regulatory frameworks—deters investors by increasing transaction costs and project risks. These critical institutional constraints furthermore result in a reduced impact of spending on the country's significant infrastructure gaps. Lack of transparency in management of the natural resource sectors (such as mining) further contributes to low business confidence.

8. **While Sierra Leone's geography, geology and climate endow the country with a wealth of natural resources, these leave the country susceptible to natural disasters and climate changes and add to prevailing fragility risks.** With the second most intensive rainfalls in Africa, extreme precipitation and sea-level rise are significant threats for landslides, coastal flooding and erosion, especially given the concentration of population and economic activity in Freetown, as well as deforestation of hills and informal settlement on floodplains. The intensity of rainfall also risks damage to critical service and transport infrastructure, and variability in rainfall patterns brings vulnerabilities as a large share (39.7 percent) of the country's installed energy capacity comes



from hydropower. According to World Bank's Lifelines report, the costs of disruptions in the power sector or businesses and households amount to 1.1 percent of the GDP for the country each year. Sierra Leone ranks 160<sup>th</sup> out of 188 countries in their ND-GAIN vulnerability score<sup>1</sup>.

9. **One of the major binding constraints to growth and poverty reduction in Sierra Leone is lack of reliable and affordable energy (electricity) supply services.** During the period of unrest (1991-2001), the country's physical infrastructure, particularly electricity, water and sanitation, and human capital was severely damaged. Despite strong post-conflict economic recovery, as of 2014, Sierra Leone ranked 181 out of 188 countries in the United Nations Human Development Index (HDI) and had an estimated Gross National Income (GNI) per capita of US\$700, placing it in the bottom of countries in Sub-Saharan Africa. In the following years, the Ebola Virus Disease (EVD) combined with the closure of the two largest iron ore mines resulted in a sharp contraction in economic growth. In early 2016, the Government of Sierra Leone (GoSL) developed an economic recovery plan, but its implementation has been quite challenging as an effective and sustainable resumption of broad-based economic growth needs to be underpinned by adequate infrastructures and human capital. According to the African Development Bank (AfDB), the country's infrastructure compares poorly to the rest of Sub-Saharan Africa, and it was ranked 46 out of 54 countries on the AfDB's Infrastructure Development Index (AIDI) in 2016. In particular, inadequate and unreliable power supply constitutes as a major barrier to the country's economic recovery and poverty reduction ambition. A recent World Bank survey of 152 private firms in Sierra Leone shows that they lost on average 11.2 percent of revenue as a result of unreliable electricity services, as compared with the average of 5.3 percent in Sub-Saharan Africa.

## B. Sectoral and Institutional Context

10. **There is progress on sector reforms albeit at a very slow pace and the corporatization and commercialization of power utilities need to be completed.** The National Electricity Act, 2011 (the Electricity Act)<sup>2</sup> repealed the National Power Authority Act of 1982 and established two state-owned enterprises: (a) the Electricity Generation and Transmission Company (EGTC) and (b) the Electricity Distribution and Supply Authority (EDSA). EGTC is responsible for power generation and transmission at high voltage levels while EDSA is responsible for the distribution network at 66 kV to Low Voltage (LV) customer connection and for electricity sales to customers. Some progress has been made since the promulgation of the Electricity Act in 2011 with the two utilities becoming functional on January 1, 2015. Oversight of the sector falls under the Ministry of Energy (MoE) and the Electricity and Water Regulatory Commission (EWRC), which was created in 2014 by the Electricity Act and has the mandate to independently regulate the sector. The mandate of the MoE includes sector policy formulation, sector planning, and coordination. Due to the overreliance on the funding interventions from GoSL, the MoE is still involved in the day-to-day operations of the two utilities. The corporatization and commercialization of EDSA and EGTC is far from completion. EWRC, five years after commissioning, still has low institutional capacity and little influence on the sector currently. Regulatory issues, including tariff setting, licensing procedures for potential developers, and technical regulation, are currently co-administered by the MoE. As a result, the Electricity Act is far from fully implemented.

11. **Sierra Leone has one of the lowest electricity access rates in the world.** According to the information provided by EDSA, as of end 2019, there were about 178,100 households across the country which are connected to and served by the main grid and isolated grids EDSA owns and operates. It represents about 14

<sup>1</sup> <https://gain.nd.edu/our-work/country-index/rankings/>

<sup>2</sup> Electricity Act 2011, Supplement to the Sierra Leone Gazette CXLII, No. 62, dated September 22, 2011.



percent of the total 1,248,000 households in the country. As the main grid and the isolated grids only serve Freetown area and some district headquarter towns, almost all these households are considered as urban. There are 55 privately operated renewable energy based mini-grids across the country, 50 with an installed solar Photovoltaic (PV) capacity ranging from 16 kW to 36 kW each, three systems of 66 - 127 kW and two hydro power mini-grids at 128 kW and 250 kW respectively. These systems serve villages and communities with households below 100 to 2000. A total of approx. 10,000 households are served by these mini-grids, representing just below 1 percent of the total number of households in Sierra Leone. Most of these mini-grids are developed and installed with grant support from Department of International Development (DFID) and the European Union (EU) and are being operated by private operators on commercial ground. Additional diesel powered mini-grids are operated by private companies (three systems) and the local community (one system). In addition, there are a fair number of households which are supplied by standalone Solar PV Home System (SHS). There are no statistics from GoSL on the numbers, types and sizes of the SHS. The SL Solar Association estimated that about 100,000 households now have solar products at home, mostly Pico systems (over 80 percent) and some small size SHS (15 percent). These solar products are sold and installed by private vendors, suppliers and contractors to individual households.

