Environmental and Social Impact Assessment of a 300 MW Solar Power Project in Bikaner district of Rajasthan, India

Ayana Renewable Power One Private Limited

Executive Summary

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EXECUTIVE SUMMARY

E.1 Project Background

Ayana Renewable Power Pvt. Ltd (hereinafter referred to as 'Ayana' or 'ARPPL' or 'Client') has been set up to develop renewable energy generation capacities in India and its neighbouring countries. The Company is run by an independent Board of Directors and a Management team. As per Company's mission statement, by 2022, ARPPL plans to install 2000 MW of renewable power in India and its neighbouring countries. The company ventures into development of solar power projects (Utility scale, Roof Top and Open Access) and wind power projects. The company has its headquarters in Bengaluru, Karnataka.

Ayana Renewable Power One Pvt. Ltd (ARPOPL), an SPV of Ayana is setting up a 300 MW solar power project in Bikaner district of Rajasthan (here in after referred to as 'the Project'). The Project site is located in Khichiya village, Gram Panchayat Jalalsar, Block and Tehsil Bikaner of Bikaner district, Rajasthan.

Ayana undertook an Environmental and Social Impact Assessment (ESIA) Study for the proposed 300 MW Project, in accordance with International Finance Corporation (IFC) Performance Standards 2012, through third party Environmental and Social (E&S) consultant agency 'Earthood Services Private Limited' (ESPL), in June 2020.

The report needs to be aligned with Asian Infrastructure Investment Bank's (AIIB) E&S Framework and for the purpose Ayana engaged ERM India Private Limited (ERM) for this alignment/ updation work in August 2020. The assignment was completed basis desk based assessment of the data shared (no site visit included), telephonic conversation / video conferencing for discussions with Ayana's corporate and site team, and other related interactions with relevant stakeholders on land securing process and compensation.

E. 2 Project overview

The 300 MW solar power plant is proposed to be developed on approx. 1500 acres of open private land in Khichiya village, Bikaner tehsil of Bikaner district. Nearest villages are Dholera, Khichiya and Jalalsar at an approximate distance of 0.5 km southwest, 2 km south, 3-5 km Southeast of the project site; respectively. Bikaner is the nearest town at a distance of ~ 30 km from the Project Site nearest railway station is at Jamsar at a distance of ~ 10 km. At the time of ESPL site visit the Project was at the pre-construction stage.

The proposed project site is approachable through National Highway (NH-15) connecting to Jamsar road which connects SH-3 to NH-15. Beyond the Jalalsar road, the project site is accessible through an unpaved village road connecting the southern part of the project site to the village. The unpaved road itself runs along the western and southern part of the project site.

Siemens Gamesa Renewable Energy (SGRE) is the EPC contractor for the Project, responsible for Project development including but not limited to providing encumbrance free, litigation and dispute free land and in line with applicable land laws, installation of the Project components and development/procurement of Project related common infrastructure. Power from the project will be evacuated through a 400 kV (DC) transmission line of about 3 km length from project site to 765 kV Power Grid Corporation of Indian Limited (PGCIL) grid substation (GSS) located at Jamsar on Bikaner highway, located on south direction of the proposed project site. The transmission line alignment route is planned to transverse on fallow land avoiding agriculture fields and settlement area.

SGRE has further appointed a land aggregator Arya Prop Mart, based out of Delhi. Arya Prop mart has in turn appointed Ms. Sidhi Developers based out of Bikaner for identifying & negotiating the land parcels, on its behalf. Total 1500 acres of private land is being procured from an estimated number of 148 land owners in total, from Khichiya village. Out of this 1500 acres of proposed project land, approx. 698 acres has already been procured and remaining 802 acres is in progress. ARPOPL land

team informed that only private land is considered for the project and the remaining land to be procured are also private land.

On the basis of the telephonic conversation with 3 (three) individual land owners from Khichiya village, google earth imagery and ESPL June 2020 ESIA report, it is understood that land parcels procured identified for the Project are mix of fallow and barren land. These farmers were willing to sell their land due to the low productivity of the agricultural land, dependency on monsoons and lack of irrigation facilities. Further, as reported there were no encroachers or non-titleholders with recognizable usage rights on their procured land parcels, hence informal rights have not been impacted due to the project.

E. 3 Applicable Reference Framework

The following reference framework is applicable to the Project:

- Applicable local and national environmental and social regulations (including that of the state nodal agency for renewable energy development);
- AIIB's Environmental and Social Framework (ESP and ESSs)
- IFC Performance Standards on Environmental and Social Sustainability (2012);
- World Bank Group's General EHS guidelines (2007); and
- EHS Guidelines for Electric Power Transmission and Distribution (2007).

