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# SIERRA LEONE WESTERN AREA POWER GENERATION PROJECT

# ENVIRONMENTAL AND SOCIAL REVIEW SUMMARY (ESRS)

# UPDATE

January 20, 2016

**CEC Africa ESRS v. 07 December 2015**

**ENVIRONMENTAL AND SOCIAL REVIEW SUMMARY (ESRS)**
**CEC AFRICA # 34971**

***Disclaimer***

*This Environmental and Social Review Summary (ESRS) is prepared and distributed in advance of the IFC Board of Directors' consideration of the proposed transaction. Its purpose is to enhance the transparency of IFC's activities, and this document should not be construed as presuming the outcome of the Board of Director's decision. Board dates are estimates only. Any documentation which is attached to this ESRS has been prepared by the project sponsor and authorization has been given for public release. IFC has reviewed this documentation and considers that it is of adequate quality to be released to the public but does not endorse the content.*[1]

## Project Description

The proposed investment is a loan to finance a 57 megawatt electric (MWe) greenfield, Heavy Fuel Oil (HFO) fired power plant to be located on a site in the Kissy Dock area, approximately 4 km east of the center of Freetown, in Sierra Leone ("the project"). The project's sponsors are Copperbelt Energy Corporation plc (CEC), the second largest power utility in Zambia, and TCQ Power Ltd, a company established in 2011 in UAE/Lebanon to acquire, build, develop and operate power projects in Africa. CEC and TCQ will each hold 50% of CEC Africa SL, the special purpose vehicle incorporated in Sierra Leone (CECASL or "the company").

The total area of the site is 7.48 acres (3.03 hectares). The site is used by Sierra Leone Roads Authority (SLRA) Western Regional Office, Mechanical Services Unit (MSU), and a Chinese construction company. The power plant will be developed as a 57 MWe installation with six heavy fuel oil / diesel fuel oil fired reciprocating engines. The power plant will be operated on HFO as the main fuel, with light fuel oil (LFO) as back-up fuel. Although an additional two phases of 39MWe each have been discussed with the Government as potential future developments, details of design and timing of these additional phases have not been defined at this time. Construction of the power plant is expected to start in 2016. Wärtsilä has been appointed by the company as both the EPC and the O&M contractor for the plant.

The HFO is planned to be imported via a new oil jetty (the Addax Petrojetty), construction of which is nearly complete to the north of the project site. The jetty will accommodate LPG and oil tankers. The jetty operations are not dedicated to the project, but they will serve multiple users, and will include the receipt and storage of petroleum products, as well as the export of bio-ethanol and bunkering facilities for vessels and barges. The fuel will be transported from the jetty manifold to the site via a new 1275 meter (m) pipeline. The pipeline will be constructed on an elevated base or pipe rack along the same right of way (RoW) of an existing HFO supply line. The RoW is located within secured areas of the National Petroleum (NP) facility and the disused refinery to the north of the project site. The last short section of the pipeline, between the refinery and the project site entrance, will cross a public secondary road providing access to the site (Factory Road) and will be buried. A pump station and buffer tank will be constructed along the pipeline route

[1] Sentences in italics are standard language and cannot be modified.

within the NP facility area. As part of the fuel system, a single storage tank for untreated HFO and two treated HFO storage tanks, with a volume of 7,500 m3 each, will be installed on site.

The power will be evacuated to the national transmission and distribution network, owned and operated by the Electricity Distribution and Services Agency (EDSA). The grid is being rehabilitated and the evacuation capacity within the grid is being developed through ongoing projects such as the World Bank IDA-funded Energy Access Project (EAP). Although final design has not been established yet, it is expected that the new EDSA double circuit line will generally follow the route of the existing line that crosses the project site; therefore, power evacuation from the plant would require a short (20 m) 33kV cable 'tee' into the rehabilitated overhead lines. It is anticipated that the company will be responsible for the addition of the second circuit on the double circuit 33kV line to improve evacuation from the project between Blackhall Road and Wellington, and for the upgrade works (new 33/11kV transformers) at Blackhall Road, Ropoti, and Wellington substations, again to improve evacuation. The relevant environmental and social assessment and management documents for the EAP can be found at:
http://www.worldbank.org/projects/P126180/sierra-leone-energy-access-project-sierra-leone-infrastructure-development-fund?lang=en&tab=documents&subTab=projectDocuments

**Overview of IFC's Scope of Review**

IFC's Environmental and Social (E&S) due diligence for this project consisted of appraising technical, environmental, health, safety and social information submitted by the company, including the following:

- Environmental, Social and Health Impact Assessment (ESHIA) for CEC Africa (SL) HFO Power Generation Project, dated December 2015;
- Project Environmental and Social Management Plan (ESMP), dated December 2015;
- Abbreviated Resettlement Action Plan (ARAP), developed to meet African Development Bank disclosure requirements and dated October 6, 2015;
- Project Health and Safety Plan, prepared by CECASL and dated September 25, 2015.

IFC E&S specialists conducted a site visit to the area of the project on September 30 – October 1, 2015 and met with TCQ senior management and technical staff of CECASL, their ESHIA consultants (Jacobs and Integems), and senior officers of EDSA and Sierra Leone Environmental Protection Agency ("EPA-SL") and representatives of the community of Kissy where the project site will be located.

This Environmental and Social Review Summary was prepared by IFC in coordination with IDA and MIGA.