12. The service quality varies significantly among consumers served by the main grid, isolated grids and the mini-grids. Since June 2018, the electricity service of the main grid has improved to an average of 18 hours per day, although supply interruptions are frequent due to planned and unplanned outages of generators, transmission lines and distribution network. The service quality in the isolated grids of EDSA varies by towns, depending on fuel availability and by seasons where electricity is partly supplied by seasonal hydro plants. It is not uncommon that the electricity supply in some towns could be interrupted for days or even weeks. The mini-grids are supposed to provide electricity for eight hours per day, but it is yet to be verified as most mini-grids only commenced operation in November 2019.

13. **Access to electricity for health centers, schools and for productive uses is low.** There is a total of about 1,300 health facilities<sup>3</sup> in Sierra Leone. As of 2019, only about 25 percent are provided with grid electricity or solar PV systems. A small portion of the remaining have diesel generation sets which suffer from poor maintenance and lack of fuels. Even with the ongoing electrification program through grid extension, more than half of the health facilities are unlikely to have grid electricity by 2030. There was a total of 8,907 primary and secondary schools in Sierra Leone in 2016 (ASC 2019 (provisional)) and the number increases every year. No detailed information was found on the number of schools with access to electricity nor the energy need of the different categories of schools. It is generally recognized that schools in towns which have power are supplied with grid electricity. A survey of sixty schools in several districts shows that about 60 percent had no lighting sources, 35 percent had diesel generators and the remaining had battery powered torches. The Off-grid Solar Market Assessment for Sierra Leone<sup>4</sup> realized under Regional Off-Grid Electrification Project (ROGEP; P160708) indicated solar water pumping for irrigation as the rural productive use alone, with the highest potential with an estimated market of US\$72 million which is not yet tapped.

14. **The limited generation, transmission and distribution capacity of the main grid are bottlenecks to expanding electricity access and improving service quality.** The current installed generation capacity connected

<sup>3</sup> WHO Sierra Leone Annual Report 2018.

<sup>4</sup> [http://www.ecreee.org/sites/default/files/ecreee\\_rogep\\_sierra\\_leone\\_final\\_report.pdf](http://www.ecreee.org/sites/default/files/ecreee_rogep_sierra_leone_final_report.pdf).



to the main grid is about 104 MW, consisting of 50 MW hydropower (Bumbuna) and 24 MW heavy fuel oil (HFO) (Kingtom and Blackhall Road) units owned and operated by EGTC as well as a 30 MW biomass (Adax) owned by the private sector. In addition, EDSA recently extended contract for the supply of 60–65 MW in the dry season and 20–25 MW in the rainy season from HFO power barge owned by the private sector. However, the available generation capacity, including from the Karpower barge, is about 80 MW in the wet season and only about 70 MW in the dry season because (a) Bumbuna can supply only 10–15 MW in the dry season; (b) Adax is not available due to the lack of biomass as fuel and high tariff (20 US\$/kWh); and (c) the EGTC's 24 MW HFO units are not operating as a result of poor maintenance and lack of spare parts. Sierra Leone's main power network now consists of a 161 kV radial single circuit transmission line (of 70 MW capacity in theory and 40 MW in practice) connecting the existing Bumbuna hydropower plant to the distribution network in Freetown. The distribution network in Freetown has a maximum capacity of about 85 MW. It is not yet adequate to deliver all the available generation capacity in the rainy season to customers. Nearly 1,000 km LV lines/cables are dilapidated and have high technical losses and low reliability. The isolated grids operated by EDSA are mostly supplied by expensive HFO/diesel units which suffer from frequent fuel shortage. Some are partly supplied by small hydro plants which are seasonal. The distribution networks in the isolated grids have very limited coverage and are unreliable.

15. **The sector's sustainable development could be achieved through significantly improving EDSA's technical and financial performance and developing/acquiring low-cost generation.** There have been some improvements in EDSA's technical and financial performance. During the last two years, the total technical and commercial (T&C) losses have been reduced to around 38 percent from about 40 percent in 2016 and the overall collection rate has increased from about 78 percent to about 85 percent. But the aggregate technical, commercial, and collection (ATC&C) losses are still over 40 percent and are much higher than the average losses of 20–25 percent in many Sub-Saharan Africa countries. At such high losses, the average weighted consumer prices of 15 US\$/kWh (excluding goods and service tax) in 2019, which has declined significantly in US\$ terms since November 2016 when the prices were adjusted, will not financially support the operations of any liquid-fuel-fired generation capacity even with the fuel price downturn. The tariff for commercial and industrial consumers is around 18 US\$/kWh and there is not much room for further increase due to political considerations and affordability constraints. Currently, the sector's deficit is financed by the Government's budget, which is putting a lot of stress on its finances. The continued reliance on the Government's budget will be challenging as the sector grows. While liquid fuel power plants are essential to meet the minimum electricity service and medium term and may play a limited role in the medium term and long term, especially as the system is adapted to integrating variable energy and during the dry season.