E. 3.1 Applicability to IFC Performance Standards and AIIB's ESF and Standards

The following standards and policy of IFC and AIIB are applicable to the Project:

S.No.	Description of IFC PS and AIIB E & Standards	Objectives and Applicability to Project
1.	**PS-1 of IFC Performance Standards 2012** Assessment and Management of Environmental and Social Risks and Impacts. The client will establish and maintain a Social and Environmental Management System appropriate to the nature and scale of the project and commensurate with the level of social and environmental risks and impacts. **AIIB E&S Standards** ESS 1: Environmental and Social Assessment and Management	**Applicable** This PS and AIIB E & S standard aims to assesses the existing social and environmental management systems of Ayana and to identify the gaps with respect to their functioning, existence and implementation of an environmental and social management plan (ESMP), a defined EHS Policy, organization chart with defined roles and responsibilities, risk identification and management procedures as well as processes like stakeholder engagement and grievance management..
2.	**PS-2 of IFC Performance Standards 2012** Labour and Working Conditions	**Applicable** The project activities will involve hiring of approximately 1000 skilled, semi- skilled and unskilled labourers during the construction phase and solar plant staff during the operation

S.No.	Description of IFC PS and AIIB E & Standards	Objectives and Applicability to Project
	AIIB E&S Standards **ESS-1 -** Environmental and Social Assessment and Management	phase. The project will have to develop a human resource policy and ensure non-discrimination and equal opportunity, protection of the workforce and occupational health and safety. Therefore, PS 2 is applicable to the Project.
3.	**PS-3 of IFC Performance Standards 2012** Resource Efficiency and Pollution Prevention	**Applicable** The Project construction activities will lead to increased fugitive dust emissions, especially in the area it is being developed due to the presence of loose sandy soil and limited vegetation. The project activities will also lead to increase in ambient noise level during the construction phase, which may impact the nearest villages of Dholera, Khichiya and Jalalsar. Furthermore, the project activities will involve generation of waste and may involve abstraction of groundwater. Therefore, PS 3 is applicable to the Project.
4.	**PS-4 of IFC Performance Standards 2012** Community Health, Safety and Security	**Applicable** The Project activities will involve upgradation/widening of the access route identified and construction activities will lead to stress on the Project access road and on the area in general. Transportation of equipment and increased traffic in the area may lead to accidents and other threats on community health and safety, therefore PS 4 is applicable to the project.
IFC PS5	**PS-5 of IFC Performance Standards 2012** Land Acquisition and Involuntary Resettlement **AIIB E&S Standards** ESS- 2: Involuntary Resettlement	**Not Applicable** This Performance standard and ESS-2 is not applicable for the project as there is no physical displacement understood to have happened due to project related land procurement. It is understood that the land parcels identified/procured are private land procured/ to be procured on willing buyer and willing seller basis. Furthermore, the project has not led to resettlement, physical displacement and economic displacement Therefore, PS 5 is not applicable to the project.
IFC PS6	**PS- 6 of IFC Performance Standards 2012** Biodiversity Conservation and Sustainable Management of Living Natural Resources	**Applicable** The Project will involve the construction and operation over 1500 acres of private land. It is learned that the majority of land is barren from more than 3 years, and some portion being fallow land and some under cultivation as evident from the google earth imagery. The risk is potentially significant due to the presence of threatened species such as vultures found in the surrounding areas. The presence of native flora and IUCN listed threatened species of fauna
IFC PS7	**PS- 7 of IFC Performance Standards 2012** Indigenous Peoples **AIIB E&S Standards** ESS-3: Indigenous Peoples of AIIB Environmental & Social Standards 2016.	**Not Applicable** As per discussion with Ayana land team it is understood that no Schedule Tribe (ST) land will be purchased for the Project. Further, there are less than 1 % STs in the study area and no forest and government land is being used for the Project. Therefore, the impact on traditional livelihood of ST population is not envisaged.
IFC PS8	**PS- 8 of IFC Performance Standards 2012**	**Not Applicable**:

S.No.	Description of IFC PS and AIIB E & Standards	Objectives and Applicability to Project
	Cultural Heritage	As confirmed through telephonic conversation with landowner and Ayana land team and google earth imagery, no cultural heritage will be affected by the project activities. Therefore, PS 8 is not applicable to the project. This PS is understood to be not applicable for the project as the Project site is not located near any cultural heritage or legally protected sites.

E. 4 Project Categorizations and Justification

The IFC criteria for project categorization are based on the assessment of environmental impacts of the project and the Project has been categorized as **Category B** based on the following reasoning:

- Environmental and social impacts of the project are anticipated during the construction phase and will encompass changes in land-use, increased noise levels, changes in air quality, use and changes in water quality, impacts on terrestrial ecology, occupational health & safety, etc.;
- The site location of the project does not involve any anticipated settlements and physical displacement;
- Development of solar power projects is occurring in large numbers in the last decade and therefore several such projects are located across India. A solar power project can therefore not be considered an unprecedented activity;
- Solar based energy development is a non-polluting source of energy and thus is not likely to lead to any adverse impacts on the baseline environment during the operation phase;
- There is potentially significant risk due to the presence of threatened species such as vultures found in the surrounding areas. The presence of native flora and IUCN listed threatened species of fauna will require the Project to implement conservation measures for their protection of said threatened species of fauna, as mentioned in the ESMP in ***Section 9***.

E. 5 Baseline Conditions

E. 5.1 Environmental Baseline

The district has a dry climate with large variation of temperatures and scanty rainfall. Hot wind blows in summer. The climate in the area is typical subtropical type of climate with low humidity. The climatological information for the site was obtained from IMD station in Bikaner P.B.O. which is about 30 km from the site. The average maximum temperature is 34.2ºC whereas average minimum temperature is 19.8ºC. The total rainfall in the district is 288.4 mm. June - September is the rainy season and receives maximum rainfall.

Drought analysis based on agriculture criteria indicates that the district is prone to severe and mild type of droughts. Occurrence of very severe type of drought in district is also there. As the district lies in the desert area, extremes of heat in summer and cold in winter are the characteristic of the desert.

