

Initial Environmental Examination

Project Number: 48209
December 2014

IND: 20 MW Solar Power Project Ranji Solar Energy Private Limited

Prepared by AECOM India Private Limited for ACME Gurgaon Power Private Limited

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November 2014

Environment and Social Impact Assessment Report

20MW Solar Power Project
Ranji Solar Energy Private Limited
Bari Seer, Jodhpur District, Rajasthan

FINAL REPORT



Contents

Executive Summary.....	1
1. Introduction	17
1.1 Project Background	17
1.2 Purpose and Scope of Study	18
1.3 Approach and Methodology.....	18
1.4 Agencies contacted	19
1.5 Limitations.....	19
1.6 Layout of the Report	19
2. Project Description	20
2.1 Site Description.....	20
2.1.1 Site Location.....	20
2.1.2 Site Settings.....	20
2.2 Other Solar Power Projects in the Region	21
2.3 Plant Overview.....	22
2.3.1 Plant Layout	22
2.4 Current Status.....	25
2.5 Land Requirement.....	25
2.6 Power Purchase Agreement	25
2.7 Implementation Schedule	26
2.8 Construction Activities.....	28
2.8.1 Site Development	28
2.8.2 Water requirement	28
2.8.3 Construction Labour	28
2.8.4 Construction Power	28
2.9 Operation and Maintenance	29
2.9.1 Scheduled Maintenance Activities.....	29
2.9.2 Unscheduled Maintenance:.....	29
2.9.3 Resource Requirements.....	29
2.10 Associated facilities.....	31
2.10.1 Power Evacuation.....	31
2.10.2 Access Roads.....	31
3. Applicable Legal Framework	32
3.1 Enforcement Agencies	32

3.1.1	Ministry of Environment, Forests and Climate Change	32
3.1.2	Central Pollution Control Board (CPCB).....	32
3.1.3	Rajasthan Pollution Control Board (RPCB).....	33
3.1.4	Rajasthan Forests Department	33
3.1.5	Petroleum and Explosives Safety Organisation (PESO)	33
3.1.6	Director Industrial Safety and Health	34
3.2	Applicable Environmental and Social Laws, Regulations and Policies	34
3.2.1	Environmental Laws, Regulations and Policies.....	34
3.3	Social Laws, Regulations and Policies.....	38
3.4	Overview of Applicable Policies of Government of India.....	43
3.5	IFC Performance Standards	44
3.5.1	IFC's Categorisation of Projects.....	50
3.6	Equator Principles	50
3.7	ADB's Safeguard Policy Statement.....	52
3.7.1	Safeguard Policy Statement (SPS), 2009.....	52
3.7.2	Social Protection Strategy, 2001	53
3.7.3	Public Communications Policy 2011	54
3.7.4	ADB's Categorization of Projects.....	54
3.8	Applicable Environmental Standards.....	54
3.8.1	Ambient Noise Standards	54
3.8.2	Noise Standards for Occupational Exposure.....	55
3.9	Applicable International Conventions.....	55
4.	Environment and Social Baseline Profile	57
4.1	Site Setting.....	57
4.2	Geomorphology and Drainage.....	57
4.3	Soils	58
4.4	Geological Framework.....	58
4.5	Hydrogeology.....	59
4.5.1	Depth to Water level	59
4.5.2	Ground Water Quality	59
4.5.3	Resource Availability	59
4.6	Climate	60
4.6.1	Temperature	61
4.6.2	Rainfall	61

4.6.3	Wind	62
4.7	Natural Hazards	62
4.7.1	Seismicity	62
4.7.2	Droughts	63
4.8	Ecology	64
4.8.1	Landscape elements of the region	65
4.8.2	Overview of forest types of the region.....	66
4.8.3	Biodiversity aspects of Flora	66
4.9	Biodiversity aspects of Fauna	71
4.10	Socio Economic Profile and Stakeholder Consultations.....	75
4.10.1	Objective of the Study	75
4.10.2	Study Area.....	76
4.10.3	Study Approach and Methodology	76
4.10.4	Administrative Set Up.....	77
4.10.5	Demographic Profile of Jodhpur District	78
4.11	Stakeholder Engagement and Information Disclosure	90
4.11.1	Stakeholder Identification	90
4.11.2	Stakeholder Engagement Process Undertaken.....	91
5.	Analysis of Alternatives.....	97
5.1	No Project Scenario	97
5.2	Alternate location of the project site	99
5.3	Alternate Methods of Power Generation.....	99
5.3.1	Sources of Electricity Generation	99
5.3.2	Greenhouse Gas Emissions.....	100
5.3.3	Cost and Reliability of Power Generation.....	101
5.3.4	Statutory and Policy Requirements.....	101
5.4	Alternate Technology for Project	102
5.5	Alternate routes to transmission lines.....	103
6.	Impact Assessment and Mitigation Measures	104
6.1	Impact Appraisal Criteria.....	104
6.2	Impact Identification	106
6.3	Construction Phase	109
6.3.1	Soil Resources and Quality.....	109
6.3.2	Land Use	110

6.3.3	Waste Generation, Storage and Disposal	111
6.3.4	Water Resources and Quality	112
6.3.5	Ecology.....	113
6.3.6	Traffic and Transport	114
6.3.7	Atmospheric Emissions.....	114
6.3.8	Noise and Vibration.....	115
6.3.9	Health and Safety Hazards.....	117
6.3.10	Socio-Economic Impacts.....	118
6.3.11	Archaeological, Historic and Cultural Aspects	120
6.4	Operation Phase	121
6.4.1	Waste Disposal.....	121
6.4.2	Aesthetics and Visual Impact	121
6.4.3	Water Resource and Quality	122
6.4.4	Ecology.....	123
6.4.5	Health and Safety Risk.....	123
6.4.6	Socio-economic Impacts.....	124
6.5	Cumulative Impact Assessment	125
6.5.1	Land Use	125
6.5.2	Water Resources.....	126
6.5.3	Climate Change	126
6.6	Decommissioning Phase.....	127
7.	Environmental Management Plan.....	129
7.1	Environment and Social Management System.....	129
7.2	Organisation Structure (Environment, Social, Health and Safety).....	129
7.2.1	Roles and Responsibilities.....	130
7.2.2	Contractors Management.....	131
7.3	Community / Stakeholder Engagement and Grievance Redressal	131
7.4	ESMP Review and Amendments.....	132
7.5	Inspection, Monitoring & Audit	132
7.6	Reporting and Review	132
7.7	Documentation and Record Keeping	133
7.8	Proposed Environment and Social Management Plan.....	133
8.	Conclusion and Categorization of Project	145

LIST OF TABLES

Table 2-1: Geographic Co-ordinates of site	20
Table 2-2 : Technical Specifications of SPV modules.....	22
Table 2-3: Proposed Solar Photo Voltaic Technology.....	23
Table 2-4 : Implementation Schedule for the proposed plant.....	27
Table 3-1: Performance Standards and Applicability	45
Table 3-2: Ambient Noise Standards.....	54
Table 3-3: Standards for Occupational Noise Exposure	55
Table 3-4: Relevant International Conventions applicable to the Project	55
Table 4-1: Average Monthly Temperature (1901-2000 year period).....	61
Table 4-2: Average Annual Rainfall for Jodhpur District (2007-2011).....	62
Table 4-3: Average Annual Wind Speed for Jodhpur District (2013)	62
Table 4-4: Vegetation characteristics of Project Site	66
Table 4-5: Quartile-wise vegetation characteristics of buffer area	68
Table 4-6: List of species recorded within core and buffer area.....	69
Table 4-7 : Details of Bird Species	71
Table 4-8: List of mammals reported for Bap Tehsil, Jodhpur districts, Rajasthan.....	74
Table 4-9: List of reptiles reported for Bap Tehsil, Jodhpur	74
Table 4-10 : Status of BPL Families in Jodhpur District and Bari Seer village	80
Table 4-11: Total main and marginal workers in Jodhpur District	85
Table 4-12: Details of working population in Bari Seer Village.....	86
Table 4-13: Details of schools present in Jodhpur District	86
Table 4-14: Number of Teachers by Schools.....	87
Table 4-15: Number of schools with facilities.....	87
Table 4-16: Key Questions and Responses from the Survey.....	91
Table 4-17: Key Questions and Responses from ACME's Representative.....	95
Table 5-1: Power Forecasts for Rajasthan	97
Table 5-2: Comparative analysis of Various Power Generation Options	101
Table 6-1: Impact Appraisal Criteria.....	104
Table 6-2: Impact Significance Criteria.....	105
Table 6-3: Impact Identification Matrix – Construction and Operation Phases	107
Table 6-4: Impact Significance – Soil Resources and Quality.....	110
Table 6-5: Impact Significance – Land Use.....	110
Table 6-6: Impact Significance- Waste Disposal.....	112
Table 6-7: Impact Significance - Water Resources	113
Table 6-8: Impact Significance - Ecology.....	114
Table 6-9: Impact Significance: Traffic and Transport	114
Table 6-10: Impact Significance - Ambient Air Quality.....	115
Table 6-11: Impact Significance - Noise and Vibration.....	117
Table 6-12: Impact Significance - Health and safety	118
Table 6-13: Impact Significance - Socio-economic	120
Table 6-14: Impact Significance - Archaeology, Historic or Cultural Aspect	120
Table 6-15: Impact Significance- Waste Disposal.....	121
Table 6-16: Impact Significance - Aesthetics and Visual.....	122

Table 6-17: Impact Significance - Water Resources	122
Table 6-18: Impact Significance - Fauna and Flora.....	123
Table 6-19: ICNIRP exposure limits for general public exposure	124
Table 6-20: ICNIRP exposure limits for occupational exposure	124
Table 6-21: Impact Significance - Health and Safety	124
Table 6-22: Impact Significance - Socio-economic	125
Table 6-23: Cumulative Impact Significance – Land Use	126
Table 6-24: Cumulative Impact Significance – Water Resources.....	126
Table 6-25: Cumulative Impact Significance – Water Resources.....	127
Table 6-25: Decommissioning Impact Significance	128
Table 7.1: Environment and Social Management Plan.....	135

LIST OF FIGURES

Figure 4-1: Geomorphological Map of Jodhpur District	58
Figure 4-2: Water level Fluctuation Map of Jodhpur District (Pre & Post monsoon -2006).....	60
Figure 4-3: Rajasthan Drought Frequency Map	63
Figure 4-3: Thematic Administrative set up of Jodhpur District	78
Figure 4-4: Decadal Population Growth of Jodhpur District (2001-2011)	79
Figure 4-5: Decadal Population Growth of Bari Seer Village (2001-2011).....	80
Figure 4-6: Decadal Literacy Level in Jodhpur District (2001-2011).....	82
Figure 4-7: Decadal Growth of Literate and Illiterate Population in Bari Seer Village (2001-2011)	82
Figure 4-8: Decadal Total SC and ST Population of Jodhpur District (2001-2011)	83
Figure 4-9 : Total SC and ST population in Bari Seer village.....	84
Figure 5-1: Solar Power Potential Map of India	98
Figure 5-2: Source wise Installed Capacity	99
Figure 5-3: Lifecycle GHG Emissions Intensity of Electricity Generation Methods.....	100
Figure 5-4: Lifecycle carbon footprint assessment of the selected Cd-Te Thin Film PV technology..	103
Figure 6-1: Noise Attenuation with Distance	116
Figure 7-1: Proposed Organizational Structure.....	130