**Identified Applicable Performance Standards**

*While all Performance Standards are applicable to this investment, IFC's environmental and social due diligence indicates that the investment will have impacts which must be managed in a manner consistent with the following Performance Standards:*

PS1 Assessment and Management of Environmental and Social Risks and Impacts

PS2 Labor and Working Conditions
PS3 Resource Efficiency and Pollution Prevention
PS4 Community Health, Safety and Security
PS5 Land Acquisition and Involuntary Resettlement

The project site is in a brownfield industrial/commercial area within an urban location, and therefore PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, PS7: Indigenous Peoples and PS8: Cultural Heritage are not applicable to the project.

The IDA project meets the criteria in Operational Policy 4.03 Performance Standards for Private Activities for application of the Performance Standards, in that it will be designed, constructed, operated and owned by a Private Entity (the company) and is productive and necessary to meet Sierra Leone's development objectives; the company is fully responsible for identifying, assessing and managing the environmental and social risks associated with the project; and the company has recognized capacity to identify, assess and manage those risks.

*If IFC's investment proceeds, IFC will periodically review the project's ongoing compliance with the Performance Standards.*

**Environmental and Social Categorization and Rationale**

This is a category B project according to the screening criteria in IDA's Operational Policy 4.03, and IFC's Environmental and Social Review Procedure. Categorization has been assigned because (i) the project is located in a brownfield industrial/commercial area where there are few environmentally important and vulnerable receptors; (ii) identified potential environmental and social risks and impacts are site-specific and either readily managed through design or addressed through mitigation measures; and (iii) most of the infrastructure needed for the construction and operation of the project is already in place. The project is considered a priority development according to the Ministry of Energy and it is considered a critical project for contributing to the rebuilding of Sierra Leone post Ebola by the World Bank/IFC.

The project's area of influence is affected by other existing sources of noise and air pollution, including a congested road network and several industrial and commercial properties in the surroundings of the site. The site is currently occupied by workshops of SLRA/MSU and by equipment of the Chinese construction company; two small plots of informal artisanal farming without legal tenure over the cultivated land are present within the site. Despite the industrial and commercial land use zoning, a number of residential and educational receptors (formal and informal residential dwellings including two shanty areas, and a few schools, including an Islamic compound) are located in the project's area of influence. The key environmental and social risks and impacts therefore include air quality, noise, occupational health and safety, traffic management, hazardous material and waste management, fuel transport, economic displacement of a small number of artisanal farmers, and community health and safety.

**Environmental and Social Mitigation Measures**

*IFC's appraisal considered the environmental and social management planning process and documentation for the project and gaps, if any, between these and IFC's requirements. Where*

*necessary, corrective measures, intended to close these gaps within a reasonable period of time, are summarized in the paragraphs that follow and (if applicable) in an agreed Environmental and Social Action Plan (ESAP). Through the implementation of these measures, the project is expected to be designed and operated in accordance with Performance Standards objectives.*

PS 1 - Assessment and Management of Environmental and Social Risks and Impacts

Environmental and Social Assessment and Management System. CECASL has prepared an Environmental, Social and Health Impact Assessment (ESHIA) study, the findings of which constitute the ESHIA report required by EPA-SL. Following formal commencement of the ESHIA process with receipt of the EPA-SL screening opinion, a scoping process was carried out with consultations of affected communities and other project stakeholders between February and May 2014. The final Scoping Report, including the ESHIA Terms of Reference (ToR), was prepared in November 2014. From June 2014 until beginning of 2015, the Ebola crisis prevented progress on the field survey work program; however, the company proceeded with the preparation of a preliminary ESHIA in order to continue engagement with the World Bank Group (WBG) and support ongoing technical discussions for project financing. Despite the continuing Ebola conditions, the ESHIA consultants were able to carry out a number of field surveys, including a socio-economic survey of 320 households within a 500 m radius of the project site (March 2015), and two measurement campaigns of ambient air quality and noise (dry season, February – March 2015, and wet season, August – September 2015). The ESHIA report was submitted to EPA-SL in September 2015. The company's approach under Ebola conditions has been to focus the assessment on the key E&S issues required in order to progress the design and prospective lenders' review. Accordingly, the ESMP will be reviewed and updated with detailed mitigation developed as part of the detailed design phase, prior to commencement of construction. This approach has been agreed to by the World Bank/IFC and the EPA-SL. The ESHIA and framework ESMP reports (December 2015) are disclosed as part of the documentation attached to this ESRS.

The ESHIA addresses the potential risks and impacts from the project, including the power plant, the fuel pipeline, the connection to the transmission line and the access road, and outlines proposed mitigation measures. Quantitative studies were carried out involving numerical modelling of emissions to atmosphere and noise during plant operations, and quantification of water consumption and discharges. The public review and public hearing, in accordance with Sierra Leonean regulations, took place on November 25-26, 2015, with the involvement of the affected community at Kissy. The ESHIA report has been made available in relevant government offices and public places in the project region and non-technical summaries in appropriate language distributed within the project's area of influence. An Environmental and Social Impact Assessment for the Addax Petrojetty project was prepared by a third party project developer.

The environmental context of the project is such that there are few important receptors with the exception of the Sierra Leone River Estuary (including Aberdeen Creek) Ramsar site, Western Area Peninsular National Park (WAPNP) and the nearby residential dwellings immediately adjacent to the southern part of the project site, the Islamic compound (including a school, a mosque and an outpatient clinic), and two other schools located along Parsonage Road, the public secondary road which will provide access to the site. The German Academy (currently used as technical training center by a security and equipment maintenance contractor) and the Sir Winston Churchill Secondary School are located along Factory Road to the west of the site.