As confirmed by ERM, during the telephonic consultation with three land owners and google earth historical assessment, majority of land is barren from more than 3 years, and some portion being fallow land. As per the google earth historical assessment few parcels were observed to be used for one season agriculture.

The plant boundary is not yet defined at this stage, and the land procurement process is still underway. There are approx. 300 number of trees of girth size more than 30 cm *Prosopis cineraria*

(Common Name: *Ghaf* or *Khejri*) at the proposed site for project. These trees are declared as state tree of Rajasthan (Notification No.11 (33)/Raj.8/77 dated 31.10.1983) and are prohibited from felling.

The topography of the site is flat with slight undulation with elevation ranging from 175 m to 200 m above mean sea level. The proposed site is characterized by presence of plain terrain, with small undulation in between.

There is no surface water body within the Area of Influence (AoI) defined for this ESIA Study. The nearest surface water body to the site is Kanwar Sain Water Supply Canal, located at a distance of 8 km towards the south of the project site, which receives water from the Indira Gandhi Nahar Pariyojna (IGNP) canal. The water from canal is supplied through tankers in the villages of study area for domestic uses after treatment.

The stage of ground water development of Bikaner tehsil, where the study area falls is reported to be over 100 % and marked as Over Exploited (excluding saline). The groundwater is not available for drinking in the project area due to saline nature of water quality.

As for natural hazards, the Project lies in the moderate damage risk zone in terms of earthquake occurrence, high damage risk zone for cyclones, the drought frequency in the area is once in four years and the Project area is not prone to flooding.

E. 5.2 Ecology baseline

The project area does not fall within 10 km radius of any significant sensitive receptors like Wild Life Sanctuaries, Biosphere Reserves, and National Parks etc.

According to the Biogeographic provinces of India published by Wildlife Institute of India (Rodgers, Panwar and Mathur, 2002), the project site falls under the Biogeographic Province – 3A – Thar Desert.

Major portion of the study area can be classified as barren/open land and undulating terrain with thinly grown shrubs, in fact the project area is located in open land. The natural vegetation in the area consists of tropical thorn forests very few trees and shrubs. In major part of the study area fallow land few patches of cultivable land highly dependent on rain.

During the survey by Earthood, no waterbody and amphibian species were recorded from the study area during the course of ecological survey. However, nine (09) species of herpetofauna were reported from the study area, out of which only two (Bengal Monitor Lizard and Desert Monitor Lizard) was listed as Schedule I species under Wildlife Protection Act, 1972;

A total of 22 bird species were observed from the study area based on secondary sources and confirm with primary survey. Three species, Long-legged buzzard (*Buteo rufinus*), Common Kestrel (*Falco tinnunculus*) and Indian peafowl (*Pavo cristatus*) are listed under Schedule I of the Indian Wildlife Protection Act, 1972 and amendments, and are accorded the highest protection. No Threatened species (IUCN version 2020-1), was recorded from the study area. Secondary data review suggest presence of 73 migratory birds were reported from the region. iBAT report for the study area suggest presence of 3 critically endangered species, 5 endangered species and 11 vulnerable species.

Total 10 species of mammals are reported in the study area of the project. The Desert National Park is located approx. 235 km away from the project site in Southwest direction.

E. 5.3 Social Baseline

The area of up to 5 km radius from the project boundary has been demarcated as study area for the project by considering the extent of project impact in terms of noise, water resources, human settlement, cultural heritage sites, location of labour sites, location of the access roads besides considering the actual land area which has been procured for the project. The study area is further divided into core zone and buffer zone. For the purpose of socio-economic baseline assessment, core

(1 km from project site) and buffer zones (beyond 1 km and within 5 km of project site) have been divided on the basis of presence of habitations. Three village habitations- fall within the buffer zone namely Lalsar, Jamsar and Dholera and habitations of two villages namely Jalalsar and Khichiya are present within the core zone.

The study area has a sex ratio of 877, of which Dholera has the lowest sex ratio of 748 females per thousand males and Khichiya has the highest sex ratio of 911 females per thousand males. Overall, the core and buffer zone has lower level of sex ratio than both the tehsil and district. One of the reasons for the lower sex ratio is the preference for the male child amongst the community as a whole.

There are 7 government primary school in the study area. There is 3 government run middle schools. There is only 1 senior secondary school for all 5 villages. As per the census of India, 2011 data, there are 2 primary and middle private schools as well.

As per the limited telephonic consultations with land owners and 2020, June ESIA report, it is understood that agriculture is the mainstay of the local economy of the study area. However, due to lack of irrigation facility and erratic rainfall, people are diversifying their sources of livelihood.

As per the ESPL June 2020, ESIA report, the primary crops in the region comprise of *Jowar* (Sorghum), *Bajra (*Millet*), Gawar* (Cluster beans) & pulses. The average land holding size of the farmers in the study area is 15 acre per household and an average agricultural income of INR 3,000 to 5,000 per acre on annual basis, depending on rainfall. Neither of the villages have access to irrigation through Kanwar Sian Lift Canal network. Due to lack of irrigation facility farmers with marginal (10-15 acres) and large land holdings (more than 15 acres) were able to manage the output for self- consumption purposes.

As per the ESPL June 2020, ESIA report, the livestock population of the study area consists mainly of cows, sheep and goats. However, there is lack of open gazing land. The average income from Goat and Sheep rearing was reported to be INR 8000-10000 on monthly basis.