List of Abbreviations

ADB	Asian Development Bank
ASEPL	ACME Solar Energy Private Limited
CDM	Clean Development Mechanism
CP	Contracting Party
CPCB	Central Pollution Control Board
DCR	Domestic Content Requirement
EMF	Electromagnetic Fields
EPFI	Equator Principles Financial Institutions
ESAP	Environment and Social Action Plan
ESIA	Environment and Social Impact Assessment
ESMP	Environment and Social Management Plan
ESMS	Environment and Social Management System
GBI	Generation Based Incentive
GHG	Greenhouse Gas
IFC	International Finance Corporation
JNNSM	Jawaharlal Nehru National Solar Mission
MNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MoEFCC	Ministry of Environment, Forests and Climate Change
NAPCC	National Action Plan on Climate Change
NGO	Non Governmental Organisation
NOC	No Objection Certificate
O&M	Operation and Maintenance
PCP	Public Communications Policy
PESO	Petroleum and Explosives Safety Organisation
PS	Performance Standard
RGSEAG	Rajiv Gandhi Scheme for Empowerment of Adolescent Girls
RPCB	Rajasthan Pollution Control Board
RSEPL	Ranji Solar Energy Private Limited
SECI	Solar Energy Corporation of India
SERC	State Electricity Regulatory Commissions
SPS	Safeguard Policy Statement
SPV	Special Purpose Vehicle

Executive Summary

Introduction

ACME Solar Energy Private Limited (hereafter referred as 'ASEPL' or 'project proponent' or 'client') through its Power Purchase Agreement (PPA) with Solar Energy Corporation of India (SECI) has proposed to develop 80 MW (solar plants) in the non-DCR (Domestic Content Requirement) category and 20MW (solar plant) in the DCR category. The 100 MW solar power project (hereafter referred as the 'project') is to be developed by tranches of 20 MW through five Special-Purpose Vehicles (SPV) wholly owned by ASEPL. Ranji Solar Energy Private Limited (hereafter referred to as 'RSEPL') is the SPV responsible for development and operation of 20 MW capacity solar power project (hereafter referred to as 'Project') in Bap tehsil, Jodhpur district, Rajasthan, India. The project is proposed in Bari Seer village, Bap tehsil, Jodhpur district, Rajasthan.

ASEPL intends to obtain financial assistance from International Finance Corporation (IFC) and Asian Development Bank (ADB), the Lenders. ASEPL engaged AECOM India Private Limited (hereafter referred as 'AECOM') to undertake an Environmental and Social Impact Assessment (ESIA) study for the proposed project (falling under Khasra 124). The ESIA Report has been developed by AECOM as per the requirement of International Finance Corporation (IFC) Sustainability Framework, 2012 and ADB Safeguard Policy Statement (SPS), 2009.

Description of the Project

The proposed 20 MW project will be developed in 275 bigha (44.15 hectares) of land falling under Khasra no. 124 as per the revenue records. The land for the project comprises of revenue land that has been classified as 'Gair Mumkim Raida land' or 'uncultivable land'. The power from the Project will be evacuated through two double circuit 132 kV lines and only the right of way for the transmission line will be procured. The access roads to the site will be about 4-5 km long and will also pass through revenue land only. No private land is procured for the Project. The allotment letter to RSEPL has been obtained from the District Collector; Jodhpur Division dated 17th October 2014.

A No Objection Certificate for the project has also been obtained from the Sarpanch of Bari Seer Panchayat dated 20th September 2014. The No Objection Certificate states that the land for the project has been classified as revenue land and is not used by the community for any purpose.

The proposed 20 MW solar power project will be based on Solar Photo Voltaic technology using Tandem Structure (with Amorphous & Microcrystalline Silicon) and Thin Film PV modules for power generation.

The Power Purchase Agreement (PPA) has been executed between RSEPL & SECI on 28th March, 2014. The scheduled date of the commissioning of the project is estimated at 13 months from the date of the PPA.

The site development activities for the proposed project will entail soil investigations; site surveys; site levelling; construction of access roads; fencing of site and laying of foundations.

The land for the proposed site is fairly levelled and no major cutting and filling will be required. The detailed design of foundations will be carried out after detailed geological analysis.

In the proposed plant almost all the buildings will be prefab type, structures will be prefab type and all the equipment will be packed and shifted in completely assembled or partially assembled form. The installation of the equipment's does not require water in any form. Very small quantity of construction water will be required for piling and foundation work which will be sourced from authorised tankers. It is estimated that about 100-150 m³ of water will be required for the entire construction phase.

During construction stage, the average labour demand for the proposed project is estimated to be about 60-70 workers. The peak labour requirement for the project will be about 100 persons. The unskilled labour for the project which will constitute 70-80% of the total manpower required will be hired locally. Only skilled labour and security staff will involve migrant labour.

The construction power will be provided at site location from 200 kVA, 11 kV HV feeders passing nearby plant area. ACME Gurgaon Power Pvt. Ltd. will apply for construction power to DISCOM after possession of land and power shall be provided after preliminary formalities and deposition of required fee.

The operation of solar power plant is relatively simple and restricted to daylight hours. With automated functions of inverter and switchyard controllers, the maintenance will be mostly oriented towards better up keep and monitoring of overall performance of the system.

The water requirements for the plant will be predominantly for washing of solar PV modules with water periodically to remove bird droppings, dust and other dirt and domestic water consumption. The domestic water consumption for the Project is estimated to be 2-3 m³/day and will be met through the canal water which is also available for domestic water demands. With a cleaning schedule of twice/thrice a month, it is estimated that approximately 35 - 40 m³ per day of water will be required for cleaning purpose. The water requirements for the project will be met through groundwater using bore wells.

Considering the development of other solar power projects in the region and development of RIICO industrial area, it is likely that an industrial supply line will be laid parallel to the existing Indira Gandhi irrigation canal. ACME group, along with other solar power project developers in the region intends to submit an application for providing water supply from the industrial line to the solar power projects in the region to reduce the stress on the groundwater resources of the region.

The manpower requirement for the operation phase of the Project has been estimated to be 6 engineers, 8 technicians and 20-30 staff for cleaning of solar panels.

The power generated from the proposed plant will be stepped up to 132 KV level using two 11/132 kV, 50/60 MVA (ONAN/ONAF), OUTDOOR type transformers located in the 132 kV switchyard within the plant premises. Two 132 kV lines from the transformers will form into a single bus and power will be transferred through double circuit line to the 132 kV Bari Seer Grid Substation. The transmission line will pass through revenue land and only the right of way will be leased for the transmission line.

Access roads of about 4-5 km length will be developed to provide connectivity to the site from the National Highway – 15. The road alignment will also pass through revenue land and will be taken on lease from the Government.

Environment and Social baseline Profile

Jodhpur district forms part of Great Thar Desert of Rajasthan and comprises of scattered sand dunes, alluvial areas dotted with few hillocks and hill chains. Bap tehsil is located in the north-western portion of the district and Sand dunes occupy a major part of the tehsil. The general elevation of plains in the tehsil is about 300 m amsl. The sand dunes are transverse and longitudinal types formed due to Aeolian action and overlie the denuded consolidated formations. Presence of boulder beds exhibit striking plain topography around Bap and similarly the low lying out-crops of limestone, shale and sandstone layers are also observed in northern part of the district near Phalodi.

Jodhpur district falls in the Luni and Barmer Basins. Major River of the district is Luni, which flows in ENE to WSW direction. The drainage of Bap tehsil is essentially ephemeral and internal.

The soils of Jodhpur can be classified as red desertic, desert, sand dunes and litosol and regosols of hills. The geological set-up of the district is represented by various igneous, metamorphic and sedimentary rocks.

Ground water occurs under unconfined to semi-confined conditions in rocks of Delhi Super Group, Jodhpur sandstone, Bilara limestone, Nagaur sandstone, Lathi sandstone and unconsolidated sediments (valley fills and alluvium). These form the chief source of ground water in the district.

As per Central Ground Water Board, Western Region, the depth to (2006) in the district ranges from 2.10 to 77.94 meters below ground level (mbgl) and 0.30 to 70.88 m during pre monsoon and post monsoon, 2006, respectively.

The stage of groundwater development of the district is 197 %, however the Bap tehsil falls under the safe category for groundwater development. The net groundwater availability in the Block is 59.2212 MCM and the annual gross draft is 16.2701 MCM. The stage of groundwater development of the Block is 27.47%. It is important to mention that with the coming up of the Indira Gandhi Irrigation canal, the population of Bap block now draw water from the canal for domestic consumption and irrigation purposes. The groundwater demand has therefore further reduced in the Block.

The district experiences arid to semi-arid type of climate. Mean annual rainfall (1971-2005) of the district is 326.8 mm whereas normal rainfall (1901-1970) is lower than average rainfall and placed at 296.1 mm.

As per the Indian Meteorological Department, the mean daily maximum and minimum temperature recorded over a period of 100 years for the district is 41.4°C and 9.6°C.

A detailed ecological assessment was undertaken which focussed on identification of floral and faunal species, sensitive habitats, endangered species and forestland and estimating the bio-diversity indices of the area. Secondary information was also collected from offices of Divisional Forest and Botanical and Zoological Surveys of India for ascertaining bio-diversity aspects.

The forest species within 5-km buffer zone belong to tropical thorn forests dominated by *Prosopis cineraria*, *P. juliflora*, *Calotropis procera* and *Capparis decidua*. Large proportion of the land is covered by sandy grass, which also acts as soil binder in the sand dune landscape. The plant species

like species Acacia Senegal and Khair (*Capparis decidua*) found in the region also have medicinal values.

A total of 72 species of birds were identified or were reported to be present in the study area. Out of the 64 local resident species, 1 unclear, 3 endemic to the Indian subcontinent, 1 partially resident and altitudinal migrants, 1 winter visitor were identified. A total of 10 species of mammals were reported for the Bap region. The most common species sighted during the survey and reported by local community included Indian hare, Rats, Jackal and Chinkara. A total 12 reptile species were reportedly present in the region, out of which 6 species of snakes and 6 species of lizards were recorded. As per the Wildlife Protection Act, Desert monitor lizard and Saw-scaled Viper falls in Schedule -II, Common cat snake in Schedule -III and 9 species under Schedule -IV were recorded within the 5-km radius.

Socio economic study in the project influenced area (3 km radius) was conducted on two settlements, Bari Seer village which is approximately 2 km from the project site and Nawagaon dhani which is 3 km from the project site, both of which are under the Bari Seer Panchayat. As per the 2011 Census Data, the total population of Bari Seer Village was 1469. The total male and female population was 51.94% and 48.05% of the total population. The sex ratio was 925 females to every 1000 males. As per consultations carried out with the Sarpanch of Bari Seer Panchayat, there are approximately 400 people residing in 101 household in Nawagaon dhani. The total literate population in Bari Seer village was 47.58%. The total SC and ST population in Bari Seer village comprised 27.36% and 10.14% of the total population respectively. The consultations conducted in the village of Bari Seer and Nawagaon dhani highlighted that all the population follow Hinduism. In addition, approximately 60% of the population in Bari Seer belong to the Rajput caste, while the remaining 40% comprise population belonging to the Brahmin; lower caste like Sunuvar, Megwar, Suthar, Chamar and Sunar; Bishois and ST's like Bhil, Jogan, Banjara and others. In Nawagaon dhani, the population mainly comprises of lower caste people and form the same group that are present in Bari Seer Village. Majority of the population are engaged in the cultivation of guar, bajra and peanuts while some of the population are engaged as unskilled and semi-skilled workers like daily wage, agricultural labourers, driving, carpentry, electrician and mechanics. The patriarchy system being prominent in the area women are mainly uneducated and follow the purdah or veiled system. They do not contribute towards the family's income and they are usually engaged in household chores.