16. **The least cost generation expansion plan indicates that the growing electricity demand** could be met by a mix of large hydropower, power import through the Cote d'Ivoire-Liberia-Sierra Leone-Guinea (CLSG) interconnection, limited gas-fired plants and solar PV plants over the long term. The peak demand observed in 2020 is 85 MW. In the short term, the only available options are private HFO plants and import through the CLSG line. In the mid-term, a gas-fired plant located in the load center of Freetown, increased import from the West Africa Power Pool (WAPP) and possibly some PV plants could replace the existing HFO plants and meet the increase in demand. The sector financial analysis and projection shows that, if the loss reduction is fully implemented to reduce ATC&C losses to 20 percent, the generation/supply expansion follows the least cost generation expansion plan and the average consumer tariff is kept at 20 US\$/kWh, the sector could become financially viable without government subsidy in 6–7 years.



17. **The Government needs to increase electricity access expansion through solar PV based mini-grids and standalone solar PV systems.** While grid extension is the most economical option to provide electricity service to 60-70 percent of the country's population, GoSL needs to increase effort to expand electrification through mini-grid and off-grid solutions in areas and communities which could not be covered by the extension of the main grid in the next decade or so. Over the past five years, the GoSL has taken a number of actions to promote and facilitate the provision of electricity through solar PV based mini-grids for communities and standalone solar systems for businesses and households. In 2016, the GoSL has adopted the Renewable Energy Policy of Sierra Leone, which aims to ensure the provision of electricity to all remote and off-grid areas of the country by utilizing off-grid solar technologies. In 2016 and 2017, it implemented duty and Value Added Tax (VAT) exemption on imported quality certified (IEC-compliant) solar products. In 2019, GoSL implemented the Mini-Grid Regulation which clearly spells out license issuing, cost-reflective tariff setting, service quality etc. for provision of electricity through the construction and operation of mini-grids by private sector. However, there still remain many barriers to the development and scale-up of the mini-grid and standalone solar PV market. In Sierra Leone, a dedicated agency with adequate capacity responsible for planning and coordinating rural electrification through mini-grid and SHS solutions is yet to be established. There is a lack of institutional capacity to collect information and develop database to record market evolution, summarize good practices and learn from lessons. Clear financial incentives to support the solar PV market do not exist. In addition, GoSL is yet to set quality standards for solar products with associated monitoring mechanism. There is a great lack of local technical capacity for installation and maintenance of solar PV systems.

18. **Weak institution and staff capacity of key stakeholders is a key constraint to the development of a sustainable sector.** Overall, the capacity of the stakeholders is inadequate to carry out sector planning; develop and implement sector strategies and policies; and procure, evaluate, and implement generation projects by the private sector. The National Power Authority (NPA)'s endemic structural and operational challenges such as lack of adequate technical, operational, Financial Management (FM), and environmental and social risk management capacity have been inherited by the two newly established entities, with little change in overall staffing at all levels. Interventions such as the operation and maintenance (O&M) contract with an international firm for the Bumbuna hydropower plant owned by the EGTC and Management Contractor (MC) for EDSA funded under the Energy Sector Utility Reform Project (ESURP; P120304) helped improve the situation to some extent. However, the staff and institutional capacity building needs to be a continuous and long-term effort and process. The MoE Planning Department has limited number of staff to enable it to perform its role of policy making, planning, and monitoring of the sector. The EWRC now has the required commissioners appointed but it lacks the requisite technical staff and tools to function properly. With support of IDA and other donors, various capacity building programs for the key stakeholders were implemented, but more needs to be done.

19. **The Government has a target to move toward a more sustainable energy mix and a reduction of Greenhouse Gas (GHG) emissions, in line with the Paris Agreement and Nationally Determined Contributions (NDCs), but detailed implementation plan and path are yet to be developed and defined.** Sierra Leone accounts for 0.36 percent of GHG emissions in Sub-Saharan Africa and 0.03 percent globally every year. The power generation capacity in Sierra Leone is currently dominated by liquid fuel generation units, which have very high level of CO<sub>2</sub> emissions per unit electricity generated. In the main grid, the total generation capacity of 164 MW (including the private HFO barge) consists of 50 MW hydropower, 30 MW biomass and 84 MW HFO units. Due to the low access and poor quality of grid power, it is estimated that there are more than 160 MW of captive HFO/diesel units owned by the mining sector, industrial and commercial enterprises, public institutions and even households. The total off-grid renewable energy capacity (solar and mini-hydro) is estimated around 20 MW. The GoSL intends to transition to an energy path which incorporates economics, environment, climate





and sustainability. The least cost generation expansion plan shows, over the long term, the country's power generation will rely primarily on indigenous and clean resources like hydropower and solar energy, complemented by low cost power available through the WAPP and supported by limited gas-fired power to respond to variable power generation and load variations. GoSL has committed through the West Africa Regional Energy Trade Development Policy Financing Program (P171225) to provide economic justification and follow least cost power plan eventually.