According to ESPL June 2020, ESIA report, the non-farm based livelihoods in the area primarily comprise of casual labour in construction sites. The daily wage rate for men was reported to be INR 400 per day and INR 300 per day for women or approx. INR 6000 - 10000/ per month. There is lack of economic opportunities in the area due to lack of development. In this situation, where adequate work isn't available in the vicinity of the villages, the individuals have started migrating to Bikaner and other cities of State for work. In such scenarios, it is only the worker who migrates, with the family staying back in the village.

As per the ESPL June 2020, ESIA report, water supply in the study area is restricted to supply of water from the Kanwar Sain lift canal through tankers. The villages in the Study Area don't have access to piped water supply or hand pumps and dug wells.

As per Rural Health Statistics 2015, there are 448 subcentres 55 PHC 13 CHC and 1 District Hospital in Bikaner District. At the village level, there are no Community Health Centres (CHC) in the study area. There is only 1 Primary Health Centre (PHC) in Jamsar village. There is 1 Maternity and child Welfare centres and no TB clinics in the study area.

As reported in ESPL June 2020 ESIA report, all the villages in the study area have access to household electricity supply. However, there were reports of power outages of 4-6 hours daily, with increased power cuts in the summer months.

E. 6 Stakeholder Engagement

During the ESIA, ESPL identified/profiled the various stakeholders of the project, such as the affected families, vulnerable groups such as women headed households, BPL families and the village-level key informants, the line departments (revenue, land, agriculture and forest), state/district administration and civil society organizations as well as developed an understanding of their stakes,

interests and influences on the project as per the IFC Performance standards and AIIB E&S Policy. This assists in understanding stakeholder views on the project and in identifying issues that should be taken into account in the prediction and evaluation of impacts.

As per ESIA report, June 2020 by 'ESPL, following feedback was provided by local community and other stakeholders:

- **Awareness about the Project**: The local community of Khichiya, Dholera and Jalalsar were aware about the proposed solar power project. Reportedly, the community supported the upcoming solar power projects in their area;
- **Employment Opportunity**: The community expects to receive benefits from the project in terms of employment and development of infrastructure and the overall community. In addition they also demanded preference to the local community in contractor and employment opportunities from the project
- **Needs/Gap assessment for CSR initiatives:** the required areas for intervention in order to bring about socio-economic development in the area have been identified.
  - **Water Supply**: There is lack of adequate drinking water and an urgent need to increase the storage capacity of the water tank.
  - **Health facilities**: Despite development of public health infrastructure in the recent past, there is a lack of adequate health care facilities for the rural poor population, which is partly due to the heavy pressure of population on these basic services. The availability of doctors specifically lady doctors at PHCs is a major concern for the community. The dependence on private sources for medical treatment is significantly high as compared to government hospital.
  - **Sanitation**: A majority of the households are defecating outside their houses in the open spaces. The condition of drainage is also unsatisfactory. The practice of open defecation needs to be checked by providing in-house toilet assistance.
  - **Education Facilities**: There are government school in the project area with lack of basic infrastructure for students. The educational attainment, particularly among youth and females, is low... The community needs to be made aware of the advantages of female education. There is an urgent need to increase the participation of population, particularly youth, in higher and technical education. This would require imparting short duration job oriented courses in technical institutions to the rural youth, besides providing free-ships and scholarships to the needy youth from disadvantaged communities and minorities.
  - **Livelihood:** Given the seasonal nature of employment in agriculture and allied activities and high incidence of unemployment, a well-planned strategy is required to improve the livelihood of rural population in the project area.
  - **Skill training:** The level of skill and training of the new entrants to the labour market needs to be improved through need based area specific skill development programmes and by promoting vocational and other job oriented courses through Industrial Training Institutes and other technical training institutes. This calls for a comprehensive survey of the skills possessed by the unemployed youth and their training needs in the growing industrial sector, including the self-employed sector

E. 7 Grievance Redressal Mechanism (GRM) Procedure

Ayana has developed a formal Grievance Redressal Mechanism (GRM) for external and internal stakeholders. The procedure is applicable to the entire life cycle of the project i.e. post site selection till the decommissioning phase (including mobilization, construction and operations phase).

Ayana has a special Grievance Redress Cell (GRC) comprising of all top management persons and site Managers. The cell is established for addressing the grievances of third party/ stakeholders, project staff and contracted staffs that has direct contact with project affected communities. The GRM consists of two phases/stages:

- Grievance Receipt and Recording;
- Grievance Investigation and Close-out.

E. 8 Key Identified Impacts

E. 8.1 Construction phase

Site clearance and loss of top soil: The site clearance, excavation for foundation and access road construction will largely affect the top layers of the soil. Loss of top soil quality would have an impact on the soil quality, but the effects can be reversed over time. Further, site clearance will be restricted only in the project site.

Vegetation clearance: The project site is located in dry and arid area comprising dry, thorny scrubs on fallow land. The vegetation clearance does not involve any endangered floral species from the project site. There are few numbers of *Khejri* trees which are scheduled trees, same will be considered during planning lay out of the solar farm to avoid cutting.