The Sierra Leone River Estuary Ramsar site is designated for its mangrove wetlands and bird interest. The site extends to include a large portion of the coast line east of the proposed site and the shorelines around Tagrin Bay and the Bunce River. Aberdeen Creek is located approximately 9 km west of the proposed site. The WAPNP is an area of equatorial rainforest located approximately 2 km south south-west of the project site at its nearest point. The forest is degraded despite its status, with higher density forest at 6 km of the site. CECASL has addressed the potential impacts on the Ramsar site by avoiding the need for abstraction and discharge of cooling water by use of air cooling and will address potential risks associated with accidental spillage of oil through robust spill prevention measures and liaison with the developers and operators of the Addax Petrojetty as part of the environmental, social, health and safety management policies and procedures for the project.

The key E&S risks and impacts identified and assessed in the ESHIA include potential impacts on (i) ambient air quality during construction and operations, (ii) noise generated by the power plant construction and operations, (iii) community health and safety associated with construction traffic and conditions of the access roads, (iv) economic displacement of a small number of artisanal farmers currently utilizing the site for subsistence farming, (v) soil and groundwater quality due to fuel spills or inadequate waste management, (vi) community water supply due to water abstraction for plant operations, and (vii) emergency conditions, particularly due to fire risk from fuel stored on site, pipeline ruptures and accidental spills. Due to the lack of urban planning, the company will engage with the relevant local authorities to identify and communicate risks associated with potential future informal settlements around the project. Risks and impacts identified and relevant mitigation and management measures are described in the relevant sections that follow.

As indicated in ESAP action #1, the company will develop and implement a Health, Safety, Environment and Social (HSES) Management System (MS), consistent with the HSES Policies of the two sponsors. The HSES MS will be designed based on international standards such as ISO 14001 Environmental Management System and OHSAS 18001 Occupational Health and Safety Management, and be compliant with the requirement of the financiers, including IFC Performance Standards. Consistent with the ESHIA commitment, a number of project-specific detailed E&S management plans and programs will be developed, to meet the objectives of the Performance Standards as indicated in the following sections. The management plans will be incorporated into the HSES MS.

Management Programs. The current framework ESMP will be the basis of developing detailed construction and operation phase management plans. The ESMP describes the structure and processes that will be applied to construction and operation activities to assess and monitor compliance and effectiveness of the mitigation measures, including oversight of contractors. Its objectives are to:
- describe the mitigation measures and actions identified by the ESHIA, requiring detailed design and implementation during construction and operation phases of the project;
- identify and describe monitoring requirements.
- identify roles and responsibilities of parties involved, including CECASL and the EPC and O&M contractor.
- identify environmental and social reporting requirements, such as internal and external audits of performance.

The elements of the ESMP will be taken forward and incorporated into detailed construction and operation phase E&S management plans (ESAP actions #1 and #2, respectively), including: (i)

Construction Management Plan; (ii) Health and Safety Plan including Fire Safety and Emergency Preparedness and Response Plan; (iii) Ambient Air Quality Monitoring Plan; (iv) Noise Management Plan; (v) Construction Vibration Management Plan (including structure survey and vibration monitoring during construction); (vi) Livelihood Restoration Plan/ Abbreviated Resettlement Action Plan; (vii) Traffic Management Plan; (viii) Monitoring and Reporting Plan; and (ix) Waste Management Plan.

The company has already developed a Project Health and Safety Plan to assist the project manager with compliance to regulatory requirements and corporate policies. The plan will be used as a guiding document, whilst reviewing the site specific plans prepared by the EPC contractor. The core principles of the plan include: (i) effective hazard identification to implement and oversee hazard controls on site and to reinforce safe behavior, (ii) mitigating recurrence, including use of disciplinary actions to reinforce commitment to provide a safe and healthy workplace based on a Zero Accident philosophy, and (iii) incident investigation and reporting, including near misses.

As indicated in ESAP action #3, CECASL will require that the EPC and O&M contractor develops their own specific implementation plans demonstrating how they intend to comply with project requirements. All contractor plans will be reviewed and approved by the company. The EPC and O&M contractor will be responsible to ensure that sub-contractors will comply with the relevant HSES requirements, and it will be monitored by the company.

Organizational Capacity and Competency. As indicated in ESAP action #4, the company will employ a full time HSES manager, and a social / community liaison officer, all who will be on site. They will be responsible to develop and implement CECASL's HSES MS and relevant programs and plans, and to review and supervise implementation of those of the EPC and O&M contractor, ensuring compliance with the requirements of host country laws and IFC's Performance Standards. The EPC and O&M contractor will have a Health, Safety and Environment (HSE) supervisor on the site. The social / community liaison officer will be responsible to manage potential social impacts, implement the Stakeholder Engagement Plan (SEP) and its grievance mechanism as well as supervising and coordinating with the contractor in all related matters.

The company will also ensure that all staff, as appropriate with their job profile, understand the environmental and social policies, procedures and mitigations, including requirements under the Performance Standards. The identification of training and awareness needs and implementation of the training plan will be the responsibility of HSES manager with inputs from the social / community liaison officer and relevant line managers. Similarly, the EPC contractor's HSE on-site supervisor will ensure proper training of contractor's and subcontractor's workers, under the supervision of the company's HSES manager.