20. **The proposed project supports the post COVID-19 economic recovery of the Government through providing critical energy to power businesses, households and critical public institutions.** Power supply is essential not only for health facilities (including for vaccine storage and administration) but also as a digital backbone for education, business and all other services during COVID-19 where only 18 percent energy access reflects the difficulties faced by people during the pandemic. The project will provide energy access for households, businesses, health clinics and schools, which is essential for job creation, revenue generation and return to normal life, all critical part of the economic recovery. The project also supports the replacement of costly liquid generation units with low cost power, which would free up scarce fiscal resources from budget of the Government for other urgent socio-economic needs.

21. **The proposed project supports the GoSL's energy transition plan to move toward a more sustainable energy mix and a reduction of GHG emissions.** The grid extension component provides imported grid electricity, which is primarily generated by hydropower plants and gas-fired plants, to consumers in towns like Kuido and Port Loko, which are now being supplied by HFO/diesel units in isolated grids, and to new industrial, commercial enterprises and public institutions in other towns currently relying on captive diesel units. The off-grid component will provide solar PV electricity to consumers in Moyamba, health facilities and schools, which either are supplied by small diesel units or have no electricity service. The grid extension and off-grid components are expected to substitute about 28 MW of HFO/Diesel capacity with 24 MW of imported electricity (80 percent gas and 20 percent hydro) and 4 MW of solar PV capacity.

22. **The proposed project builds on the ongoing IDA program and complements the programs of other development partners.** The grid extension component supports the Government's efforts to double the electricity access rate by extending the activities under ESURP, capitalizing on the electricity which could be imported through the CLSG interconnection and targeting the major towns which are close to the transmission network and have the lowest unit cost of providing electricity service and yield the highest economic and financial return. The off-grid component compliments programs of European Union (EU), DFID, United States Trade and Development Agency (USTDA) and nongovernment organizations (NGOs) which focus on supporting electricity access in rural villages through mini-grids. The off-grid support under the project focuses on large district headquarter towns as well as the public institutions and productive segment which could not be economically served by the main grid. The technical assistance component will: (a) further improve EDSA's financial and operational performance through deepening corporatization and commercialization, building on the progress made under ESURP; (a) support further development of human capital with special attention to women and enhancement of institutional capacity of the sector by expanding support to improving technical schools for engineers and technicians; and (c) help demonstrate how private sector could be competitively procured to operate and expand isolated grids, building on DFID's experiences in mini-grids for rural villages.

23. The proposed project is implemented in parallel with IDA's three-year Programmatic Advisory Services and Analytics (PASA) in Sierra Leone. The PASA is centered around four pillars: (a) energy access expansion; (b) sector financial sustainability; (c) private sector participation; and (d) digital transformation of sector entities.



PASA is an amalgamation of tasks, activities and advice directedly requested from the GoSL as a result of extensive policy dialogues. The PASA will aim at: (i) providing quick wins and quality analytics to reinforce trust, build consensus both among stakeholders of the country and among development partners; (ii) support the GoSL in laying out and implementing key reforms; and (iii) support implementation of operations in the energy portfolio.

24. **The project is also aligned with other interventions of WBG in Sierra Leone including regional energy DPF, national DPF, regional investment projects like CLSG and existing portfolio of investments.** IDA has been a partner in Sierra Leone's power sector with a portfolio of projects and continuing support to the Government reform agenda. It has built a close working relationship with all sector stakeholders and has become a trusted partner regarding policy, institutional development, and sector investment. Over the past few years, IDA has supported the following activities: (a) US\$16 million under the Energy Access Project (EAP) funded by a Department for International Development (DFID) grant through the Sierra Leone Infrastructure Development Fund (SLIDF), which supported the rehabilitation of the distribution network in Freetown to increase distribution capacity and improve supply reliability; (b) the US\$40 million IDA-funded ESURP and its Additional Financing (AF-P166390) of US\$50 million to further increase the network capacity in Freetown and improve the technical and financial performance of EDSA through strengthening EDSA management and financing the implementation of loss reduction investments and measures; (c) an AF of US\$59.6 million of IDA credit under the CLSG Regional Interconnector Project (P163033), which would link the transmission network in Sierra Leone with the WAPP network in facilitating power trade; (d) IDA's assistance to the Government to promote solar PV development by the private sector through both the regional initiative and a technical assistance funded by Public-Private Infrastructure Advisory Facility (PPIAF); and (e) technical support and policy advice on an as-needed basis, including least cost analysis and option analysis for sector financial viability.

25. **The proposed project is aligned with the outcomes of the multi stakeholder energy sector roundtable held in October 2019 and following EDSA turnaround roundtable in November 2019** where the Government and donor groups were in consensus on the sector's priorities. The project will help addressing the Government's priorities on (a) doubling energy access through both grid and off grid applications; and (b) loss reduction and financial turnaround of EDSA.

26. **The project is also designed to capitalize on the availability of the Japan Policy and Human Development (PHRD) grant administrated by IDA.** With limited amount of IDA grant, the largest portion still needs to be focused on provision of electricity for major towns by grid extension. While a small amount of IDA will be used to target key facilities like health clinics and schools in rural areas which could not be provided with grid electricity in the next decade, the expected outcome and impact will be limited. The overall development objective of the proposed project is well aligned with PHRD's grant program development objective "increase the delivery of off-grid electricity and other energy services in rural areas of fragile and conflict-affected states in African Countries". The availability of PHRD co-financing could significantly increase the size of project activities and enhance outcomes and impacts for rural areas in Sierra Leone. The provision of electricity for health facilities and schools becomes ever more important in the wake of the COVID-19 pandemic.