Waste generation: General construction waste generated onsite will comprise of concrete, steel cuttings/filings, packaging paper or plastic etc. Municipal solid wastes consisting of food waste, plastic, glass and waste paper will also be generated by the construction workforce at canteen facility. A small proportion of the waste generated during construction phase will be hazardous and will include waste fuel, grease and waste oil containing rags.

The water will be obtained from approved water tanker supplier or nearby borewells in the region having good water quality to use as construction water. According to CGWB study for Bikaner district, Tehsil Bikaner where the project site falls is categorized as “Over Exploited” (excluding saline) in terms of ground water development. Requisite permissions from CGWA will be obtained prior to installation of any borewells.

Air quality: Air quality in the study area will be impacted in the form of fugitive dust emissions from construction/installation activities, vehicular emissions and exhaust emissions from DG sets. However, the construction activities are going to occur for a small period (~6 months).

Ambient noise: Based on ambient noise monitoring conducted for the project, the noise level in the project area is within CPCB permissible limit. Few settlements from Jalalsar are located within 1km distance from the boundary of the project site may have some disturbance during construction.

Occupational and community health and safety: The construction phase activities such as installation of solar PV panels, construction of transmission lines and substations and movement of material and personnel may result in impacts on the health and safety of the workers and the community. These activities will involve the use of heavy machinery and live transmission power lines. These will be consistent across project life cycle (construction, operation and decommissioning stages) and therefore the impacts would be similar in nature.

Reduction of Land-holding and loss of agricultural income- The Project is being developed on 1500 acres of land procured by Ayana, on willing seller and buyer arrangement through Land Aggregator on negotiated rate. At time of site visit (18th June 2020) out of total 1500 acres, about 500 acres of land already procured from titleholders through sale deeds. As per information collected during primary socio-economic survey, approximately 60 titleholders are getting directly affected by the project activities. In the project area per family average land holding is 15 acres and no family is getting landless from the project as they hold land parcel at other location.

As reported during the limited telephonic consultations with three land sellers, the land sold was only a fraction of their total land holdings. These farmers were willing to sell their land due to the low productivity of the agricultural land, dependency on monsoons and lack of irrigation facilities. The three land sellers who were consulted informed that the compensation received after selling their land will be reinvested into purchase of fertile land in other nearby villages. Selling land is therefore also considered as an option of liquidating their assets. The sale of land is also not expected to have significant impact on the agricultural income of the land sellers as they are not solely dependent on the particular land parcel. Further, as reported there were no encroachers or non-titleholders with recognizable usage rights on their procured land parcels, hence informal rights have not been impacted due to the project.

As per the discussion with ARPOPL land team, and land sellers and assessment through google earth imagery, the project does not involve physical displacement of titleholder.

There is no residential & commercial (temporary & permanent) structure on the land procured or being procured and it is understood that the project will not result in any physical displacement.

Labour and employment: As gathered from consultations Ayana's site team, a significant segment of labour requirement (1000 nos. unskilled and semi-skilled) during the construction phase will be sourced locally. During construction stage the labour camp need to be established for labour from outside in the project area. Proper facilities and monitoring on labour will be required to avoid conflict with local labour and chances to spread of transferable diseases.

The Project will therefore boost the local employment, if higher number of unskilled labourers is required to be engaged for construction activities. Additionally, there would be some skilled labour required that would be brought in from other states (if not present in local area) that would also lead to spike in economic activity in the area, during construction phase. This would lead to better business opportunities for smaller vendors in the area owning petty shops, petty contractors firms, etc. for providing essential goods and services to the project.

The entire project is located within both natural as well as modified habitats (scrub lands). These scrub lands have a good number of trees specifically *Khejri* [*Prosopis cineraria* (L.) Druce] (300 nos.); as well as other shrubs. Although the Project may impact the vegetation at the study are, it must not have an impact on Khejri trees, which have been declared as state tree of Rajasthan (Notification No.11(33)/Raj.8/77 dtd 31.10.1983) and are prohibited from felling.

Excavation for the construction activities will have a direct impact on burrowing fauna, such as the White-footed Fox, etc. and an indirect impact on flora/fauna through the changing of soil properties.

E. 8.2 Operational phase

Soil environment: In the operation phase, soil compaction and erosion may occur due to vehicle movement, which only happens during the occasional maintenance activities.

Waste generation: The waste generated from project includes domestic solid waste at SCADA building and substation and hazardous waste like waste oil and lubricants and oil containing jutes and rags will be generated during maintenance activities.

Dry robotic cleaning: Use of dry cleaning technologies is a proposed method that will be adopted to undertake module cleaning. Therefore, water requirement for module cleaning purpose will be minimum.

It is understood that during the operation phase, approximately 30 workers including employees of ARPOPL and O&M contractor would be deployed at site. The employees will include 4-5 staff for service engineers, 3-4 housekeeping and approximately 10-15 are envisaged to be employed as security guards. As the scale of activities (which may lead to employment/business) during the operations phase is relatively lower than in the construction phase.

Ecology: Several species of birds identified during the ecological study were found perched on wires and towers/poles in the area. It has been observed across power projects globally that avifaunal species utilize the transmission towers/poles for nesting, hunting prey or using the height of the manmade structure as a lookout for predators. These transmission lines and towers/poles can potentially constitute an electrocution and collision hazard to birds.

Species that can climb or fly over the walls can also enter the compound. Solar modules or other such obstacles can injure wildlife. Some studies also suggest that avifauna is attracted to the solar module as they mistake it for water bodies and roost on the solar modules[1]. The roosting could lead to heat related incidents when solar waves bouncing of the panel are focused on the bird.