Analysis of Alternatives

The analysis of the alternatives considered for the proposed project is no project scenario; alternate location of project site, sources of electricity generation, greenhouse gas emissions, cost and reliability of power generation, statutory and policy requirements, alternate technology for the project and alternate route to transmission lines for the proposed project. The site has been selected due to the reason that it located away from major settlements, it does not fall under any reserved or protected forests, the land procured is revenue land and no environmental sensitive features are located within the vicinity of the immediate site surroundings. While land selected for the project is revenue land, there have been efforts taken up to minimise impacts, including issues related to titleholders and informal users. Avoidance of government lands that are seasonally

cultivated and used for grazing purposes has been carried out. The section on stakeholder consultation highlights this point in details.

Anticipated Environmental Impacts and Mitigation Measures

The Project is a renewable energy projects which uses solar energy for power generation. Renewable energy projects are considered to be cleaner compared to fossil fuel based energy projects. In accordance to the screening criteria of the IFC, AECOM has categorized Project as Category B. With respect to ADB classification, the project has been categorised as Category B for Environment, Category C for Involuntary Resettlement and Indigenous People.

The anticipated impacts and mitigation measures during the construction and operation phases have been provided below,

S.No.	Impacts Identified	Suggested Mitigation Measures
Construction Phase		
1	Land Use change and soil pollution	<ul style="list-style-type: none"> RSEPL has considered all aspects of siting and design prior to selection of the sites Use of existing roads for transport of man and material to the extent possible All construction material to be kept within the footprint of the area acquired. Loose construction material to be covered to avoid being carried into adjoining areas by wind. Painting of panels, switchyard structures to be undertaken after covering the land beneath with a sheet of impervious material. Fuel storage for DG sets to be done on paved surfaces
2	Waster Generation: Accumulation of construction waste; Runoff into rain water channels; Unhygienic condition for labours	<ul style="list-style-type: none"> Construction waste to be properly stored and disposed off to local municipal waste disposal site Domestic waste generated by workers to be collected and composted at site Other wastes like wood packaging material, metal jute etc. will be sold to scrap dealers. Provision of segregated toilets for male and female workers in the ratio of 1:15 and 1:10 (toilet to workers) respectively; Waste oil shall be stored on paved surfaces Empty paint containers shall be stored in earmarked area and sold to authorised vendors.
3	Water Resource: Ground water extraction; Runoff into rain water channels; Wastage of water	<ul style="list-style-type: none"> Water for construction to be arranged by the construction contractors through authorised tanker water suppliers. Domestic water requirement of the workers at site to be met through irrigation canal. Adequate arrangement for storm water management during construction period to be made to avoid sediment runoff from the site. Optimal utilization of water to be ensured throughout the construction phase Storm water flow during monsoons to be directed to the existing channels with silt traps to avoid sedimentation of the channels or the receiving water body. Curing chemicals to be used to reduce water requirement.
4	Ecology: Clearing of vegetation; Cutting of trees; Disturbance to avifauna	<ul style="list-style-type: none"> Tree cutting will be limited to those directly affecting the solar panels. Workforce to be instructed to avoid any other activity likely to

S.No.	Impacts Identified	Suggested Mitigation Measures
		<p>affect the local flora & fauna.</p> <ul style="list-style-type: none"> • High noise generating activities to restricted to daytime with proper mitigation measures • Transportation to be undertaken along identified paths
5	<p>Traffic and Transport: Arbitrary movement of vehicles leading to congestion and accidents Improper parking of vehicles used by workers and for movement of material can lead to discomfort to other users.</p>	<ul style="list-style-type: none"> • Training of drivers about road safety to be organised ; • Vehicle movement and parking within the Project premises shall be manned properly to avoid accidents • Routes for use by construction traffic to be planned to minimize impact on adjoining activities. • Dedicated path within the site for exclusive entry and exit of the construction vehicles to be provided. • Regular maintenance of vehicles to be taken up.
6	<p>Air Emissions: Fugitive dust Emissions from diesel engines and DG sets</p>	<ul style="list-style-type: none"> • Dust generating activities to be avoided in conditions of very high wind and covers to be provided for loose construction material at construction site. • It is to be ensured that construction equipment's are properly maintained to minimise smoke in the exhaust emissions. • Machinery to be turned off when not in use. • Housekeeping of the area to be maintained • The impact of emissions from vehicles bringing construction material to be minimised by proper upkeep of maintenance of vehicles, sprinkling of water on unpaved roads at the construction site and planned movement of such vehicles. • Vehicle speed to be restricted to 15km/hour at site to minimize potential for dust generation in the surroundings • Trucks /dumpers to be covered by tarpaulin sheets during off site transportation of friable construction materials and spoil • All the vehicles entering the site to be asked to have updated PUC (Pollution under control) certificate. • Generator to be optimally used with proper orientation and adequate stack height
7	<p>Noise and Vibration: Disturbance to habitations Disturbance to fauna Occupational Hazard</p>	<ul style="list-style-type: none"> • Use of inherently quiet plant and equipment as far as reasonably practicable and regular maintenance to ensure noise emissions are maintained at design levels. • Integral noise shielding to be used where practicable and fixed noise sources to be acoustically treated, for example with silencers, acoustic louvres and enclosures. • Provision of rubber paddings/ noise isolators at equipment/machinery used for construction • Construction vehicles to be well maintained and not idling equipment or vehicles when not in use. • Provision of make shift noise barriers near high noise generating equipment to minimise horizontal propagation of noise • Loud, sudden noises to be avoided wherever possible. Fixed noise sources to be located away - more than 50m inside from site boundary. • Noise prone activities will be restricted to the extent possible during night time 2200 to 0600 hours to reduce the noise impact. • Site workers working near high noise equipment use personal protective devices to minimise their exposure to high noise levels
8	<p>Health and Safety Hazards: Accidents leading to injuries</p>	<ul style="list-style-type: none"> • All the required safety measures based on individual job profile to be provided (as per working guidelines, use of personal

S.No.	Impacts Identified	Suggested Mitigation Measures
	fatalities; Occupational health hazards	<p>protective equipments like gloves, helmets, ear muffs, safety belts etc.) for construction worker through the contractors.</p> <ul style="list-style-type: none"> • Ensure effective work permit system for hot work, electrical work, working at height, working in confined space etc. • Ensure personal protective equipment for all personnel present at site are made available. • Arrangement for fire control measures • Display of phone numbers of the city/local fire services, etc. at site. • Ensure good housekeeping at the construction site to avoid slips and falls. • Dropping/lowering of construction material or tool to be restricted and undertaken only under strict supervision, if required. • Provision of proper sanitation at the labour camp.
9	Socio Economic: Increased Community Expectations; Influx of Migrant Workers	<ul style="list-style-type: none"> • The project shall avoid using community /village roads for project activities. Alternative access roads will be constructed and used; • The project will communicate and discuss with the community in a transparent manner about employment/contract and other opportunities on a regular basis and demonstrate the efforts being made to accommodate as many people as possible. The projects will ensure that there is a transparent process of giving jobs/contracts and other benefits. • Accommodation shall be ensured for a minimum space of 4-4.5 m² is allocated per person for migrant workers • Water supply through borewells and authorized water tankers- Adequate provisions of water with about 150 litres per capita per day shall be made. • Disposal of sewage through a septic tank – soak pit arrangement.
Operation Phase		
1	Waste Disposal: Domestic waste from staff quarters; Waste transformer oil and solar panels	<ul style="list-style-type: none"> • Transformer oil to be replaced and retained by the supplier of transformers • Buy back arrangement with solar panel manufacturer/supplier • Authorised supplier to be identified for disposal
2	Water Resource: Water requirement for cleaning Ground water extraction Water logging	<ul style="list-style-type: none"> • Avoid wastage of water during washing of panels • Adequate storm water drainage
3	Ecology: Distraction to avifauna; Routine clearance	<ul style="list-style-type: none"> • Solar panels to have an anti-reflective coating to minimize the light reflecting off of the panels. • Clearing of vegetation to be limited to removal of undergrowth or shrubs at the plant site
4	Health and Safety: Electromagnetic field Accidents leading to injury/fatality	<ul style="list-style-type: none"> • EM F generated to be of weak in intensity • Personal protective equipment to be provided for all personnel at road construction and transmission line.
5	Social: Impacts on Local Economy; Upgrades to Local Infrastructure	<ul style="list-style-type: none"> • In case of development of local enterprise in the vicinity of the project, these should be encouraged through sourcing opportunities. • Collaborate with local govt. and industry for any community development programs to share the resources and cut cost;

S.No.	Impacts Identified	Suggested Mitigation Measures
		<ul style="list-style-type: none"> Avoid duplicating existing infrastructure and emphasize on improving or upgrading the quality and quantity of the same.
Decommissioning Phase		
1	Impacts due to disposal of panels, contamination of soil, generation of wastes and associated health and safety risks	<ul style="list-style-type: none"> The proponent shall inform the workers and local community about the duration of work; The old, redundant panels can be disposed of (at a registered disposal facilities designated for this purpose); The workers shall be clearly informed about the expected schedule and completion of each activity; The reduction in workers shall be done based only on the requirement of his/her skill set and not guided by any other factor; All waste generated from demobilization phase shall be collected and disposed off at the nearest municipal disposal site; and All necessary Personal Protection Equipment (PPE) shall be used by the workers during demolition work.

Environmental Management Plan

The proposed project is being developed by RSEPL which is a subsidiary of ASEPL. ASEPL Management has developed an Environment and Social Management System (ESMS) Manual which covers Quality systems, Environment, Health & Safety Management Systems and Social Management Systems.

The ESMS Manual has been developed in compliance with the requirements of International Finance Corporation's (IFC) Performance Standard 2012 and ISO 14001: 2004 and is being amended to include requirements of ADB's Safeguard Policy Statement, 2009 as well. The ESMS Manual developed by ASEPL is a three tier document with the policies being the umbrella document which defines the commitment of the management for addressal of EHS and Social issues associated with the operations, apex manual which lays the objectives, programs, resource management, product realization, measurement, analysis and improvements. Operational Control Procedures and (instructional) checklists are defined as second and third tier document. The Management systems has been developed to provide generic guidelines to all future and present solar projects of ASEPL and its subsidiaries, irrespective of specific site or project conditions.

RSEPL shall thus ensure that the ESMP is implemented by its contractors through contractual arrangements. In addition, regular community engagement and disclosure is to be undertaken by RSEPL. A Grievance Redressal Mechanism would be developed and disclosed to the community as well.

In order to implement the ESMP, the on-site team will develop a time-bound and action-oriented Environmental and Social Action Plan to implement the mitigation measures provided for each of the identified environmental and social impacts. This ESMP will have to be monitored on a regular basis, quarterly or half-yearly and all outcomes would need to be audited in accordance with existing EHS commitments. Through the process of inspection, audit, and monitoring RSEPL shall ensure that all the contractors comply with the requirements of conditions for all applicable permits including suggested action plans. The inspections and audits shall be done by RSEPL/ASEPL's trained team and external agencies/experts. The entire process of inspections and audits will be documented.

1. Introduction

The ACME Group has been a pioneer in the development of green technology solutions that are environmental friendly, energy efficient, cost effective and capable of delivering a quick return on investment. The Company has a business focus on 3E's i.e. energy generation, energy conservation and energy management.