### C. Relevance to Higher Level Objectives

27. The proposed project is consistent with the Poverty Reduction Strategy Paper (PSRP-III) for Sierra Leone covering 2013–2018. Expanding and improving electricity supply is one of the strategic priorities of the



Government’s National Development Program outlined in PRSP-III. It continues to be a critical priority under the new Medium-Term National Development Plan (MTNDP, 2019–2023), entitled ‘Education for Development’. The proposed project is also consistent with the World Bank Group’s Country Partnership Framework (CPF) for Sierra Leone for FY2021-2026 (Report number 148025; May 26, 2020), which has three focus areas. The project activities will contribute to “Economic diversification and competitiveness with resilience”, the third focus area of the CPF. They are more specifically aimed at contributing to achieving objective 3.1 “Build resilient infrastructure (power, mobility, technology) for enhanced competitiveness”. The project activities will also contribute to a lesser extent, although still substantially, to objective 3.2 “Boost productivity in key sectors for a diversified economy”. It also indirectly contributes to objective 3.1 “Improve Quality of Education” and objective 3.2 “Deliver Quality and Inclusive Health Services” of the second focal area, through supporting improvement of health facilities and schools through the provision of solar PV electricity. The proposed project directly supports three key energy sector objectives of the Government outlined in the MTNDP: (a) electrification of all district headquarters which is a key element of the country’s electrification strategy; (b) the increase of rural electrification through engagement and involvement of key stakeholders including private sector; and (c) improvement of the financial performance of the sector for sustainable development.

28. The proposed project is also consistent with the World Bank Group COVID-19 Crisis Approach Paper and it addresses the deficit of the key infrastructure facilities which is one of the most critical elements for promoting sustainable growth and job creation in post COVID-19 recovery. The project directly contributes to Pillar 3: Ensuring Sustainable Business Growth and Job Creation and Pillar 4: Strengthening Policies, Institutions and Investments for Rebuilding Better. The proposed project supports the implementation of the Maximizing Finance for Development (MFD) approach laid out in the World Bank’s Development Committee paper by addressing the key infrastructure deficit, lack of electricity, which is critical to attracting private sector investment in the industrial and business sectors. The project directly supports private participation in the operation and expansion of isolated grids and supply of standalone PV systems for industrial, commercial, and residential consumers. The proposed project also contributes to IDA’s commitment to addressing climate change through substituting high emission liquid fuel electricity in two districts headquarter towns and by promoting solar PV projects, contributing to contributes to the objectives of the [newly-released Africa Climate Business Plan](#)<sup>5</sup> and IDA19’s target to support the development of 10 GW renewable energy generation.

### C. Proposed Development Objective(s)

29. The Project **Development** Objective (PDO) is to increase electricity access in Sierra Leone.

#### PDO Level Indicators

- People provided with new and improved electricity service (number) (Corporate Results Indicator);  
People provided with new and improved electricity service – female (percentage);
- Health facilities and schools provided with standalone PV systems (Number);
- GHG emission reduced/avoided (tons/year) (Corporate Results Indicator).

<sup>5</sup> <http://documents1.worldbank.org/curated/en/946731593673121971/pdf/The-Next-Generation-Africa-Climate-Business-Plan-Ramping-Up-Development-Centered-Climate-Action-Main-Report.pdf>.



## D. Project Description

30. The project is structured around three main components: (a) provision of grid electricity services in seven district headquarter towns and surrounding communities through distribution network expansion and/or connection with the CLSG line; (b) provision of solar electricity in one district headquarter town and surrounding communities, and a number of large communities, which are not expected to be connected to the main grid in the near future, and provision of electricity to health facilities and schools through standalone PV systems with possible extension to mini-grids in selected areas; (c) technical assistance for human capital development and project implementation support.

### Component 1: Electrification of towns and communities through grid extension (US\$35 million IDA)

31. This component supports activities to provide grid and improved electricity services to seven major towns and surrounding communities by capitalizing on the availability of electricity through the imports over the CLSG interconnection. The component includes:

- (a) three segments of connection lines from the 225 kV CLSG transmission line to distribution networks in three towns, which include: (i) single circuit 33 kV distribution line of about 35 km, including a 15 MVA 33/11 kV transformer, connecting the distribution network in Kabala with the 225/33 kV Fadugu substation of the CLSG line; (ii) a single circuit 66 kV sub-transmission line of about 100 km, including a 66/33/11 kV transformer of 20 MVA, connecting the distribution network in Kailahun with the 225/66 kV Kenema substation of the CLSG line; and (iii) a shield wire of about 25 km connecting the distribution network in Pujehun with the shield wire along the CLSG line to supply the communities and villages along the CLSG corridor.
- (b) the expansion of the distribution networks in Waterloo, Makani, Magbraka, and Koidu, including several adjacent communities to provide electricity to new customers. The project activities in each town include: (i) 11 kV distribution lines and distribution transformers; (ii) low voltage distribution lines; (iii) service lines and connections to households, commercial, industrial users and public institution like schools and health clinics; and (iv) meters; and
- (c) the provision of consulting services to assist EDSA for site supervision and construction management of the distribution network extensions and the connecting lines.