E. 8.3 Decommissioning phase

Soil environment: Soil in the study area will be affected due to soil compaction due to the increased vehicular and workforce movement, dismantling and storage of plant components on the adjacent land, removal of internal electric lines/ poles etc. and waste generated in form of dismantled plant components and demolition debris from plant foundations, storage yard and substation complex.

Air quality: Air quality in the study area will be impacted in the form of fugitive dust emissions from construction/installation activities, vehicular emissions and exhaust emissions from emergency DG sets. The biggest source of emissions in the decommissioning phase is the fugitive dust emissions from demolition activities. The demolition activities are likely to occur for a very small period of time.

Ambient noise: During decommissioning phase of the project, noise will generate from movement of vehicles carrying dismantled structure and equipment.

Economy and employment: The major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income.

E. 9 Key cumulative impacts

All of the above highlighted impacts may have a heightened effect in the study area as the study area is characterized by the presence of other solar power Projects, namely:

- 250 MW Solar Power Plant owned by Renew Power Limited;
- 600 MW Solar Power Plant of Azure Renewable Energy

E. 10 Mitigation Measures and ESMP

For the purpose of providing site specific mitigation measures to mitigate key identified impacts from the Project, an ESMP has been developed. The ESMP specifies the standards and controls required to manage and monitor environmental and social impacts during construction and operation phases. To achieve this, the ESMP identifies potential adverse impacts from the planned activities and outlines mitigation measures required to reduce the likely negative effects on the physical, natural and social environment. This is in accordance to IFC Performance Standards and AIIB's E&S policy and standards which emphasizes the importance of managing social and environmental performance throughout the lifecycle of the Project.

E. 11 Organizational Structure

At the Site level, during operation phase, Ayana will depute a Site Manager/ Plant Head. Ayana's Plant Head will be responsible for managing the environment and social performance of the Site, in compliance with the Company's IMS system and the applicable legislation and shall also be responsible for reporting the EHS compliance status to the corporate office. The Plant head will be supported by the Site In charge/ Safety Supervisor of the O&M Contractor. During construction phase,

[1] https://www.bsg-ecology.com/wp-content/uploads/2019/04/Solar-Panels-and-Wildlife-Review-2019.pdf

Ayana's Site In charge will be supported by a Project Management Contractor (PMC) Safety Supervisor, who will be responsible to oversee EPC's work progress and report the overall EHS status of the site during construction phase.

E. 11.1 Roles and Responsibilities

Ayana Bikaner project team will play a role of supervisor to oversee the project performance pertaining to environment, health, safety and social issues. Ayana's role will include coordination and monitoring of management plan implementation by engineering procurement construction (EPC) through Project Management Consultant (PMC).

Ayana will engage an EPC to construct and commission the solar power plant. EHSS requirements will be part of terms & conditions of EPC contract. The EPC will provide its EHSS management plan to Ayana for review and Approval and will implement same at the project site. EPC will deploy its dedicated EHSS team at site to implement EHSS management plan.

Ayana will contract a Project management consultancy for overall supervision and implementation of project. PMC will deploy its dedicated team for project management services at site the team will include dedicated members for EHSS (Manager and Sr. Engineer). The PMC will review EHSS management plan provided by Tata and will ensure same is implemented. The team will Audit and inspect the site daily as per the Framework agreed above, over compliance requirement on EHSS, and ensure that Gap if any identified are closed on time and reported to Ayana team.

Ayana will deploy construction and site managers at project site who will be over all responsible to monitor and ensure that work being carried out are following contract requirement. Ayana Head office team will be visiting site on regular intervals to Audit and Inspect compliance requirements.

E. 11.2 Inspection, Monitoring and Audit

Inspection and monitoring of the environmental impacts of the Project activities will increase the effectiveness of ESMP. Through the process of inspection and auditing, Ayana will ensure that the conditions stipulated under various permits are followed. The inspections and audits will be done by EPC contractor (during construction phase) and O&M contractor during Operation and Maintenance phase, Ayana's QHSE department with support of external agencies/experts. The entire process of inspections and audits should be documented. The corrective and preventive measures emerging out of inspection and audit findings will be implemented by the site in-charge.

E. 11.3 Reporting and Documentation

Ayana will develop and implement a programme of regular reporting through the stages of the project lifecycle. The personnel delegated EHS roles shall be required to fully comply with the monitoring programme in terms of timely submissions of reports as per acceptable level of detail. Reporting will be done in form of environmental check list, incident record register, training records, and environmental and social performance reports (monthly, quarterly, half yearly, yearly etc.).

E. 11.3.1 External Reporting and Communication

Project head is responsible for ensuring that communication with regulatory agencies and stakeholders are maintained as per the requirement. All complaints and enquiries are to be appropriately dealt with and records should be maintained in a Complaint/Enquiry Register by the delegated staff of project QHSE.

E. 11.3.2 Internal Reporting and Communication

According to Ayana's Integrated Management System and QHSE Manual, QHSE personnel/ PMC supervisor at site will share inspection and audit findings with their suggested measures regularly to the Site In-Charge. Site In-Charge will further share the QHSE findings to the QHSE department for

their consideration. The QHSE audit findings are also to be communicated within the staff working on the project. To maintain an open communication between the staff and management on QHSE performance the followings are being used.