Emergency Preparedness and Response. Storage, handling and use of HFO at the facility can present potential hazard in relation to accidental spills and fire. The facility will be designed following the guidelines of National Fire Protection Association (NFPA) 850 recommended practice. The EPC and O&M contractor will develop an emergency preparedness and response plan for the construction and operational phase respectively. The plan will describe the procedures to follow when handling an emergency situation such as fire, hazardous material, waste or fuel spills, injuries, natural disasters. The plan will also describe procedures applicable for road traffic and barge incidents. Due to the location of the site in the proximity of residential dwellings and community facilities (e.g., schools) and due to the use of Addax Petrojetty for HFO supply, spill

response procedures will be developed within the emergency preparedness and response plan. Workers will be trained in the handling, storing, and disposal of hazardous materials and emergency procedures. Emergency spill containment material and clean up equipment will be available on site. Liaison with the developer and operator of Addax Petrojetty facility will be established to coordinate emergency response.

As indicated in ESAP action #5, the Fire Safety and Emergency Preparedness and Response Plan will be developed in close coordination with the community facilities (including the schools) and emergency services providers, and will be communicated to the affected community. The emergency response system will include establishment of a communication network between the company, the EPC and O&M contractor and national public emergency services such as fire departments, traffic police, local medical services, and the nearby residents in formal and informal shanty dwellings, other sensitive receptors (the Islamic compound and the other schools) and the commercial properties in the vicinity of the site and access road. As part of the plan, CECASL will assess the public services it can rely on and, based on the assessment, define the structure and equipment that will need to be available in-house. The system will be periodically tested through emergency drills.

Monitoring and Review. The ESHIA commitments include further survey work (supplemented by project consultation) to be conducted post-Ebola, including air quality, noise, groundwater and socio-economic aspects (with special focus on the nearby formal and informal shanty dwellings), as well as the development of the monitoring plans. As indicated in ESAP Action #6, the preconstruction surveys will be carried out starting in the first quarter 2016 and monitoring will continue during construction. Monitoring will be conducted to ensure compliance with regulatory requirements and the Performance Standards, as well as to evaluate the effectiveness of operational controls and other measures intended to mitigate potential impacts, as identified in the ESHIA. The monitoring plans will describe the indicators to be measured and the frequency, and will define roles and responsibilities for monitoring and reporting.

Indicators to be monitored during construction include: vehicle accidents and speed limits, noise and dust generation, water quality, waste disposal, occupational health and safety (including near misses, accidents, lost time incident, root cause analysis), and job creation within local communities. During operations, monitoring will include: air emissions and ambient air quality, noise, occupational health and safety, effluent discharge, water and fuel consumption, fuel characteristics (including sulfur, ash and conradson carbon residue content), greenhouse gas emissions, and job creation within the local communities.

CECASL will perform a number of internal and external audits and inspections annually and will develop and implement an audit schedule. The contractor will be required to provide HSE performance reporting on a regular basis and include audits in their respective HSE Plans.

PS 2 – Labor and Working Conditions

Human Resources Policies and Procedures: At the peak of construction, the project is anticipated to employ up to 200 construction workers. During operations, the plant is expected to employ approximately 45 permanent employees. During construction which will last approximately 18 months, the company will maximize employment from the surrounding community. It is expected that Freetown is able to provide local labor for the project construction and therefore risks

associated with a significant influx of workers are considered limited. A workers accommodation camp is not anticipated to be required for the project, and, as needed, the EPC contractor will ensure that transportation to the site for workers is provided. However, if the EPC contractor elects to develop an accommodation camp, it will be designed and operated consistent with IFC/EBRD guidance note on Workers' Accommodation: Processes and Standards.

As indicated in ESAP action #7, CECASL will develop a Human Resources (HR) policy that describes its approach to managing its workforce consistent with national labor requirements including policies on equal opportunities, harassment, child labor, freedom of association; and a simple and clear manual which outlines the employees' rights under national employment laws, any collective bargaining agreement as well as their rights with regards to working hours, wages, overtime compensation, benefits, company code of conduct and disciplinary action, grievance mechanism, and performance management ensuring compliance with this Performance Standard. The company will monitor and audit as necessary labor and working conditions of its contractor, subcontractors and main suppliers.

Occupational Health and Safety. Occupational health and safety of the employees and workers engaged by third party are addressed in CECASL Project Health and Safety Plan. The selected EPC and O&M contractor has an established health and safety management system that is consistent with OHSAS 18001. Key performance indicators, including lagging (such as total recordable injury rate and loss time injuries frequency) and leading indicators, will be used to measure occupational health and safety performance. Project safety performance will be monitored and reported on a monthly basis.

An occupational health and safety manual will be provided to all personnel on site. The company will ensure that all contractor's and subcontractor's workers are adequately trained and will monitor their performance. Staff on the site (employees, contractors and subcontractors) will be required to wear relevant personal protective equipment which will be supplied by the company and the EPC and O&M contractor. First aid kits will be readily available at the site. A worker health monitoring program, including Ebola-related measures, will also be established to ensure proper management of occupational health and safety concerns and incidents.

As indicated in ESAP action #8, a process hazard analysis (PHA) (e.g., hazard and operability study (HAZOP)) will be prepared to cover the full project infrastructure. The information generated from the PHA/HAZOP will be used to prepare the Fire Safety and Emergency Preparedness and Response Plans. Prior to start of operation, designated staff will be trained in first aid response, fire safety and spill response. The plant design will incorporate provisions for fire prevention, fire detection, and fire suppression (including water and foam and portable extinguishers, readily available). The design of the fire protection system will follow National Fire protection Association (NFPA) 850 guidelines. The facility will have equipment installed including gas detectors, heat sensors and manual pull stations in the event of a fire and an audible alarm system. A fire water tank will be installed and a peak instantaneous flow rate of 55m3/hour will be required for fire water (beyond the existing capacity provided in the fire water tank).