32. The 225 kV single circuit CLSG line, including the substations, is under the final stage of construction and is scheduled to be completed and commissioned by June 2020. The CLSG line is part of the planned West Africa Power Network to facilitate power exchanges among the countries in West Africa and is partly financed by IDA. It also benefits the towns, villages and communities which are located not far the line. The GoSL is financing the construction of the distribution networks in the four towns and have selected the contractors through a competitive process and signed the contracts. A 30% advance payments has been made against each contract Construction mobilization already commenced in some towns as of early October 2020.

33. The route selection and design of the transmission lines will be completed following detailed survey. The transmission lines will mostly connect one town to another and pass sparsely populated areas. The selection of transmission routings will aim to avoid any ecologically sensitive or protected areas and the relocation of residential houses, and if possible sited along existing public roads to minimize environmental and social impacts. The lines would be mounted mostly on poles (concrete or steel tubular) which have very small footprints ( $\leq 1\text{m}$  dia.) or on steel lattice structures ( $\leq 4\text{m}$  dia.) where land space is not a constraint. The 66 kV



line would have a second 33 kV line to distribute electricity all the communities within 1 km of the line. All sub-transmission lines would have a 24 band Optical Ground Wire (OPGW) as shield wire not only for use by the utility for their communication and control purposes but also for public use to support the digitization efforts of the Government. The distribution network will be located mostly in towns and communities. The design of the distribution network and service connections will be finalized following site and customer survey. The project activities in each area will be implemented through one or more Engineer, Procure and construct (EPC) contractors to be competitively procured.

34. There are currently no generation and supply in the towns of Kabala, Kailahun, and Pujehun. The GoSL planned to provide electricity through liquid fuel generation units if IDA would not finance the connection lines with the 225 kV CLSG line. If these towns would not be connected to the transmission network, the customers would be served by small liquid fuel generation units, which are costly, polluting and unreliable due to frequent shortage of fuel and spare parts. There is an isolated grid serving a small portion of the customers in Koidu, which is currently supplied by diesel generators. The distribution network expansion in the town of Koidu includes a 33/11 kV transformer and a few hundred-meter 33 kV lines to link the distribution network with the 33 kV line under construction, which connects with the 225 kV transmission line. Only a very small portion of the customers in Waterloo is currently served by an 11 kV line linking with the distribution network in Freetown. A double circuit 33 kV line connecting both with the Freetown network and a substation of the planned 225 kV Fadugu-Bumbuna 225 kV line, financed by ongoing ESURP, is under contracting stage. Makani and Magbraka are currently served by a combination of electricity from Bumbuna and backup diesel units and only a portion of the customers are currently served due to lack of generation capacity. There is not generation and supply in the town of Kambia and the town could be connected to the Fadugu-Freetown line. But the town is not included under the project as the Fadugu-Freetown line is expected to be commissioned in nearly three years and financing could be provided in the future.

35. The towns and communities that have been slated for connection to the transmission network are either already with isolated local grids in operation supplied by small HFO/diesel units or with local distribution networks in early stage of construction. These towns are selected based on the Electricity Network Investment Plan (ENIP) prepared by the National Rural Electric Cooperative Association (NRECA) International Ltd. for the Ministry of Energy in 2016, taking into consideration the progress made during the last few years. The ENIP identified the ongoing and planned high voltage transmission lines across the country, including the CLSG line and the 225 Fadugu-Freetown line, the subtransmission lines and medium voltage distribution lines, and the distribution networks which would be required to provide grid electricity to the district headquarter towns and communities where population, industrial and commercial activities are concentrated. There are a total of fifteen (15) districts in Sierra Leone. In addition to the seven towns discussed above, Freetown is mostly electrified, two towns (Kenema, Bo) are being connected and rehabilitated through an AFDB/DFID funded project, two towns (Koidu, Port Loko) are being supplied by isolated grids through primarily expensive liquid fuel generation, and two towns (Bonthe and Moyamba) currently have no electricity service of any form but could not be connected to the transmission grid in the coming years. Other major towns like Lungi are not included because there is insufficient funds to finance the relatively long connecting line.

36. Although Waterloo, Makeni, and Magburaka are currently connected to the main grid, and Koidu, Port Loko are served by isolated grids, only a portion of the customers in these towns and surrounding communities are connected to the distribution networks with access to electricity. This is primarily due to the lack of generation capacity in the main grid and the isolated grids. As the CLSG line is connected to the main grid, more generation and supply capacity will become available in the main grid. Koidu will have access to reliable



electricity from the CLSG line as it is connected to the transmission network. Port Loko will have access to reliable electricity when it is connected to the Fagudu-Bumbuna line, which is still in the design stage. Therefore, only Koidu is selected for expansion to provide electricity to more customers under the project and Port Loko will be connected in the future.