ACME is actively pursuing alternative energy initiatives in solar sector providing solutions for both thermal and photovoltaic technologies in India and aims to be at the forefront of the solar revolution in the country. ACME has a proven track record in developing, constructing and operating large scale power projects. It has pioneered solar power development in India and has commissioned the first solar thermal power project based on Tower technology in Asia.

ACME Solar Energy Private Limited (hereafter referred to as 'ASEPL'), a joint venture company between ACME Cleantech Solutions Limited, EDF Energies Nouvelles and EREN is committed to setting up large grid – connected solar power plants across India, with the aim to deliver continuous power across India. ACME's solar portfolio of 67.5 MW includes 15 MW Solar PV in Gujarat (commissioned), 25 MW Solar PV in Madhya Pradesh (commissioned), 2.5 MW Solar Thermal in Rajasthan (commissioned) and 25 MW Solar PV in Odisha, which is under commissioning.

ASEPL has been selected for developing 80 MW in the non DCR (Domestic Content Requirement) category and for 20 MW in the DCR category. The 100 MW solar power project is to be developed by tranches of 20 MW through five special-purpose vehicles (SPV) wholly owned by ASEPL. Ranji Solar Energy Private Limited (hereafter referred to as 'RSEPL') is the SPV responsible for development and operation of 20 MW capacity solar power project (hereafter referred to as 'Project') in Bap tehsil, Jodhpur district, Rajasthan, India. The project is proposed in Bari Seer village, Bap tehsil, Jodhpur district, Rajasthan.

ASEPL is looking to secure financing from IFC and ADB (the Lenders) for a max US\$ [80] million [16]-year tenor loan and intends to carry out an Environmental and Social Impact Assessment (ESIA) as per the requirement of International Finance Corporation's (IFC) Performance Standards and IFC's Environment, Health and Safety guidelines and ADB Safeguard Policy Statement (SPS) (2009). ACME Solar Energy Private Limited has engaged AECOM India Private Limited to undertake the ESIA study for the proposed project. This ESIA report has been prepared on the basis of a reconnaissance survey, baseline noise monitoring, primary ecological survey, data analysis and consultations and discussions with relevant stakeholders.

1.1 Project Background

The Jawaharlal Nehru National Solar Mission was launched on the 11th January, 2010 has set the ambitious target of deploying 20,000 MW of grid connected solar power by the year 2022 and is aimed at reducing the cost of solar power generation in the country. In the Phase I of the Mission, 950 MW solar power projects were selected in two batches (batch-I during 2010-11 and batch-II during 2011-12). With the successful implementation of the Phase I of the Mission, JNNSM has launched the Phase II of the Mission with Solar Energy Corporation of India (SECI) as the nodal agency, and envisages cumulative installation of 10,000 MW utility scale and 1,000 MW off-grid solar power projects.

ASEPL has been selected for 80MW in the non DCR category and for 20MW in the DCR category, by Solar Energy Corporation of India (SECI), under batch 1 of Phase 2 of the Jawaharlal Nehru Solar Mission. RSEPL is the SPV responsible for development and operation of 20 MW capacity solar power project in the DCR category in Bap tehsil, Jodhpur district, Rajasthan, India.

The project will be based on Solar Photo Voltaic technology using Tandem Structure (with Amorphous & Microcrystalline Silicon) and Thin Film PV modules for power generation. The project will spread across an area of 275 bigha and will comprise of revenue government land.

1.2 Purpose and Scope of Study

This study is being undertaken as per the requirements of the IFC Performance Standards to understand the environmental and social compliance of Project in accordance to the requirements of the IFC's Performance Standards. The scope of work includes:

- Reconnaissance survey and primary site assessment to collect and review baseline environmental and social conditions;
- Collection of additional secondary environmental, social and demographic information;
- Identification and review of the applicable standards and identification of key issues;
- Assessment of potential environment and social impacts of the project and its components;
- Suggesting mitigation measures and plans to maximize project benefits in consultation with affected communities and
- Preparation of Environmental and Social Action Plan (ESAP) based on the ESIA and suggest procedures for mitigation and monitoring of environment and social impacts on an ongoing basis as well as to identify any requirements that may occur subsequent to the completion of the ESIA.

1.3 Approach and Methodology

The approach and methodology applied for the execution of the impact assessment study is as provided:

- The relevant project document and detailed project report was reviewed to understand the project requirements
- Regulatory review was undertaken to understand the applicable, local and national legislation and regulatory frameworks.
- A detailed social and environmental assessment of site and surround areas was undertaken through:
 - Reconnaissance surveys to understand site specific issues
 - Discussions with the local community and identification key issues;
 - Collation of secondary information on social aspect of the site, supplemented by consultations with the local communities to understand community perception with regard to the project and its activities. The approach included:
 - Stakeholder mapping and Identification;
 - Focused group consultations with selected land losers and other impacted groups;
 - Field surveys and data compilation;

- Group/Community Consultations: Group meetings and consultations with local and community representatives; and
- Assessment of impacts based on understanding of the project activities and existing baseline status;
- Preparation of Environment and Social Management Plan.

1.4 Agencies contacted

The following agencies were contacted during the course of the study:

- ACME Solar Energy Private Limited
- Forest Department
- Indian Meteorological Department
- Survey of India
- Census of India

1.5 Limitations

The study undertaken is structured around the project information as provided by the project proponent, any significant activities may result in variation of outcome.

Professional judgement and subjective interpretation of facts has been applied for interpretation of various aspects. All information and inferences presented herein are based on the details currently available as per the scope of work, information provided by the client or its representative, existing secondary data, budget and schedule.

1.6 Layout of the Report

The remaining sections of the report include the following:

- Section 2: Project description;
- Section 3: Applicable Environmental and Social Legislative Framework;
- Section 4: Social and Environment baseline;
- Section 5: Analysis of Alternatives;
- Section 6: Environmental and Social Impact Assessment; and
- Section 7: Environmental and Social Management Plan

Annexures

- Annexure I - List of Solar Power Projects in Bap Tehsil
- Annexure II – Allotment Letter from District Collector confirming lease of land
- Annexure III – Social Questionnaire
- Annexure IV – No Objection Certificate from Bari Seer Panchayat
- Annexure V - Attendance Sheet of Social Consultations
- Annexure VI – Location of the 100 MW solar projects provided by ASEPL
- Annexure VII – ASEPL Base Map showing GPS Tracking
- Annexure VIII – Single Line Diagram (AC and DC Side)

2. Project Description

This section of the report provides a description of the site settings and project components along with other associated facilities. This section also elaborates on the various project phases along with its implementation mechanism and schedule.

2.1 Site Description

2.1.1 Site Location

The site for the proposed project falls in Bap Tehsil, Jodhpur district. Jodhpur district is one of the largest districts of Rajasthan state and is located in the western region of the state. The district is bound by Nagaur district in East, Jaisalmer district in west, Bikaner district in North and Barmer as well as Pali districts in the South. The length of the district from North to South and from East to West is about 197 km and 208 km. respectively. Bap tehsil is located in the northern region of Jodhpur district.

The site selected comprises of land from Bari Seer village of Bap Tehsil and has been identified based on the solar irradiation data, geotechnical investigations, ease of land procurement, benefit and losses due to irradiation, shading analysis and the distance from main substation, line construction length and complexity required for line construction. The nearest highway is the National Highway – 15, which connects Samakhiali in Gujarat with Pathankot in Punjab, at a distance of about 1 km from the site. The rail and air connectivity to the site is through Bap station and Jodhpur airport. The geographic coordinates of the proposed five sites are presented in Table 2-1.

Table 2-1: Geographic Co-ordinates of site

S. No.	Latitude	Longitude
1	27° 29'11"N	72° 23'44"N
2	27° 29'17"N	72° 24'20"N
3	27° 29'28"N	72° 24'21"N
4	27° 29'36"N	72° 24'21"N
5	27° 30'07"N	72° 24'11"N
6	27° 29'58"N	72° 24'22"N
7	27° 26'22"N	70° 11'30"N
8	27° 29'32"N	72° 24'53"N
9	27° 29'55"N	72° 25'00"N
10	27° 30'34"N	72° 25'21"N
11	27° 30'19"N	72° 25'27"N
12	27° 29'51"N	72° 25'29"N
13	27° 29'49"N	72° 25'28"N
Reference Point		
1	27° 29'35"N	72° 22'59"N

2.1.2 Site Settings

The project area comprises of revenue land from Bari Seer village. The project area is characterised by rural setup and flat barren land. The project area has a gentle slope and has an average elevation of about 207 m above mean sea level. As per the revenue records, the land use of the site is

classified as uncultivable land and includes Khasra No. 124. The site comprises of scanty vegetation and is not used by the community for grazing or any other activities. During the site walkthrough no encroachments were observed in the Project area and the same was verified during consultations with the Sarpanch (Village Head) and the community.

The nearest settlements include Nawagaon and Bari Seer settlement which are located at a distance of about 2 km and 3 km from the site respectively. The Indira Gandhi irrigation canal, which supplies water for drinking and other domestic use is located in proximity of the Project site. No water bodies are located in the project area or its surroundings. A catchment area, existing school, agricultural land and water body within the vicinity of the proposed site have been excluded by the project proponent from the project area. No wild life protection or ecological sensitive area is located within 5 km radius of the Project area.



Photo 2-1 : View of Project Site

2.2 Other Solar Power Projects in the Region

Based on desktop research and discussions with client, it is estimated that about 300 MW of solar power projects are proposed in the Bari Seer Region. Details of some of the existing and proposed solar power projects in the region are provided below:

- 50 MW solar power plant – M/s Today Homes
- 30 MW solar power plant – M/s Solar Direct

Further details have been provided in Annexure I.

2.3 Plant Overview

The proposed 20 MW solar power project will be based on Solar Photo Voltaic technology using Tandem Structure (with Amorphous & Microcrystalline Silicon) and Thin Film PV modules for power generation. The salient features of the project components have been presented in Table 2-2 and the details have been provided in subsequent sections.

Table 2-2 : Technical Specifications of SPV modules.

Parameter	Description	
Technology	Solar Photo Voltaic (Tandem Structure-12.7296 MWp & Thin Film CdTe-11.2266 MWp)	
PV module type	SHARP SOLARTANDEM STRUCTURE	FIRST SOLAR THIN FILM (CdTe)
Module peak power(Wp)	130	90
Modules per string	15	15
Strings per Inverter	408	594
Modules per Mounting structure	60	90
Modules in plant	97920	124740
No. of Inverters	16	14
No. of transformers with Capacity & Voltage Ratio	4 Nos – 3.00 MVA 4x0.370/11 kV	3 Nos – 3.00 MVA 4x0.370/11 kV & 1 No – 1.50 MVA 4x0.370/11 kV
Mounting Arrangement		
Mounting	Fixed Tilt	Fixed Tilt
Surface azimuth angle of PV Module	180°	180°
Tilt angle(slope) of PV Module	21°	21°
Annual Energy Generation (MU's)	22.830	20.527

Source: Detailed Project Report

2.3.1 Plant Layout

The plant will have fixed type structure facing to south with a tilt angle of 21° from horizontal to optimize the power output. The modules will be mounted on structures of y type fabricated form hot dip galvanized steel sections. The design of structure will be tested in order to ensure that it can withstand forces likely to be encountered during highest speed level in this region (approximately 47m/s). Each structure will be earthed to the earthing network laid in field through 8 mm Galvanised Iron (G.I.) wire at 2 points.