PS 3 – Resource Efficiency and Pollution Prevention

Resource Efficiency. The plant configuration will use six medium speed diesel generating sets, inside a closed HVAC controlled power house, closed loop fin-type radiator cooling system, and

steam system operating on the recovery of the exhaust gas heat. The selected technology has been continuously improved and adapted to meet international emission standards, increased specific capacity and increased fuel efficiency.

Air Emissions. Ambient air quality measurements showed concentrations of NO2, albeit measured over a relatively short timescale, within the annual mean WHO ambient air quality guideline (AAQG) of 40 µg/m3 and concentrations of SO2 well within 24-hour average guideline of 20 µg/m3. Measurements of 24 hour mean PM10 concentrations ranged from 112 to 448 µg/m3 during the dry season and from 48 to 120 µg/m3 during the wet season, compared with the 24 hour mean WHO ambient air quality interim target of 150 µg/m3 and the guideline of 50 µg/m3. Measurements of 24 hour mean PM2.5 concentrations ranged from 15 to 80 µg/m3 in the dry season and from 7 to 25 µg/m3 during the wet season, compared with the WHO ambient air quality interim target of 75 µg/m3 and the guideline of 25 µg/m3. The airshed at the project site is therefore considered non-degraded for NO2, SO2 and PM2.5, and potentially degraded for PM10, due to the high values measured during the dry season.

Based on project fuel specification, the HFO will have an ash content of a maximum 0.15%, carbon residue of a maximum 20%, and a sulfur content of 2% or less, which is in compliance with WBG's guidelines for non-degraded airsheds for SO2. Air emissions, as predicted by the contractor and supplier of the engines, are expected not to exceed the applicable and relevant guideline levels set out in the WBG's EHS Guidelines for Thermal Power Plants, with the exception of particulates, which the contractor guarantees will not exceed 100 mg/Nm3 (above the guidelines of 50 mg/Nm3 and 30 mg/Nm3 for a facility located within a non-degraded airshed and within a degraded airshed, respectively). Because less stringent levels of PM emissions than those provided in these EHS Guidelines are conservatively predicted based on the worst fuel characteristics allowed by the fuel specifications, as part of the ESHIA, the company has provided a technical and financial justification and a site-specific quantitative assessment to demonstrate compliance with applicable ambient air quality standards and minimization of incremental impacts. The impact of the flue gas emissions on ambient air quality was assessed using the Atmospheric Dispersion Modelling System (ADMS) version 5 dispersion modelling software. Modeling assumed 6 x Wärtsilä 20v32 generating sets operating at 100% load for 7884 hours per year (i.e. 92.5% of the year), and emitting via a common stack grouping with stack height of 65 m. The assumption that the plant is operating at 100% load, 92.5% availability is conservative, as the average plant load is expected to be below 100%. A stack height assessment was undertaken to determine the appropriate stack height for the proposed power plant. Conservatively, the emissions from the engines were assumed to be constantly at the limits for liquid fueled reciprocating engines <300 MWth input.

The model showed no predicted exceedance of the relevant WHO AAQG for NO2 and SO2. The project contribution was predicted to be less than 25% of the AAQG values for annual mean NO2, which is in line with the WBG EHS guidelines. There is also no predicted exceedance of the annual mean or 24-hour mean AAQG for PM2.5 and the project contributions for the respective averaging periods are relatively low, approximately to 2.8% to 4.7% of the annual mean and 24-hour mean AAQGs, respectively. While exceedances of both the annual mean and 24 hour mean AAQG values for PM10 were predicted due to the high background concentrations measured (particularly the dry season measurements), the project maximum contributions in terms of PM10 for the respective averaging periods is, however, low, approximately 1.4% to 2.4% of the AAQG values for the most conservative scenario of plant operating at 100% load with maximum PM emission levels. The maximum 24-hour mean levels and the annual maximum mean levels were predicted to be located approximately 0.9 km east of the site and east of Wellington Creek, a predominantly

industrial/commercial area on the coast and, therefore, the predicted concentrations of the emitted substances will be lower within the nearby more densely populated residential areas. The assessment concluded that the maximum predicted annual mean increases for each pollutant are not significant, with regard to potential human health effects.

Regular monitoring of fuel quality will be implemented by the company. A Continuous Emissions Monitoring System (CEMS) will be installed to monitor the emissions of the relevant pollutants and associated emissions parameters, and provision will be made for manual sampling of pollutants, including sampling points with safe access. The company will develop and implement an ambient air quality monitoring program (ESAP actions #1 and #2) with monthly sampling to assess the airshed conditions and monitor concentrations of NO2, SO2 and particulates (PM10 and PM2.5) in the project's area of influence during construction and operations phase. Heavy metals and unburned hydrocarbons will also be periodically measured. The ambient air quality monitoring program will be undertaken for at least two full year of operations and will be subsequently calibrated based on the results of the monitoring, in consultation with WBG and EPA-SL. Should actual monitoring indicate that air emissions are above the predicted levels and a measurable impact on ambient air quality is associated with the plant's operations, CECASL will implement additional pollution control measures to further reduce stack emissions, including, as needed, necessary capital and/or operating improvements.

Noise and Vibrations. Two ambient noise surveys were conducted during the ESHIA study. While the project site and its surroundings are zoned by Freetown City Council as commercial/industrial land use, several buildings surrounding the project site have residential, community or educational usage. The average night-time noise levels measured around the site were below the WBG noise level guideline for industrial areas of 70 dBA, although the guideline was exceeded during the day. Measured levels were well above the WBG guidelines of 45 dBA (night time) and 55 dBA (daytime) for residential, institutional and educational uses, exceeding both the daytime and the night-time guidelines by between 14 – 19 dBA.