Monthly Compliance Report: Once the construction of the project starts, a monthly compliance report needs to be submitted by the Contractor. The compliance will be verified against applicable laws, IMS and other conditions as required by the contract.

E. 11.3.3 Documentation

Documentation is an important step in the implementation of the ESMP, Ayana Bikaner will establish a documentation and record keeping system in keeping with their IMS, to ensure recording and updating of documents as discussed in the ESMP. Responsibilities have to be assigned to relevant personnel for ensuring that the ESMP documentation system is maintained and that document control is ensured through access by and distribution to, identified personnel in form of the following:

- Master Environment Management System document;
- Legal Register;
- Operation control procedures;
- Work instructions;
- Incident reports;
- Emergency preparedness and response procedures;
- Training records;
- Monthly QHSE Monitoring reports;
- Auditing reports; and
- Complaints register/ Workmen Grievance/ Community Grievance and issues attended/closed.

E. 11.4 ESMP Review and Amendments

The ESMP acts as an environment and social management tool which needs to be periodically reviewed to address changes in the organization, process or regulatory requirements. Following a review, Site in charge in coordination with personnel delegated QHSE will be responsible for making the amendments in the ESMP and seeking approval from the corporate heads. The amended ESMP will be communicated to all the staff on the project.

E. 11.5 Training Programme and Capacity Building

Training is needed for effective implementation of ESMP. The training programme will ensure that all concerned members of the team understand the following aspects:

- Purpose of management plan for the project activities;
- Requirements of the management plan and specific action plans;
- Understanding the sensitive environmental and social features within and surrounding the project areas; and
- Aware of the potential risks from the Project activities.

QSHE head of Ayana through EHS head of EPC Contractor and Project management consultant will ensure that environmental health and safety induction training and job specific trainings are identified and given to the concerned personnel for construction activities and operation of the solar plant.

Also; general health safety and environment awareness will be increased among the project's team to encourage the implementation of health Safety and environmentally sound practices and compliance requirements of the project activities. This will help in minimizing adverse health safety and environmental impacts, compliance with the applicable regulations and standards, and achieving performance beyond compliance. The same level of awareness and commitment will be imparted to the contractors and sub-contractors prior to the commencement of the project.

E. 12 Purpose of the ESMP

The purpose of ESMP is to:

- Provide an institutional mechanism with well-defined roles and responsibilities for ensuring that measures identified in ESIA designated to mitigation potentially adverse impacts are implemented;
- List all suggested mitigation measures and control technologies; safeguards identified through the ESIA process;
- Provide Project monitoring program for effective implementation of the mitigation measures and ascertain efficacy of the environmental management and risk control systems in place; and
- Assist in ensuring compliance with all relevant legislations at local, state and national level for the Project.

E. 13 Mitigation measures

The relevant mitigation measures to all the impacts identified during the impact assessment study have been presented in Section 6 (Impact Assessment) and Table 10.1 (Environmental and Social Management Plan) of the ESIA report for the Project. Key mitigation measures for construction and operational phases have been summarized below. As for decommissioning phase, ensure mitigation measures for construction phase are reviewed and appropriately followed.

- Land use:
  - Construction activities should be restricted to designated area;
  - On completion of construction activities, land used for temporary facilities such as stockyard if any should be restored to the extent possible; and
  - The land use in and around permanent project facilities should not be disturbed
- Soil:
  - Site clearance, piling, excavation and access road construction will not be carried out during the rain to minimize erosion and run-off.
  - Vehicles will utilize existing roads to access the site.
  - EPC Contractor should ensure that no unauthorized dumping of used oil and other hazardous waste is undertaken at the site;
  - All hazardous waste should be stored in a shed that is protected from the elements (wind, rain, storms, etc.) and away from natural drainage channels
  - Allow only covered transportation of topsoil within the project site.
  - Plantation activities (depending on survival) may be undertaken by Ayana
  - Filling and transfer of oil to and from the container shall be on impervious surface
  - Care should be taken with regard to possible changes in soil quality due to human activities, such as disposal of waste material and domestic effluents on soil of the surrounding area.
  - Provision of mobile toilets and septic tanks for usage of project team / workers

- Broken solar panels should be stored in paved surface and be handed back to manufacturers / authorized recycler.

- Water:
  - Use RMC for pile concreting as well as other building construction work to minimize water consumption.
  - Explore alternative methods of civil construction work to minimize water consumption.
  - Ensure optimal usage of water
  - Dry module cleaning techniques technology adopted for the project, need regular monitoring for its efficient working
  - Authorized water tankers should be hired for water supply during construction stage of the project or Obtain permission from, Government of Rajasthan water supply from Kanwar Sain lift canal or IGNP
  - Regularly maintain logbook for water consumption.
  - Prepare and implement water conservation scheme e.g., rainwater harvesting at the project site.
- Air Quality:
  - Approach road should be constructed for transportation
  - Develop green area around the project site to trap the dust generated due to the project development activities.
  - Vehicles speed to be restricted to 10-20 km/hr on unpaved road.
  - Raw material should be covered with tarpaulin sheet during transportation and in storage area.
  - Ensure use of dust suppress chemical use on unpaved area to minimize the dust emission.
  - Fine materials (e.g. sand) should be covered during transportation.
  - All the project vehicles shall have PUC. Ensure regularly maintenance of project vehicles during construction and operational phase.
  - Turn off the machineries when not in use.
- Noise Level:
  - Restrict major noise generating activities during daytime 6:00 am to 10:00 p.m.
  - Provide personal protective equipment (e.g. Ear plugs / Earmuffs where required) to all workers wherever noise is generated due to machinery operation.
  - Regular maintenance of project vehicles.
  - DG sets (if use) should comply with Environment (Protection) Rule
  - Use of equipment’s /machines with inbuilt noise enclosure, wherever possible or provision of special acoustic enclosures for individual noise generating equipment’s, wherever possible.
  - Low noise equipment shall be used as far as practicable
  - The number of equipment operating simultaneously shall be reduced as far as practicable.
  - Workers should be prevented from continuous exposure to noise.
  - During material movement, honking should be avoided to avoid disturbance to locals.