All the series connected modules will be taken to string combiner box using 4/6 mm² copper cables which will be tied with structure and will be laid inside the conduit when passing through the underground trench for protection purpose. A suitable Series-Parallel combination will be deployed in order to achieve required voltage and current output. The SRCB (String Combiner Box) for the Tandem Structure plots will use 20 A fuses for each combined string; 4 strings will be combined using a wire harness and will be taken to the String combiner and monitoring box.

The SRCB for Thin film will use 25 A fuses for each combined string; 6 strings will be combined using a wire harness and will be taken to the String combiner and monitoring box. SRCB for both, Tandem Structure and thin film will be of 16 channels each. The power will then be fed to inverter and after converting into AC it will be fed to 3.00 MVA 4x0.370/ 11 kV transformers for stepping up to 11 kV level. The Inverter used will be grid tie central solar inverter with efficiency > 98.5% and with the entire feature for synchronisation and isolation and delivering solar power to grid.

The central inverter can be of outdoor type or indoor type. In case of indoor type, the inverter room will be designed in such a manner considering the protection from weather and at the same time proper ventilation of hot air generated by inverter during operation. The necessary fire protection and auxiliary supply will be provided at inverter level. The information of strings that is current, voltage, fuse status will be provided up to inverter and from inverter room both data of inverter and SRCB will be combined and common data will be taken to main control room on suitable protocol.

The main power after stepping-up to 11 kV will be collected at main control room and will be stepped-up to 132 kV through 2 nos. 50/60 MVA outdoor transformers. The proposed plant has been configured with an installed PV module capacity of 23.956MW peak (MWp) delivering approximately 20 MW nominal AC after inverter. A single plot comprises of four inverters. The complete plant consists of 7 plots, each with 4 inverters and 1 plot with 2 inverters.

The single line diagrams – DC side and AC side are presented in **Annexure VIII**.

2.3.1.1 Solar Photovoltaic Technology

The technology selected for the proposed Project comprises of Amorphous and Microcrystalline Silicon and Thin Film PV modules. The details have been presented in Table 2-3.

Table 2-3: Proposed Solar Photo Voltaic Technology

Technology	Manufacturer and Model	Specific production (kWh/ kWp)	Performance ratio (%)	Capacity Utilization Factor (%)
Tandem Structure	SHARP SOLAR 130	1793	80.75	24.43
Thin Film CdTe	First Solar FS390	1829	82.33	25.11
Combined		1810	81.49	24.74

2.3.1.2 Module Mounting System

A fixed module mounting system of 21° inclination has been chosen for the PV plant. The mounting structures will comply with appropriate industrial standards and will be capable of withstanding on-site loading and climatic conditions.

- **Tandem Structure** - The modules will be arranged in landscape orientation in 4 rows. 60 modules will be assembled per support structure. The total number of mounting structures required would be 1632 for the 12.7296 MWp plant.

- **Thin Film** - The modules will be arranged in landscape orientation in 6 rows. 90 modules will be assembled per support structure. The total number of mounting structures required would be 1386 for the 11.2266 MWp plant.

2.3.1.3 Inverters

The DC electricity generated by the modules will be converted to AC in the inverters. The proposed project will comprise of HITACHI make PCS-670 kW transformer less inverters. These are three phase inverters, which are clustered in groups of four for a single plot. The Single Line Diagram (AC and DC Side) has been provided in **Annexure VIII**.

2.3.1.4 Transformers

The low voltage station will comprise of 0.370-0.370-0.370-0.370/ 11 kV, 3000 kVA, 50 Hz ONAN type step-up transformers suitable for continuous operation. The transformers have been selected to operate at maximum efficiency and to be rated for a maximum temperature rise of 55°C with a daily average ambient temperature of 40°C. The transformer cores will be constructed from CRGO electrical grade steel sheet laminations. Winding conductor material should be electrolytic grade copper, free from any scales with no possibility of shrinkages. The core and copper losses will be minimal.

2.3.1.5 High Voltage Station

The high voltage station will come up at the solar plant premises and will be owned by ACME. It will comprise of two 11/ 132 kV, 50/ 60 MVA, 50 Hz ONAN / ONAF type step up transformers and a switchyard.

2.3.1.6 Earthing System

There will be dedicated earthing stations for transformer, MV switch boards, PLC panels and high voltage panels. Maintenance free earthing stations have been considered for the designs. All the modules will be appropriately earthed in accordance to the NEC. Grounding of the modules may be done as recommended by manufacturer.

2.3.1.7 Lightning Protection

The entire PV plant and the electrical room will be protected from lightning. The protection system will be based on early streamer emission lightning conductor air terminals. The air terminals will provide an umbrella protection against direct lightning strike covering a radial distance of 100 m. The air terminal will be capable of handling multiple strikes of lightning current and should be maintenance free after installation. The lightning arrester will be installed in the MV substation room with a mast height of 5 m. These air terminals will be connected to respective earthing stations, and an earthing grid will be formed connecting all the earthing stations through the required galvanised iron tapes.

The earthing stations for the lightning discharges will be provided with test links of phosphorus bronze and located at 150 mm above ground level in an easily accessible position for testing.

2.4 Current Status

The proposed project is in the planning stages. The land for the project has been identified and an Allotment Letter from the District Collector, Jodhpur Division confirming the transfer of 275 bigha (44.15 hectares) land on lease has been obtained. The formal coordinates of the project area by the State Revenue Department after the issuance of Allotment Letter is in the process of being undertaken. The construction contractor, ACME Cleantech Solutions has been identified to commence the construction activities at site.

2.5 Land Requirement

The proposed 20 MW project will be developed in 275 bigha (44.15 hectares) of land falling under Khasra no. 124 as per the revenue records. The land for the project comprises of revenue land that has been classified as 'Gair Mumkim Raida land' or 'uncultivable land' as per the revenue records. The power from the Project will be evacuated through two double circuit 132 kV lines and only the right of way for the transmission line will be procured. The access roads to the site will be about 4-5 km long and will also pass through revenue land only. No private land is to be procured for the Project. The allotment letter to RSEPL has been obtained from the District Collector; Jodhpur Division dated 17th October 2014.

A No Objection Certificate for the project has also been obtained from the Sarpanch of Bari Seer Panchayat dated 20th September 2014. The No Objection Certificate states that the land for the project has been classified as revenue land and is not used by the community for any purpose.

2.6 Power Purchase Agreement

The Power Purchase Agreement (PPA) has been executed between RSEPL & SECI on 28th March, 2014. Key highlights of the PPA are summarized as below.

- Validity of the PPA shall be 25 years from the date of commercial operation. As per the terms of PPA, RSEPL have to commission the project within 13 months from the date of PPA i.e. 28th March, 2014 failing which project developer is liable to be pay liquidity damages of INR 1, 00, 000/day/MW after 3 months of grace period.
- Power from the solar PV plant shall be evacuated at 132 kV voltage levels, with the point of interconnection as prescribed by SECI.
- Tariff rate as agreed upon shall be INR 5.45/kWh for 25 years from the date of commercial operation. Metering shall be done jointly by the project developer and SECI on first date of every month leading in transparent administration.
- Benefits of the Clean Development Mechanism (CDM) will be shared between the power producer and SECI. However, the power producer will enjoy full benefits of the Clean Development Mechanism (CDM) in the first year, after which its share will reduce by 10% every year till both parties enjoy equal benefits (50:50).

2.7 Implementation Schedule

The scheduled date of the commissioning of the project is estimated at 13 months from the date of the PPA. First level of planning for project implementation has been done. The implementation schedule is presented in Table 2-4.

Table 2-4 : Implementation Schedule for the proposed plant

Project Implementation Schedule - 20 MW Solar PV Project SECI Rajasthan																		
S.No.	Activity	Duration	Start Date	End Date	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	
1	Letter of Acceptance/NTP/Zero date	0		28-Mar-14														
2	Land acquisition & Possession	225	28-Mar-14	8-Nov-14	[Yellow bar from Apr-14 to Nov-14]													
3	Financial Closure	55	14-Sep-14	8-Nov-14														
4	Connectivity Agreement	55	14-Sep-14	8-Nov-14														
5	Land Survey & Land Development	35	24-Oct-14	28-Nov-14														
5(I)	Toppographical and Contour Survey	15	24-Oct-14	8-Nov-14														
5(II)	Soil Investigation	20	24-Oct-14	13-Nov-14														
5(III)	Earth Restivity Test	15	13-Nov-14	28-Nov-14														
5(IV)	Land Development	20	8-Nov-14	28-Nov-14														
6	Detailed Engineering for Major Jobs	62	14-Oct-14	15-Dec-14														
7	Procurment	60	1-Oct-14	30-Nov-14														
7(i)	Module	21	1-Oct-14	22-Oct-14														
7(II)	Inverter	54	1-Oct-14	24-Nov-14														
7(III)	AC Side EPC	55	1-Oct-14	25-Nov-14														
	DC Side EPC	60	1-Oct-14	30-Nov-14														
7(IV)	Trnsmisssion Line	45	8-Oct-14	22-Nov-14														
8	Supply of Major Items like Solar Modules, Inverters	76	15-Dec-14	1-Mar-15														
8(I)	MMS Structure	60	15-Dec-14	13-Feb-15														
8(II)	HT Cables	45	22-Dec-14	5-Feb-15														
8(III)	Switchyard Materials	60	27-Dec-14	20-Feb-15														
8(IV)	DC Cables etc. other material	45	30-Dec-14	13-Feb-15														
8(V)	String Combiner Boxes	30	30-Dec-14	29-Jan-15														
8(VI)	Transmission Line Materials supuly	60	22-Dec-14	20-Feb-15														
8(VII)	Earthing & Other BOP items	45	22-Dec-14	5-Feb-15														
8(VIII)	Inverters	50	8-Jan-15	27-Feb-15														
8(IX)	Power Transformer& Inverter Transformer	30	24-Jan-15	23-Feb-15														
8(X)	Modules	45	15-Jan-15	1-Mar-15														
9	Erection of Major Items	101	1-Dec-14	12-Mar-15														
9(I)	Site Infratructure/Fencing	60	1-Dec-14	30-Jan-15														
9(II)	MMS Civil Foundation & Control room	55	10-Dec-14	3-Feb-15														
9(III)	Module Mounting Structures Erection	60	25-Dec-14	23-Feb-15														
9(IX)	Modules Installations	48	23-Jan-15	12-Mar-15														
9(X)	DC Side Cable laying and Other installations	50	9-Jan-15	28-Feb-15														
9(VI)	Inverters Installations	45	15-Jan-15	1-Mar-15														
9(VII)	Earthing & Other BOS Items Installations	70	25-Dec-14	5-Mar-15														
9(VIII)	Transmission Line work	90	10-Dec-14	10-Mar-15														
9(IX)	132KV Switchyard Work	90	10-Dec-14	10-Mar-15														
10	Testing and Commissioning	35	7-Feb-15	14-Mar-15														
10(I)	System Testing & Commissioning	30	7-Feb-15	9-Mar-15														
11	Synchronization with Grid System	5	9-Mar-15	14-Mar-15														
11	Proposed Commercial Operation date (COD)	1	14-Mar-15	15-Mar-15														

2.8 Construction Activities

2.8.1 Site Development

The site development activities for the proposed project will entail the following:

- soil investigations;
- site surveys;
- site levelling;
- construction of access roads;
- fencing of site;
- laying of foundations;

The land for the proposed site is fairly levelled and no major cutting and filling will be required. The detailed design of foundations will be carried out after detailed geological analysis.

2.8.2 Water requirement

In the proposed plant almost all the buildings will be prefab type, structures will be prefab type and all the equipment will be packed and shifted in completely assembled or partially assembled form. The installation of these equipments does not require water in any form. Very small quantity of construction water will be required for piling and foundation work which will be sourced from authorised tankers. It is estimated that about 100-150 m³ of water will be required for the entire construction phase.