The construction phase will have temporary impact on ambient noise mainly due to use of heavy equipment at the site and construction traffic. Construction works are estimated to generate high noise levels in the range 83-87 dBA at a distance of 10 m. Noise will be mitigated by limiting construction activities to daytime according to a time schedule which will be presented to the affected community during public consultation and as part of the engagement activities with the residents and management of the schools prior to construction.

During operations, the main noise sources will be the diesel engines operating within an engine hall, the exhaust stack, the combustion air intake, the engine hall air supply, the four electrical transformers, and the cooling radiator array. Design noise attenuation measures include air intake and ventilation attenuators and exhaust silencers. In addition, enhanced mitigation measures have been considered in the design, including enhanced ultra-low noise radiator fans and increased size of the ventilation attenuators. The noise levels were predicted using a 3D noise model prepared in Cadna/A. WBG noise level guideline for industrial areas of 70 dBA is predicted to be complied with at the site boundary. Due to the presence of residential and educational receptors, the study carried out (i) a comparison of the modeled nighttime noise levels with the relevant 45 dBA criterion and (ii) an assessment of the criterion of maximum increase in background levels of 3 dBA, per WBG EHS Guidelines. While, due the high noise baseline levels measured, the noise levels were predicted to exceed the nighttime 45 dBA criterion for considerable distances from the

site boundary, the predicted change in noise level did not exceed 3 dB at any building in the project vicinity.

Although the modeled change in noise levels did not exceed 3 dB criterion, the ESHIA has committed to identify and implement additional enhanced noise reductions (layout optimization, ultra-low noise radiator fans, increased size of the ventilation splitter attenuators and noise barrier) to reduce night time noise levels to 55 dB LAeq at the nearest residential dwellings located in the proximity of the site, an approach considered prudent to ensure the plant operations do not worsen the current noise environment. As indicated in ESAP action #9, a Noise Management Plan will be developed including provisions identified during detailed design for noise reductions at source and specific engagement with the affected people, including nearest residential receptors and schools. An ambient noise monitoring program will be undertaken for at least two full years of operations and will be subsequently calibrated based on the results of the monitoring. Should actual monitoring indicate that noise impacts are above the predicted levels, CECASL will implement additional enhanced noise mitigation.

Vibrations are expected to be limited and mainly associated with the construction phase: a Construction Vibration Management Plan will be developed and implemented, including structure survey and vibration monitoring during construction, as per ESAP action #1.

Water Consumption and Liquid Effluents. During construction water will be supplied to the project by tankers. Potable water will be provided in bottles/drums and delivered to site via trucks. As the power plant is air cooled, limited water volumes will be required for radiator makeup water, wash down and sanitary/domestic use. During operations water will be supplied by groundwater abstraction boreholes, which will be drilled to supply water for the project. As indicated in ESAP action #10, the company will undertake a borehole survey to identify the location of any nearby water wells and will provide assurance that the boreholes drilled to provide water to the plant will not affect existing community water sources. If water purchased from Guma Valley Water Company is considered as a supplemental source, the company will carry out an assessment of water availability to other water users on the network to ensure continued water usage.

A water treatment system designed to treat brackish water, with low organic matter and suspended solids content, will provide treated water which will be stored in a 100m3 water tank. Two water tanks, each of 700m3 size capacity, will be installed on site for the fire response system.

All sanitary sewage will be sent to either an onsite septic tank for storage and disposal or to an onsite effluent treatment plant, depending on the final design. Industrial wastewater generated will be a limited quantity and treated in an oil/water separator. Potentially contaminated storm water drainage system will be directed to an oil/water separator for treatment. Oil from the oil/water separator(s) will be recycled or disposed of in the on-site incinerator. The containment basin for the transformers will be sized to contain both oil leakage and firefighting water in case of emergency. The design of the wastewater management network and units is not finalized yet, but, as indicated in the ESHIA, if treated wastewaters are discharged to a stream or a drain, they will meet the applicable and relevant effluent guidelines of the WBG General EHS Guidelines (Table 1.3.1) and EHS Guideline for Thermal Power Plants (Table 5).

Waste and Hazardous Materials. Both CECASL's and the contractors' management plans will include waste management procedures. The company will ensure that the EPC and O&M

contractor appropriately minimizes and controls release of hazardous materials (e.g. used oils, chemicals for water treatment, fuel, and wastewater treatment).

Waste generated during construction will include excavated soil, domestic waste, various packaging, containers, used oil, and batteries. The excavation will be limited given that the topography of the site is relatively flat.

During operations, the most significant solid wastes will be sludge from the HFO cleaning with fuel separators (centrifuges), lube oil cleaning, any fuel and lube oil drain and leakage at the plant, and the water/effluent treatment plant. Other sources of solid waste will include domestic and commercial waste (cardboard, paper, pallets, packaging material from spares, food wastes), and wastes produced during maintenance, such as sludge removed from oil separators, scrap metals; air filters, and paper and plastic packaging materials. Because there are not suitable hazardous waste disposal facilities in Sierra Leone, hazardous waste will be stored on-site and appropriate disposal determined as part of the Waste Management Plan. Hazardous waste will be managed in compliance with PS 3 requirements. If transboundary movement of hazardous materials and waste is needed, it will be consistent with national, regional and international law.