37. The expansion program in Waterloo and surrounding communities, Makeni, Magburaka, and Koidu are expected to provide new electricity access to about 37,250 residential customers and 8,300 industrial, commercial and public institutions. In addition to these newly added customers, the connecting lines are expected to benefit about 8,700 residential customers and 1,870 industrial, commercial customers and public institutions initially through the provision of more reliable grid electricity. The maximum demand from the newly connected and existing customers is expected to be about 22 MW, which is all expected to come from import through the CLSG line soon, far less than CLSG's transmitting capacity of about 200 MW.

38. During project implementation, measures will be taken to reduce technical, commercial and collection losses. These measures include distribution transformers will be properly spaced and sized to avoid long low voltage lines; all equipment and conductors will meet certain efficient standards; all customers will be provided with pre-paid meters; and all illegal connections in existing towns will be removed. These measures, together with the strengthening of the EDSA's management and the implementation of other anti-theft measures, could help achieve ATC&C losses to be lower than 20 percent.

**Component 2: Electrification through mini-grid and standalone solar systems (US\$10.0 million IDA and US\$2.7 million PHRD)**

39. Due to the very low access rate in the country, the Government will focus on electrification of major towns and communities close to the transmission lines in the short to medium term through grid extension. A large portion of small towns and rural communities of the country are not likely to be connected to the main grid for at least ten years. This provides a huge market for off-grid solutions. The mini-grid option provides a cost effective solution for small towns, large communities and settlements. The stand-alone PV system provides a very flexible and cost-effective solution for many homes, schools, clinics and productive businesses. There are private sector players which are very interested in and active in the areas of homes and productive businesses. The component will directly support the provision of solar electricity to health facilities and schools as electricity provision for these public institutions would need to be done through public funding. The component includes three subcomponents, all meant to deliver solar energy, and will be co-financed by IDA and Japan PHRD grant:

40. Subcomponent 2 (a). Installation of PV mini-grids with battery storage capacity (US\$6.0 million IDA). This subcomponent includes the construction of a solar PV plant with battery storage capacity in the town of Moyamba and the construction of solar PV based mini-grids in several large communities. Based on population size and industrial/commercial profiles in Moyamba, a detailed technical and financial analysis was carried out to determine the sizes of the solar PV capacity and battery storage capacity. It is tentatively considered that a solar PV system with a capacity of 600 kW plus 1800 kWh of battery storage will be implemented initially. These numbers and the precise siting of the PV plant and storage facilities will be determined based on more detailed site survey and design. It is expected that siting of the PV system and battery storage will not require house demolishing and land acquisition. A total of 4 MW solar PV capacity is expected to be installed under the subcomponent.

41. Moyamba is selected as it is one of the two district headquarter towns which could not be economically



connected to either the CLSG line nor the planned Fadugu-Freetown line. The other town Bonthe is smaller and is being electrified through support of DFID grant. The GoSL is financing the construction of the distribution network in Moyamba and has selected the contractor through a competitive process and signed the contract. It is expected that construction activities will commence during September-October 2020. The GoSL initially planned to provide electricity through liquid fuel generation units. If these towns are not connected to a solar mini-grid, the customers would be served by small liquid fuel generation units, which are costly, polluting and unreliable due to frequent shortage of fuel and spare parts.

42. The subcomponent will also include the installation of solar PV capacity and battery storage as well as the distribution networks in several large communities. The selection of the communities will be based on the minigrid feasibility study which are being carried out by USTDA and expected to be completed by December 2020. In addition to the usual factors which are considered in the selection of the minigrid sites, high emphasis will be put on the availability of big industrial/commercial entities to anchor electricity demand and provide constant revenue. Based on the initial analysis and also the experience of the DFID projects, it is expected that six to ten mini-grids would be financed under the component.

43. Based on financial analysis of the mini-grids and affordability analysis of the consumers, it is concluded that all capital costs of the mini-grids will need to be financed by grants to ensure sustainability of investments. Therefore, the installation of the solar PV systems with storage capacity as well as the network will be implemented through Engineering, Procurement and Construction (EPC) contractors to be competitively selected. Then private developers would be engaged to operate the mini-grids and also be responsible for adding new generation and extending new connections to meet the future needs in the area.

44. Subcomponent 2 (b). Installation of solar PV systems for health facilities and schools (US\$3.5 million IDA, US\$2.2 million PHRD). There is a total of about 1,400 health facilities and about 11,000 Primary and Secondary Schools as well as special schools in Sierra Leone. However, over 72 percent of health facilities and over 77 percent of schools have no access to the grid electricity.

45. Despite the ongoing electrification program through grid extension, more than half of the health and education facilities are unlikely to have grid electricity by 2030. The activities under this sub-component will aim at installing solar PV systems for about 200 health facilities and about 500 primary and/or secondary school and special schools which are not going to be electrified through grid extension or mini-grid in the next five years. An analysis has been carried out to review the types of equipments at different types of health facilities which required electricity services of different quality. Depending on the size of the health and education facilities, the solar PV sizes are expected to range from 3 kW to 20 kW with a total capacity of around 2 MW. The systems will not only provide electricity to electrical equipment at the public facilities, but it will also power water pump if a nearby operational borehole is available and/or the workers commodities. The selection of the health facilities will be based on a number of factors, including the potential to extend electricity service to nearby villages and communities through the development of mini-grids in the future and possibly the presence of maternity wards. Libraries of about 50 selected schools will be provided with solar lanterns. The PHRD grant and IDA fund will finance the installation of solar PV systems in a number of health facilities and schools.