2.8.3 Construction Labour

During construction stage, the average labour demand for the proposed project is estimated to be about 60-70 workers. The peak labour requirement for the project will be about 100 persons. The unskilled labour for the project which will constitute 70-80% of the total manpower required will be hired locally. Only skilled labour and security staff will involve migrant labour. The labour camps for the Project will be provided within the site premises and will comprise of porta cabins. Adequate sanitation facilities will be provided for the labour.

The security staff will be trained adequately in the use of force (and where applicable, firearms) and appropriate conduct toward workers and the local community, and require them to act within the applicable law.

2.8.4 Construction Power

The construction power will be provided at site location from 200 kVA, 11 kV HV feeders passing nearby plant area. Ranji Solar Energy Pvt. Ltd. will apply for construction power to DISCOM after possession of land and power shall be provided after preliminary formalities and deposition of required fee.

2.9 Operation and Maintenance

The operation of solar power plant is relatively simple and restricted to daylight hours. With automated functions of inverter and switchyard controllers, the maintenance will be mostly oriented towards better up keep and monitoring of overall performance of the system. The solar Photovoltaic system requires the least maintenance among all power generation facility due to the absence of fuel, intense heat, rotating machinery and waste disposal. However, keeping the Photovoltaic panels in good condition, monitoring and correcting faults in the connected equipment and cabling are still required in order to get maximum energy from the plant. The maintenance functions of a typical solar PV power plant can be categorised as given.

- Scheduled or preventative maintenance – Planned in advance and aimed at preventing faults from occurring, as well as keeping the plant operating at its optimum level.
- Unscheduled maintenance – carried out in response to failures

2.9.1 Scheduled Maintenance Activities

The Scheduled Maintenance includes the following activities:

- **Module Cleaning** – The module cleaning will depend on the site location, weather patterns, availability of water & cleaning material, lowering of soiling loss.
- **Junction or String Combiner Box** – periodic checking of the junction boxes and string combiner boxes for water ingress, dirt or dust accumulation and integrity of the connections to avoid corrosion & short circuit.
- **Inverter Servicing** – Inverter faults are the most common cause of system downtime in PV power plants and therefore, the scheduled maintenance of inverters should be treated as a centrally important part of the O&M strategy. The preventive maintenance of inverters includes visual inspection, cleaning/replacing cooling fan filters, removal of dust from electronic components and tightening of any loose connections.

Other activities will include testing of structural integrity, balance of plant maintenance and vegetation controls.

2.9.2 Unscheduled Maintenance:

Unscheduled maintenance activities will include tasks undertaken in response of failures. The key parameter when considering unscheduled maintenance will be diagnosis, speed of response and repair time. Although the shortest possible response will be preferable for increasing energy yield, this will be balanced against the likely increased contractual costs of shorter response times.

2.9.3 Resource Requirements

2.9.3.1 Water Requirements

The water requirements for the plant will be predominantly for washing of solar PV modules with water periodically to remove bird droppings, dust and other dirt and domestic water consumption. The domestic water consumption for the Project is estimated to be 2-3 m³/day and will be met

through the canal water which is also available for domestic water demands. With a cleaning schedule of twice/thrice a month, it is estimated that approximately 35 - 40 m³ per day of water will be required for cleaning purpose. The water requirements for the project will be met through groundwater using bore wells. The project area falls in Bap tehsil which forms a part of Bap Block of Jodhpur District.

As per the assessment of Central Ground Water Board for Jodhpur District, the stage of groundwater development of the district is 197 %. The Bap block has witnessed a maximum rise of 1.59m in ground water levels and a rise of 0.01m as per decadal trend. The net groundwater availability in the Block is 59.2212 MCM and the annual gross draft is 16.2701 MCM. The above mentioned data asserts that the Bap Block falls under the safe category for groundwater development. The stage of groundwater development of the Block is 27.47%. It is important to mention that with the coming up of the Indira Gandhi Irrigation canal, the population of Bap block now draw water from the canal for domestic consumption and irrigation purposes. The groundwater demand has therefore further reduced in the Block. Since the plant is based on an arid land, water harvesting and water conservation is recommended to be practiced at the plant site. Channels and culverts are required to be constructed to harvest rainwater in the plant site, which will eventually help in recharging of ground water.

Considering the development of other solar power projects in the region and development of RIICO industrial area, it is likely that an industrial supply line will be laid parallel to the existing Indira Gandhi irrigation canal. ACME group, along with other solar power project developers in the region intends to submit an application for providing water supply from the industrial line to the solar power projects in the region to reduce the stress on the groundwater resources of the region.

2.9.3.2 Man Power Deployment

The manpower requirement for the operation phase of the Project has been estimated to be 6 engineers, 8 technicians and 20-30 staff for cleaning of solar panels. The organisation structure for the Project comprises of a Plant Head responsible for the day-to-day operations of the plant. The Plant Head will be positioned at site and will directly report to the Deputy General Manager. He will be assisted by shift in charge and maintenance technicians. The day-to-day operation / functions like planning the routine maintenance, safety and environmental control will be placed under the care of the shift in charges.

2.9.3.3 Training

It will be necessary to have the operation and maintenance personnel to have requisite qualifications, experience and skill. The Plant Manager will be selected as an experienced person drawn from similar industry as far as possible. Adequate training will be provided to operation and maintenance personnel at the Photovoltaic power plant. Persons with mandatory competency certificate holder for key electrical functions will be put in charge of the relevant operations. Recruitment of persons will be planned in such a way that the shift in charges and maintenance technician are available at the start of commissioning after training.

2.10 Associated facilities

2.10.1 Power Evacuation

The power generated from the proposed plant will be stepped up to 132 KV level using two 11/132 kV, 50/60 MVA (ONAN/ONAF), OUTDOOR type transformers located in the 132 kV switchyard within the plant premises. Two 132 kV lines from the transformers will form into a single bus and power will be transferred through double circuit line to the 132 kV Bari Sær Grid Substation. The transmission line will pass through revenue land and only the right of way will be leased for the transmission line.

2.10.2 Access Roads

Access roads of about 4-5 km length will be developed to provide connectivity to the site from the National Highway – 15. The road alignment will also pass through revenue land and will be taken on lease from the Government.

3. Applicable Legal Framework

This section highlights the environmental and social regulations applicable to the proposed solar power project. The section broadly focuses on the institutional framework, applicable environment, health and safety and social legislative, IFC's Performance Standards and ADB's Safeguard Policy Statement requirements relevant to the proposed Project.

3.1 Enforcement Agencies

A brief description of the relevant enforcement agencies with respect to the institutional framework is described in the following sub-sections.

3.1.1 Ministry of Environment, Forests and Climate Change

The Ministry of Environment, Forests and Climate Change (MoEFCC) is the nodal agency in the administrative structure of the Central Government for the planning, promotion, co-ordination and overseeing the implementation of India's environmental and forestry policies and programmes.

The primary concerns of the Ministry are implementation of policies and programmes relating to conservation of the country's natural resources including its lakes and rivers, its biodiversity, forests and wildlife, ensuring the welfare of animals, and the prevention and abatement of pollution. While implementing these policies and programmes, the Ministry is guided by the principle of sustainable development and enhancement of human well-being.

The specific functions of MoEFCC are as follows:

- Environmental policy planning;
- Effective implementation of legislation;
- Monitoring and control of pollution;
- Environmental Clearances for industrial and development projects covered under EIA notification;
- Promotion of environmental education, training and awareness; and
- Forest conservation, development, and wildlife protection.

3.1.2 Central Pollution Control Board (CPCB)

The Central Pollution Control Board (CPCB) was established in September 1974, for the purpose of implementing provisions of the Water (Prevention and Control of Pollution) Act, 1974. The executive responsibilities for the industrial pollution prevention and control are primarily executed by the CPCB at the Central level, which is a statutory body, attached to the MoEFCC. CPCB works towards control of water, air and noise pollution, land degradation and hazardous substances and waste management. The specific functions of CPCB are as follows:

- Prevent pollution of streams and wells;
- Advise the Central Government on matters concerning prevention, control and abatement of water and air pollution;
- Co-ordinate the activities of SPCB's and provide them with technical and research assistance;

- Establish and keep under review quality standards for surface and groundwater and for air quality;
- Planning and execution of national programme for the prevention, control and abatement of pollution through the Water and Air Acts; and
- The CPCB is responsible for the overall implementation and monitoring of air and water pollution control under the Water Act, 1974, and the Air Act, 1981.

3.1.3 Rajasthan Pollution Control Board (RPCB)

Rajasthan Pollution Control Board (RPCB) implements various environmental legislations in the state of Rajasthan, mainly including Water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981, Water (Cess) Act, 1977 and some of the provisions under Environmental (Protection) Act, 1986 and the rules framed there under like, Biomedical Waste (M&H) Rules, 1998, Hazardous Waste (M&H) Rules, 2000, Municipal Solid Waste Rules, 2000. Some of the important functions of RPCB are:

- To plan comprehensive program for the prevention, control or abatement of pollution and secure executions thereof,
- To collect and disseminate information relating to pollution and the prevention, control or abatement thereof,
- To inspect sewage or trade effluent treatment and disposal facilities, and air pollution control systems and to review plans, specification or any other data relating to the treatment plants, disposal systems and air pollution control systems in connection with the consent granted,
- Supporting and encouraging the developments in the fields of pollution control, waste recycle reuse and eco-friendly practices.
- To educate and guide the entrepreneurs in improving environment by suggesting appropriate pollution control technologies and techniques
- Creation of public awareness about the clean and healthy environment and attending the public complaints regarding pollution

3.1.4 Rajasthan Forests Department

The Forest Department is responsible for the management of forests and wildlife in the state of Rajasthan. It implements three major acts- Rajasthan Forest Act 1953, Indian Wildlife (Protection) Act 1972 and Forest (Conservation) Act 1980. The various activities undertaken by the department include Forest Protection, Forest Development Works, Wildlife Management, Soil and Moisture Conservation Works, Forest Planning, Harvesting, Ecotourism activities, Research, Extension and Training.

3.1.5 Petroleum and Explosives Safety Organisation (PESO)

The PESO is under the Department of Industrial Policy & Promotion, Ministry of Commerce and Industry, Government of India. The Chief Controller of explosives is responsible to deal with provisions of

- The Explosive Act 1884 and Rules, 1983,
- The Petroleum Act 1934 and the Rules 2002,
- The Static and Mobile pressure vessels {Unfired} Rules, 1981 and amendment 2000, 2004;
- Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 and amendment 2000

3.1.6 Director Industrial Safety and Health

The main objective of the Director, Industrial Safety and Health is to ensure safety, health, welfare and working conditions of workers working in factories and in construction works by effectively enforcing the provisions of the Factories Act, the Building & Other Construction Workers Act and others labour legislations. It is also to ensure the protection of rights of workers and to redress their grievances.

3.2 Applicable Environmental and Social Laws, Regulations and Policies

The relevant acts and Rules pertaining to the project is summarised in section below.