Although the design is not finalized yet, the company plans that the sludge waste is burned in a small on-site incinerator, which will be intermittently operated, will be used for the disposal of HFO sludge only and will not be used for incineration of any other materials. The quantity of the sludge to be incinerated will approximate 10 tonnes/month. The incinerator will have a combustion capacity below 3MWth. If confirmed to be the preferred option for HFO sludge disposal, the incinerator will be designed and operated to meet good industry international practice to prevent technical problems and environmental impacts. The final options for hours of operation and volume of sludge to be processed in the incinerator will be defined in the Waste Management Plan to de developed as part of the ESMP. Hours of operation will be restricted to ensure that the incinerator it is not considered a significant source of air quality emissions. Bottom ash and residuals should be managed based on their classification as hazardous or non-hazardous materials. The resulting ash will be analyzed and will be stored and disposed of per Waste Management Plan. If hazardous, the ash will be shipped overseas to appropriate facilities for disposal.

A number of measures will be integral to the design and operation of the proposed incinerator, including:
- The incinerator will be fully automated with flue gas O2 and temperature in combustion chamber flue gas outlet, combustion temperature controller, negative pressure switch, flame safeguard control, and relevant alarms;
- The incinerator will be operated intermittently and will not exceed the operating limits defined in the Small Combustion Facilities Emissions Guidelines included in the WBG General EHS Guidelines (pg. 6).
As indicated in ESAP action #11, the company will provide IFC with detailed information on the foreseen incineration technology, and with the Incinerator Operations Manual which will define the operations of the incinerator including total quantity to be incinerated and hours of operations.

The fuel storage tanks will be above ground with secondary containment. The anticipated total amount of fuel onsite at any given time is estimated 11,000 m3. The estimated fuel consumption is 261m3 of HFO per day.

Greenhouse Gases (GHG). The company estimates that the power plant will produce up to 464 GWh of electricity per year depending on the load factor, with carbon dioxide emissions up to 312,000 t CO2 equivalent per year at CO2 emission performance of 0.67 kg CO2/kWh. As required for projects with GHG emissions greater than 25,000 tons CO2 equivalent per year, the company will quantify GHG emissions annually in accordance with internationally recognized methodologies and good practice.

A "Climate Change Potential Review" was included in the ESHIA scoping report and concluded that there will be no significant climate change effects. The plant site is located >15 m above sea level and 500 m inland. Climate change effects for the project are therefore limited to lesser implications such as changes in rainfall frequency/intensity and minor temperature change implications for engine efficiency. The design included adaptation measures to address this risk, such as additional capacity for the drainage design in addition to appropriate engine selection.

PS 4 – Community Health, Safety and Security

Community Health and Safety. The site is about 0.9 km from the main road (Bai Bureh Road) through Parsonage and Factory roads, which are in poor conditions. In addition to the presence of two schools and the Islamic compound (whose entrance is directly on the access road), there are some shanty houses along access road and some artisanal farming areas, particularly within the storm drain overflows of Factory Road. The distance from the Queen Elizabeth II Quay, where the heavy plant equipment will be unloaded, to the site is 4.4 km.

Due to the conditions of the access roads and the shanty houses located in close proximity to the project entrance, community health and safety risks will be mitigated by the project during construction and operations. As indicated in ESAP action #12, CECASL will develop and implement a Traffic Management Plan to control traffic and ensure community safety.

The Traffic Management Plan will include measures related to safety of delivery of raw materials, road grading and maintenance, roadside incident management and spill response, defensive driving, and drugs and alcohol testing for truck drivers, and community awareness.

To minimize the fire risk to surrounding community posed by storage of large quantities of fuel on the plant site, CECASL will ensure that the design will include a detailed hazard analysis, focused on potential effects of fire on the residential and community receptors located in the vicinity of the project site, and the needed measures to mitigate the risk. The tank farm will be designed following NFPA 850 guidelines, including minimum physical separation of the tanks. Each tank will be bunded to contain all the volume of fuel, a cooling ring will be installed in all the tanks, a foam system will be installed inside each tank, and hydrants will be installed in the tank farm. CECASL and the EPC and O&M contractor will put in place an emergency preparedness and response system that will be tested for its integrity as described in PS1 above.

As indicated in the ESHIA report, CECASL is committed to ensure that the HFO pipeline route is all within secured areas of the NP facility and the refinery with the exception of the road crossing next to the site entrance, where the pipeline will be underground and duly protected.

A Worker Policy and Code of Behavior will be developed, including guidance for staff and construction workers, disciplinary actions for conduct violations and a grievance mechanism for

community complaints. Compliant with national law and consistent with relevant international good practice recommendations, a worker health screening program, based on sound ethical and technical practice, will be developed and implemented during construction.

Security. Security arrangements to be performed during the construction and operational phases have not been established yet. CECASL will ensure that security personnel have undertaken necessary screening and training in accordance with good industry practices. As indicated in ESAP action #13, the company will prepare policy and procedures, including a Code of Behavior for security personnel, to ensure that security arrangements will follow the requirements of PS4 including provision of a grievance mechanism. The project will adhere to the Voluntary Principles on Security and Human Rights to ensure that adequate health and safety training of security personnel takes place. The company will ensure that EPC and O&M contractor implement appropriate incident response procedures in accordance with the recommendation relevant to Interactions Between Companies and Public Security included in the Voluntary Principles on Security and Human Rights.