46. This subcomponent will also develop a sustainability strategy that will not only develop the quality assurance frameworks for the solar component base systems to be installed in these facilities but it will also cover the design and installations aspects of the systems, the operation and maintenance and the budget provision for the replacement of the components of the systems at the end of their live time.



47. Subcomponent 2 (c). Provision of technical assistance for market assessment, capacity building, result monitoring and evaluation (US\$0.5 million IDA, US\$0.5 million PHRD). The activities under this subcomponent will support the implementation of the above subcomponents and help achieve the intended outcomes. The specific activities include market assessment and affordability analyses of productive uses in rural Sierra Leone, awareness raising, capacity building of the beneficiaries on business management including women-led businesses, capacity building of the private sector, monitoring and evaluating results against targets, summarizing experiences and lessons for program improvement.

**Component 3: Human capital development and project implementation support (US\$6 million IDA)**

48. **Subcomponent 3 (a) (US\$3.5 million IDA).** This subcomponent will support MoE: (i) the procurement of services of a private firm for the operation, maintenance and future expansion of the mini-grid under Component 2; (ii) preparation of a clean cooking investment project; (iii) the strengthening of the institutional capacity of the key stakeholders in promoting and managing the development of renewable energy, and implementing National Electrification Strategy; (iv) strengthening of policy and institutional capacity to reduce gender disparity in energy sector employment, in particular in EDSA and in relation to energy access; and (v) operational expenditures.

49. **Subcomponent 3 (b) (US\$1.5 million IDA).** This sub-component will: (i) support EDSA by building on the progress made in improving EDSA’s management and staff capacity, further strengthening the governance and management of EDSA to achieve full corporatization and commercialization so that EDSA management has the autonomy and incentives to manage and is fully accountable for the results; (ii) support EDSA to improve the network’s resilience to climate disasters by improving O&M procedures and enhancing staff capacity; and (iii) support project implementation by EDSA as needed, including implementation of environmental and social requirements.

Legal Operational Policies	
	Triggered?
Projects on International Waterways OP 7.50	No
Projects in Disputed Areas OP 7.60	No

Summary of Assessment of Environmental and Social Risks and Impacts

50. Based on preliminary assessments, the key environmental and social risks of the project may include; (i) removal of vegetative cover, (ii) erosion and water pollution, (iii) dust and noise pollution, (iv) modification of the aesthetic nature of the environment; (v) land acquisition and displacement; (vi) worksite hazards and injuries; (vii) community health and safety; and (viii) GBV risks.





## E. Implementation

### Institutional and Implementation Arrangements

51. **MoE for Component 2 and 3(a).** The MoE currently has a Project Management Unit (PMU) led by the planning department. The PMU has a communication specialist, a financial management specialist (FMS), planning engineers and Monitoring and Evaluation (M&E) officers. However the PMU is currently staffed to primarily manage the technical assistance component of ESURP. As this project has a big component to support mini-grid and standalone solar PV system deployment, the PMU will be restructured and significantly beefed up. A project coordinator with experience in mini-grid and solar PV will be appointed to lead and coordinate the implementation of the component 2 and 3(a). The PMU will be staffed with people with experience and expertise in solar PV technology and procurement. MoE has been closely involved in the implementation of the solar PV mini-grid projects, including solar PV system for a large number of health facilities and a number of schools supported by EU and DFID. MoE has a lot of staff and experts in the preparation of mini-grid projects, and the preparation and implementation of standalone PV systems for public institutions. Some of the staff could be assigned to the PMU and some could provide technical support as needed. However, as the management of the off-grid fund needs significant technical expertise and experience to manage the preparation and implementation, a professional fund manager is expected to be employed to assist the PMU in managing the RBF for deployment of solar PV systems for the productive businesses. Additional international and local experts will be employed as consultants to assist in the preparation of technical specifications for the bid documents and in bid evaluation as needed.

52. **EDSA for Component 1 and 3(b).** EDSA currently has a Project Management Team (PMT) that is implementing the investment component of ESURP. The PMT comprises mainly of staff of the Engineering Department (Planning and Projects), Environmental and Social Management Unit (ESMU) and dedicated staff of EDSA's Finance Department and the Procurement Unit. The team is supported by experienced consultants that are assisting in project implementation and in building the capacity of the regular EDSA staff. The consultants include a supervision engineer, an environmental specialist, social and gender specialist (under procurement), a senior procurement specialist, and an FMS supported by finance assistance, civil engineer, substation engineer and specialized consultants to be hired as needed. Young professionals (engineers, accountants, and social and environmental officers) are being recruited to augment the staff capacity of the EDSA employees. The PMT is headed by the Director of Engineering (Technical Services) but the day-to-day coordination of the overall implementation is handled by an experienced project coordinator. The PMT will be responsible for the preparation and implementation of component 1 of the proposed project to capitalize on the available capacity in terms of procurement, financial management and safeguards. But the PMT would need to be expanded and additional consultant would need to be engaged to meet the increased activities and geographical areas to be covered. In view of the lessons and experiences from ESURP, an engineering firm is expected to assist EDSA in contract management and site supervision. Additional experienced procurement specialist will be employed as needed.



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