3.2.1 Environmental Laws, Regulations and Policies

The Environment (Protection) Act; 1986 and Environment (Protection) Rules 1986 and amendments

The Environment (Protection) Act, 1986 has been enacted to provide for the protection and improvement of environment by preparation of manuals, codes or guides relating to prevention, control and abatement of environment pollution. This Act is an umbrella legislation that provides a single focus for the protection of the environment and seeks to plug the loopholes of earlier legislation relating to the environment. The Act further makes it mandatory that discharges from any industry or operation are not in excess of the standards and hazardous substances handling comply with the procedural safeguards. The salient provisions of the Act include but not limited to the following:

- Restrict or prohibit industries, operations or processes in specified areas;
- Undertake environmental impact assessment for certain categories of industries to inform the decision making in approval of new or expansion projects;
- Restrict or prohibit handling of hazardous substances in specified areas;
- Protect and improve the quality of the environment and prevention, control and abatement of environmental pollution;
- Lay down standards for the quality of the environment, emissions or discharges of environmental pollutants from various sources;
- Lay down procedures and safeguards for the prevention of accidents, which may cause environmental pollution;
- Bar on filing of any suit or legal proceedings against the Government or officials empowered by it for action taken in good faith, in pursuance of the Act; and
- Bar of jurisdiction to Civil Court to entertain any suit or proceedings in respect of anything done, action taken or directions issued by the Central Government or any other authority empowered by it, in pursuance of the Act.

Box 1: Applicability of Environment (Protection) Act; 1986 and Environment (Protection) Rules 1986 and amendments

The Environment Protection Act and Environment Protection Rules require projects to maintain stipulated standards and environmental management through various supporting rules promulgated under the Act.

RSEPL shall ensure compliance under the Rules.

The Water (Prevention and Control of Pollution) Act 1974 and Air (Prevention and Control of Pollution) Act 1981

The objectives of the Water (Prevention and Control of Pollution) Act are to provide for the Prevention and Control of Water Pollution and the maintenance or restoration of the wholesomeness of water for the establishment, with a view to carrying out the purposes aforesaid, of Boards for the prevention and control of water pollution, for conferring on and assigning to such Boards powers and functions relating thereto and for matters connected therewith.

The Air (Prevention and Control of Pollution) Act, 1981 has been enacted to implement measures devised for its effective prevention, control or abatement of air pollution. The Act assigns powers and functions to the CPCB and the SPCBs for prevention and control of air pollution and all other related matters. The CPCB, as well as the SPCBs are eligible for contributions from the Central as well as the State Government, respectively, to perform their functions appropriately. The Act prohibits the construction and operation of any industrial plant without the consent of SPCBs.

Box 2: Applicability of Water Act, 1974 and Air Act, 1981

Any process or activity resulting in discharge of wastewater/ effluent into the environment falls under the purview of this Act and requires the developer to take 'Consent to Establish' and/ or 'Consent to Operate' under the Water Act. Any process or activity resulting in release of contaminants to the atmosphere requires a 'Consent to Establish' and/ or 'Consent to Operate' under the Air Act. The solar power projects have been classified as Green Category projects.

The proposed project will obtain 'Consent to Establish' and 'Consent to Operate' under the Water Act from Rajasthan Pollution Control Board

EIA Notification 2006 as amended till 2009

The EIA Notification provides for conducting environmental impact assessment studies and obtaining environmental clearance from Ministry of Environment, Forests and Climate change or State Environment Impact Assessment Authority. The Schedule of the notification provides criteria for categorising projects into A and B categories based on the magnitude and scale of the impacts associated with the project and provides for incorporating environmental safeguards in the project planning phase.

Box 3: Applicability of EIA Notification

As per schedule to the notification, projects or activities are categorised as i.e. A or B, based on their threshold and likely spatial extent of potential impacts on human health and natural and manmade resources. The category A and B projects require Environmental Clearance from Ministry of

Environment, Forests and Climate change (MoEFCC) or State Environment Impact Assessment Authorities. Solar power projects are exempted from the purview of the EIA notification.

The EIA Notification is not applicable to the proposed project.

Manufacture Storage & Import of Hazardous Chemicals (MSHC) Rules 1989 and Amendment 2000

These rules apply to the activities, which involve handling, storage and import of hazardous chemicals as specified in Schedule 1 of the Rules. The indicative criteria are specified in the Part 1 of the same schedule. The rule also applies to the industrial activity involving isolated storage in the quantities mentioned in Schedule 2.

The MSHC Rules also require provision for the proper storage and handling of chemicals. Definition and classification of the chemicals as dangerous/ hazardous is specified under the MSHC Rules and listed in Schedules 1, 2 & 3. The information on various requirements and clearances under the MSHC Rules has to be furnished to the SPCB office.

Box 4: Applicability of MSHC Rules, 1989

The proposed project will not require storage or use of explosives during construction activities.

The Rules are not applicable to the proposed Project as no Hazardous Chemicals are envisaged.

Ozone Depleting Substances (Regulation) Rules, 2000 as amended in 2005

As a party to the Vienna Convention on the protection of the ozone layer and the Montreal Protocol, India has released the Ozone Depleting Substances (Regulation) Rules 2000 pursuant to the Environment (Protection) Act, 1986.

Rules regulate production, consumption, export, import, sale, purchase and use of ozone depleting substances in specified time bound programme in line with the Montreal Protocol.

Box 5: Applicability of ODS Rules, 2000

The proposed project will involve use of insulating material for wiring and electrical units. Some of the insulating materials comprise of ozone depleting substances.

RSEPL shall ensure that all the insulation material used for wiring and electrical units used for the proposed project are free of ozone depleting substances.

Noise Pollution (Regulation and Control) Rules, 2000

As per the Noise Pollution (Regulation and Control) Rules 2000, every operating facility is required to take all possible steps to meet the ambient noise level standards prescribed in the Rules. The rules prescribe maximum permissible values of day and night time noise levels for zones A, B, C and D representing industrial, commercial, and residential and silence zone respectively

Box 6: Applicability of Noise Pollution Rules, 2000

The Rules require activity/processes generating noise to ensure that the ambient noise standards are within the prescribed Standards. The proposed project will result in generation of noise during

construction. The project is located in a residential area and the noise standards prescribed for these area as 55 dB (A) for daytime and 45 dB(A) for night-time.

RSEPL shall ensure compliance to the Noise standards for the residential area in the proximity of the project during construction period.

Hazardous Waste Management, Handling and Trans Boundary Movement Rules 2008 as amended.

The rule states the requirement for handling and managing wastes categories as hazardous under the schedule. It lays down requirement for:

- Authorisation for collection, reception, storage, transportation and disposal of hazardous wastes
- Filing of annual return under the rules
- Other compliance under the rules include:
 - Authorisation by Central Pollution Control Boards to vendors accepting waste/used oil
 - Liability of the occupier, transporter and operator of a facility: The occupier, transporter and operator of a facility shall be liable for damages caused to the environment resulting due to improper handling and disposal of hazardous waste listed in schedules to the Rules;
 - The occupier and operator of a facility shall also be liable to reinstate or restore damaged or destroyed elements of the environment;
 - The occupier and operator of a facility shall be liable to pay a fine as levied by the State Pollution Control Board with the approval of the Central Pollution Control Board for any violation of the provisions under these rules.

Box 7: Applicability of Hazardous Waste Management, Handling and Trans Boundary Movement Rules

The Rules require activity/processes involving storage and handling of hazardous waste, to seek Authorisation from State Pollution Control Boards. The proposed project will result in generation of small quantities of waste oil (lubricant, hydraulic, etc.) from construction machinery and equipment during construction phase. It will generate transformer oil during operation phase. Broken solar panels or defunct solar panels will also be generated from the project.

RSEPL shall tie up with the supplier of transformers for the repair and maintenance works and will specify replacement and disposal of used transformer oil as a mandate for the supplier. RSEPL shall also enter into buyback agreements with the solar panel manufacturer and supplier.

Forests (Conservation) Act, 1980 and Rules 1981

The Act restricts the powers of the State in respect of de-reservation of forests and the use of forestlands for non-forest purposes. An advisory committee has been created to oversee the implementation of the statute. According to Section 2 of the Act " prior approval of the Central Government is required for:

- De-reservation of a reserved forest
- Use any forest land for any non -forest purpose
- Assign any forest land to any private person or entity not controlled by the Government

- Clear any forest land of naturally grown trees for the purpose of using it for reforestation

Box 8: Applicability of Forest Conservation Act, 1980 and Rules, 1981

The Forest Conservation Act and Rules mandate projects requiring diversion of forest land for non-forest purposes to seek Forest Clearance from the Ministry of Environment and Forests and Climate Change. The proposed project does not require any forest land and will not trigger the conditions of the Act.

The Forest Conservation Act, 1980 and Rules, 1981 will not be triggered by as no forest land is required for the proposed project

The Wildlife (Protection) Act, 1972

The Act provides for protection to listed species of flora and fauna and establishes a network of ecologically important protected areas. It empowers the Central and State Governments to declare any area to be a Wildlife Sanctuary, National Park or a closed area.

There is a blanket ban on carrying out any industrial process or activity inside any of these protected areas. In case forestland within the protected areas network is to be diverted for any non-wildlife use, a no objection has to be obtained from the Indian Board of Wildlife and the State Legislature, before the final consideration by MoEFCC.

The schedules categorize animals, birds, and plants. Schedule I lists endangered species of mammals, reptiles, amphibians, birds, crustaceans and insects. Any possession and transportation of these species without prior permission is offence under the Act.

Box 9: Applicability of the Wildlife (Protection) Act, 1972

The Wildlife Protection Act, 1972 is not triggered by the project as no wild life habitats of corridors are affected by the project.

3.3 Social Laws, Regulations and Policies

The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013

The Act lays down procedures for acquisition of land for public purpose, including need for a social impact assessment study, notification and acquisition, payment for damage, hearing of objections, preparation of rehabilitation and resettlement scheme by the Administrator, declaration of the intended acquisition, enquiry into measurement, values and claims and award by the competent authority, rehabilitation and resettlement award for affected families and provisions for Scheduled Castes and Scheduled Tribes. The key features include:

- Preliminary notification for land proposed for acquisition for public purpose
- Clearing of objection within 60 days of the notification and the provision for hearing of all objections
- Parameters to be considered by Collector in determination of amount of compensation
- National monitoring committee for rehabilitation and resettlement
- Establishment of Land Acquisition, Rehabilitation and Resettlement Authority

- Apportionment of Compensation and dispute settlement regarding the same
- Payment of compensation for land value, trees and structures
- Developers to get the consent of up to 80 per cent of people whose land is acquired for private projects. For Public Private Partnership projects, the approval of 70 per cent of land owners is mandatory
- Elaborate processes and entitlements for rehabilitation and resettlement by particularising the outlines of benefits
- Compensation for land owners and livelihood losers

Box 10: Applicability of the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013

The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act is applicable when private land is being acquired by the government. The land for the project comprises of leased 'Gair Mumkim Raida' or 'barren non agricultural' revenue land under Government of Rajasthan. The land does not comprise any private land.

The land being acquired for the project is revenue land under Government of Rajasthan and is proposed to be leased and hence, does not trigger the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act.

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 & rules 2007

The act vests the forest rights and occupation in forest land in forest dwellers (ST and other traditional forest dwellers) who have been residing in forests for generations but whose rights could not be recorded. The act provides a framework for recognising the forest rights and the nature of evidence required for such recognition and vesting of forest land.

Box 11: Applicability of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006 & rules 2007

The project does not include any forest area or any of the traditional forest dwellers.

The Act is not applicable for the proposed project.

The Child Labour (Prohibition and Regulation) Act, 1986

The Act prohibits employment of children in certain occupation and processes as listed in the Act. The Act also specifies conditions of work for children, if permitted to work. These include a working day of maximum of 6 hours a day (including rest), no work period exceeding 3 hours at a stretch, and no overtime (Section 7). The Act requires maintenance of a register for employed children (Section 11).