PS 5 – Land Acquisition and Involuntary Resettlement

The development of the project site will not involve physical displacement as there are no inhabitants (legal residents or squatters), but will result in limited economic displacement and livelihood impacts on artisanal farmers who do not own the land but are allowed to cultivate subsistence crops. The zone of impact is restricted to the project site itself. Initially, 16 farmers were identified farming small areas within the project site during the two consultative meetings held in early February 2014 and early May 2014. After the Ebola situation in the country, a follow-up meeting was also held with the artisanal farmers in September 2015, when updated data on the farmers were collected and details of compensation were further discussed. Although during the original project consultation with the farmers in February 2014 it was indicated that there were 16 farmers utilizing the site, only 10 farmers were identified as permanently farming within the site in September 2015. Based on the discussion with the farmers, it is understood that the other farmers used the plots occasionally and had since moved on. The project has prepared and disclosed an Abbreviated Resettlement Action Plan (ARAP) to manage the economic displacement of the 10 artisanal farmers. The ARAP includes details on the farm plots referred as "heaps" and each ranging between 20 to 25 square meters in size. An initial estimated number of 32 heaps were identified within the project site and estimated compensation amounts were calculated based on the crops grown: potato leaf, cassava leaf, green, sour and krain-krain. The farmers are all women from around the area utilizing the heaps to supplement their subsistence and household income by selling the remainder crops at the nearby market. As indicated in the ESAP action #14, the ARAP will be finalized and implemented in consultation with the artisanal farmers once the Ebola situation is all clear, prior to project construction, in accordance with PS5. The ARAP will be finalized based on further assessment on determining the adequate compensation measure and mechanism for the artisanal farmers as well as identifying the supporting livelihood restoration activities. Though the artisanal farmers do not own the heaps, the project is committed to identify areas that would allow them continuing their farming activities.

In addition, the project is currently assessing the potential impacts, especially during the construction phase, and relevant mitigation options for seven families located on the side of the project site's front entrance. Despite being an industrial zone, the families have settled in the area for some time and reside in informal structures mainly composed of zinc roofs and wooden beams.

The main impact involves traffic safety concerns, especially during the construction phase, with increasing traffic in and out of the project site. Analysis of mitigation options being assessed may identify, as preferred option, the physical relocation of these families, for which the project would be required to complement the ARAP and define specific measures to adequately manage the physical displacement of the families and restore their livelihoods in line with PS5 as per ESAP action #14.

**Stakeholder Engagement**

The project carried out consultations with key stakeholders during the ESHIA scoping phase (January 2014 to May 2014) and during the ESHIA assessment phase (February 2015 to March 2015) despite challenging conditions due to the Ebola outbreak. From January 2014 to May 2014, a number of informal and formal meetings were held with key stakeholders: Sierra Leone Environment Protection Agency (EPA-SL); Japan International Cooperation Agency (JICA); Sierra Leone Roads Authority (SLRA); Sierra Leone Non- Governmental Organizations (SLANGO); Conservation Society of Sierra Leone (CSSL); China Road Construction Corporation (CRCC); Ministry of Agriculture Forestry and Food Security (MAFFS); Energy Distribution and Service Agency (EDSA); the local community members and residents around the project site as well as the Islamic school and the Sir Winston Churchill School. Additionally, a Public Community Consultation Workshop took place on May 15, 2014, indicating broad support for the project, but also showing local people's high expectations for job opportunities, electricity supply and economic and community development as a result. Ongoing consultation with the artisanal farmers at the SLRA site was highlighted as being of particular importance.

The Freetown community including the Kissy Dockyard and its surroundings were engaged in a series of media based activities to inform about the project through:
- information published via three local tabloid newspapers namely the Salone Times, Awoko and Standards Times;
- information broadcast across local radio stations (Radio Democracy, Radio Citizen and Tumac Radio). These broadcasts were in the local dialects (krio, mende and temne) and were aired in the morning, afternoon and evening;
- a follow up on community specific broadcast undertaken on the 9th-10th March 2015 using a public address system;
- hand bills handed out to interested individuals and posters put up at strategic points in the community;
- invitations delivered to organizations/stakeholders in the Western Area of Freetown.

The Public Hearing to gather feedback from key stakeholders and finalize the approval of the ESHIA as per Sierra Leone EPA's requirement, was held on November 25-26, 2015.

As noted above in the PS 1 section, a Community Liaison Officer will be recruited and will be responsible for managing continuous engagement with the stakeholders and liaising with local authorities in managing socio-economic pressure on the power plant and its surroundings. Prior to the commencement of the construction phase, the project will develop and implement a Stakeholder Engagement Plan (SEP) to continuously inform the public throughout the project's cycle as per ESAP item #15. As required by PS1, as part of the stakeholder engagement activities, the client will provide periodic reports to the affected community, describing progress with implementation of the ESAP and relevant to management of key E&S issues identified in the

ESHIA and issues of concern identified through the consultation process or grievance mechanism, including air emission and noise management. As part of the SEP, a grievance mechanism will also be established that will allow stakeholders, and in particular the local community, to have the ability to lodge complaints or voice their concerns, and for any such complaints to be dealt with, recorded and monitored by CECASL.

**Local Access of Project Documentation**

Copies of the ESHIA have been made available from November 17, 2015 at a number of locations for public review and comment including offices of EPA-SL, CECASL, Integems, Ministry of Energy, Electricity Distribution and Supply Authority (EDSA), Hotel 5-10 at Kissy, and Archbishop Brosnaham Memorial Hall.

In addition, the Environmental and Social Review Summary (ESRS) and the Environmental and Social Action Plan (ESAP), together with the ESHIA, will be available at the following locations:

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