- In case of complaints of higher noise levels and uncomforting received from the inhabitants of nearby settlements possibility of putting noise barriers near to the receptor need to be considered.

- Social:
  - Providing skills-based training interventions, especially for self-employment to the young and unemployed in the families who will be selling land to project. This will enhance their employability and create potential for income generation through self-employment;
  - Explore possibilities of employment of locals, land sellers during construction phase of the project;
  - Engage the impacted households (of land sellers) in the CSR activities that will be initiated by the Project;
  - The sourcing of local labour, wherever possible should be made obligatory by ARPOPL (through contractual provisions) for sub-contractors, at least for construction phase ;
  - Preference should be given to the land sellers and vulnerable population in the study area, to the extent practicable;
  - It should be clearly communicated to the workers working during the construction period that this will be short term employment and the duration should be informed;
  - Information on local employment should be communicated to the gram panchayat (GP) and information on availability of employment opportunities should be displayed at GP office premises (preferably in the local language) in consultation with the Sarpanch
  - Engagement of local vendors, to the extent possible, for the goods and services required for the project during construction phase;
  - ARPOPL will establish a mechanism to audit subcontractors and suppliers with respect to compliance of utilizing local labour and resources;
  - Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievance with respect to information sharing related to jobs and opportunities for vendor-ship
  - the contractor’s compliance to the applicable rules and regulations;
  - To the extent possible, locate the labour camp(s) within the project footprint area identified;
  - Development of the labour camp in keeping with the IFC Worker’s Accommodation Guideline;
  - Provide adequate sanitation and waste management facilities including, such as safe drinking water, proper waste collection and disposal system, etc.;
  - Undertake health awareness among the local community,
  - Provide the local community an understanding of the project activities and the possible health and safety risks associated with the same as part of the engagement process;
  - Implement on-site vector control measures;
  - Access to the local community to the grievance redressal mechanism for the project

- Ecology:
  - Areas with vegetation patches around water source should be avoided during planning of ancillary components;
  - Top soil that is disturbed should be stored separately for restoration of the habitat. Unnecessary disturbance of neighbouring vegetation should be strictly prohibited;

- Simultaneous revegetation of native species on outskirts of project activity should be practiced for areas that are determined to have loose or unstable soil;
- Strict prohibition on use of fuel wood and shrubs from nearby areas as kitchen fuel; and
- Local grass species should be seeded in the outskirts disturbed areas during monsoon.
- Areas with pre-existing burrows or ground roosting sites of birds should be avoided when possible; This should be ascertained before starting ground activities;
- Project components should be established in a phased manner to allow for movement of species across the solar farm area and reduce overall impact from human-wildlife conflict;
- Anti-poaching and hunting policy should be strictly enforced; and
- General awareness regarding the presence of protected, migratory and threatened species should be increased among the staff and workers.
- Access road construction should be carried out in a phased manner with construction activities;
- When grasses or small scrubs are removed for access road construction, replanting should be implemented after the construction phase to allow roosting mammals and birds to utilize these resources in the next breeding season.
- Transmission towers to avoid nesting by any of the birds. Marking overhead cables using diffractors/diverters;
- The transmission poles cross arms should have suspended insulators and perch rejecters in order to reduce the electrocution of bird species; and
- Jump connectors using insulating chains of at least 60 cm in length (determined based on the average wing span of common avifauna) should be used.
- Regular checking of the boundary wall to avoid any space for wildlife entrance into compound;
- Bird detractors such as scarecrows or moving clothes could be installed around the solar modules to prevent avifauna from venturing close; and
- Regular removal of grass and ground vegetation form the solar site can help to reduce the faunal activities within the site.

E. 14 Conclusion

The Project is a green energy project proposing to generate 300 MW power through solar energy after commissioning. The Project and its key components such as site office building, external transmission lines, lines, internal transmission line, etc. are likely to have minor to negligible impacts on baseline environmental parameters such as soil, noise, water, air, after suggested mitigation measures are implemented. The impact on land use (conversion from fallow land to industrial land) would have low impact. The E&S impacts during operation phase are likely to be minor to negligible. The social impacts from the Project are assessed to be low in terms of loss of fallow land with low income from single season cultivation and community health and safety impacts. The project development is beneficial in terms of local employment and overall local area development.

The Environmental and Social Management Plan (ESMP) describes mitigation measures for impacts specific to Project activities and also discuss implementation mechanism. To conclude, the implementation of ESMP/ Management plans will help Ayana in complying with its internal E&S requirements as well as national/state regulatory framework in addition to AIIB's ESP and ESS requirements.

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