The Constitution of India (Part III, Article 24 - Fundamental Rights) describes that no child below the age of fourteen years shall be employed to work in any factory or engaged in any other hazardous employment

Box 12: Applicability of the Child Labour (Prohibition and Regulation) Act, 1986

The Child Labour Act prohibits employment of children in certain occupations and processes including construction works. The project will involve construction activities through subcontractors.

RSEPL shall ensure that no child labour is engaged at site for construction or operation works either directly or by the sub contractors. RSEPL shall include a clause in the subcontractor agreements prohibiting employment of child labour for the proposed project.

The Bonded Labour (Abolition) Act 1976

The act states that all forms of bonded labour stands abolished and every bonded labourer stands freed and discharged from any obligations to render any bonded labour.

Box 13: Applicability of the Bonded Labour (Abolition) Act, 1976

RSEPL shall ensure no bonded labour is engaged at site for construction or operation works.

The Trade Union Act, 1926

Provides procedures for formation and registration of Trade Unions and lists their rights and liabilities. It encompasses any combination, permanent or temporary, that gets formed to regulate relationship between workmen and their employers.

Box 14: Applicability of the Trade Union Act, 1976

RSEPL shall ensure that there is no policy restricting association of workers.

Wages

The Government of India has formulated several Acts and Policies regarding wages and remuneration. The details have been provided below:

Minimum Wages Act, 1948 – The Act requires the Government to fix minimum rates of wages and review the rates every 5 years. These are the minimum wages that are to be paid to employees.

The Payment of Wages Act, 1936, amended in 2005 - Every employer shall be responsible for the payment to persons employed by him of all wages required to be paid under this Act.

Equal Remuneration Act 1976 - As per the Equal Remuneration Act 1976, it is the duty of an employer to pay equal remuneration to men and women workers for same work or work of a similar nature.

Box 15: Applicability of the Acts Regarding Wages

The various acts described above require projects to provide payment to its employees and the payment should be in no case lesser than the rates provided in the Minimum Wages Act. Also, equal payment to men and women for same work is required.

RSEPL shall ensure that payment of minimum wages as fixed by the government or above without any gender bias is paid by RSEPL and its sub-contractors.

Workmen's Compensation Act, 1923

The Act requires that, if personal injury is caused to a workman by accident arising out of and in the course of his employment, his employer shall be liable to pay compensation in accordance with the provisions of this Act.

Box 16: Applicability of the Workmen's Compensation Act, 1923

The proposed project will involve health and safety risks such as electrical hazards during maintenance works etc during construction, operation and maintenance works.

RSEPL to ensure compensation for personal injury caused to any worker by accident arising out of and in the course of his employment as per the Act.

Maternity Benefit Act, 1961

The act states that no employer shall knowingly employ a woman in any establishment during the six weeks immediately following the day of her delivery or her miscarriage. No pregnant woman shall, on a request being made by her in this behalf, be required by her employer to do during the period any work which is of an arduous nature or which involves long hours of standing, or which in any way is likely to interfere with her pregnancy or the normal development of the foetus, or is likely to cause her miscarriage or otherwise to adversely affect her health.

Box 17: Applicability of the Maternity Benefit Act, 1961

RSEPL to ensure that engagement of female workers during their pregnancy follows the requirement of the act.

Other Labour Related Legislations

Other labour related legislations applicable for the Project include the following:

- The E.P.F. and Miscellaneous Provisions act, 1952
- Payment of Bonus Act, 1965 and Amendment Act No.43 of 1977 and No.48 of 1978 and amendments
- Payment of Gratuity Act, 1972
- Public Provident Fund Act, 1968
- ESI Act , 1948 (Employees State Insurance Act, 1948)
- The Contract Labour (Regulation & Abolition) Act, 1970 and Rules
- Employer's Liability Act, 1938 (as amended).
- The Industrial Employment (Standing Orders) Act, 1946 (as amended).
- The Industrial Disputes Act, 1947 (as amended).
- The Personal Injuries (Compensation Insurance) Act, 1963 (as amended).

Rules include:

- Contract Labour (Regulation & Abolition) Central Rules, 1971
- Industrial Disputes (Central) Rules, 1957
- Minimum Wages (Central) Rules, 1950
- Payment of Bonus Rules, 1975

- The Personal Injuries (Compensation Insurance) Rules

Box 18: Applicability of other Labour related legislations

RSEPL to ensure compliance with all relevant sections of the above mentioned Acts and Rules. RSEPL shall also ensure that their sub contractors are also compliant to the same.

The Public Liability Insurance Act, 1991 amended 1992 and The Public Liability Insurance Rules, 1991 amended 1993

The Public Liability Act was made effective to provide insurance and immediate relief, by the one who control or handle hazardous chemicals, to persons affected due to accident due to handling of such hazardous substances on 'No Fault Liability' basis.

The rules enlist the pre-requisite documentations, powers of the collector and gives direction of application for compensation.

Box 19: Applicability of the Public Insurance Policy Act, 1991

The Act requires projects to provide compensation to affected people in case on any accidents due to handling of hazardous substances. The proposed project does not involve handling of large quantities of hazardous substances.

RSEPL shall provide compensation in case of any hazardous substance release due to its activities.

Building and Other Construction Workers (Regulation Of Employment And Conditions Of Service) Act, 1996

The Building and Other Construction Workers Act has been formulated with an objective to regulate the employment and condition of service of buildings and other construction workers and to provide for their safety, health and welfare measures and for other matters connected therewith or incidental thereto.

These rules suggest the responsibilities and duties of employers, architects, project engineers, and designers, building workers, undertaking any operation or work. The rule intends to ensure safety of workers, promote following of the accepted principles of standard safe operating practices connected with building and other related to or incidental to building or other construction, sanitation or hygiene of workers, timely payment of wages , testing , examination and inspection of machinery and equipment.

Box 20: Applicability of Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996

The proposed project will not involve extensive construction works. The construction activities will be limited to site clearance, construction of internal roads, construction of foundations, and installation of solar panels on mounting structures.

RSEPL shall ensure that the contractor has a valid registration under the Building and Other Construction Works Act. Any other contractors or third parties to be involved in the construction works for the proposed project, if required, will also be engaged only subject to availability of

valid registration. All Health and Safety requirements as provided under various sections of the rules will be complied by RSEPL and its sub contractors.

The Electricity Act 2003

This Act covers major issues involving generation, distribution, transmission and trading in power. The Act delicens power generation completely (except for hydro power projects over a certain size) as per the act, 10% of the power supplied by suppliers and distributors to the consumers has to be generated using renewable and non-conventional sources of energy so the energy is reliable. The Act delicens distribution in rural areas and brings in a licensing regime for distribution in urban areas. However, as per the Act, only 16 states in India have notified what constitutes as rural areas and therefore the rural distribution is yet to be freed up in nearly one third of the country.

Box 21: Applicability of Electricity Act, 2003

The Electricity Act, 2003 allows private sector projects to obtain distribution Licences from the State Electricity Regulation Committee and to have open access to the transmission lines. The license requires power generating companies to comply with the standards of performance specified in the Act.

RSEPL shall obtain license under the electricity act and ensure that the Health and Safety requirements specified under the rules are complied to.

3.4 Overview of Applicable Policies of Government of India

Various policies released by the Government of India from time to time needs to be addressed while undertaking the projects. Some of the policies (including sector specific) have been discussed briefly in the subsequent sections.

National Solar Mission

The objective of the Jawaharlal Nehru National Solar Mission (JNNSM) under the brand 'Solar India' is to establish India as a global leader in solar energy, by creating the policy conditions for its diffusion across the country as quickly as possible. The Mission has set a target of 20,000 MW and stipulates implementation and achievement of the target in 3 phases (first phase up to 2012-13, second phase from 2013 to 2017 and the third phase from 2017 to 2022) for various components, including grid connected solar power.

The successful implementation of the JNNSM requires the identification of resources to overcome the financial, investment, technology, institutional and other related barriers which confront solar power development in India. The penetration of solar power, therefore, requires substantial support. The policy framework of the Mission will facilitate the process of achieving grid parity by 2022.

Box 22: Applicability of National Solar Mission

The National Solar Mission encourages development of solar power projects in the country.

The proposed project is being set up under batch 1 of Phase 2 of the Jawaharlal Nehru Solar Mission and will operate within the policy framework of the mission.

National Environmental Policy 2006

Government of India released the National Environment Policy in 2006. The present national policies for environmental management are contained in the National Forest Policy, 1988, the National Conservation Strategy and Policy Statement on Environment and Development, 1992; and the Policy Statement on Abatement of Pollution, 1992. Some sector policies such as the National Agriculture Policy, 2000; National Population Policy, 2000; and National Water Policy, 2002; have also contributed towards environmental management. All of these policies have recognized the need for sustainable development in their specific contexts and formulated necessary strategies to give effect to such recognition.

The dominant theme of this policy is that while conservation of environmental resources is necessary to secure livelihoods and well-being of all, the most secure basis for conservation is to ensure that people dependent on particular resources obtain better livelihoods from the fact of conservation, than from degradation of the resource.

Box 23: Applicability of National Environment Policy

The proposed project will comply with the requirements of the National Environment Policy.

3.5 IFC Performance Standards

The Performance Standards (PS) established stipulates that the project shall meet the following throughout the life of an investment by IFC or other relevant financial institution:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- Performance Standard 2: Labour and Working Conditions;
- Performance Standard 3: Resource Efficiency and Pollution Prevention;
- Performance Standard 4: Community Health, Safety and Security;
- Performance Standard 5: Land Acquisition and Involuntary Resettlement;
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Performance Standard 7: Indigenous Peoples; and
- Performance Standard 8: Cultural Heritage.

These performance standards and guidelines provide ways and means to identify impacts and affected stakeholders and lay down processes for management and mitigation of adverse impacts. A brief on the requirements as laid down in the performance standards is described in the Table 3-1.

Table 3-1: Performance Standards and Applicability

Performance Standard	Description	Applicability	Requirements
<p>PS1: Assessment and Management of Environmental and Social Risks and Impacts;</p>	<p>PS 1 establishes the importance of integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; the client’s management of environmental and social performance throughout the life of the project.</p>	<p>The PS1 is applicable to projects with environment and/ or social risks and/ or impacts.</p> <p>The proposed project is a solar power project and will have environmental and social impacts such as stress on existing water resources, generation of noise, construction activities etc .</p> <p>PS1 is therefore applicable for the project.</p>	<p>RSEPL shall conduct a process of environmental and social assessment. ASEPL already has an established Environment and Social Management System (ESMS) incorporating the following elements:</p> <ul style="list-style-type: none"> ○ policy; ○ identification of risks and impacts; management programs; ○ emergency preparedness and response; ○ stakeholder engagement; and ○ Monitoring and review.
<p>PS2: Labour and Working Conditions</p>	<p>PS2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. The objectives of the PS:2 are:</p> <ul style="list-style-type: none"> ○ To promote the fair treatment, non-discrimination, and equal opportunity of workers. ○ To establish, maintain, and improve the worker-management relationship. ○ To promote compliance with national employment and labour laws. ○ To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers 	<p>The PS:2 applies to workers directly engaged by the client (direct workers), workers engaged through third parties (contracted workers), as well as workers engaged by the client’s primary suppliers (supply chain workers).</p> <p>The proposed project will involve employment of direct and contracted workers during construction and operation phases.</p> <p>PS2 is therefore applicable for the proposed project.</p>	<p>The project proponent will formulate HR policies and procedures and grievance redressal mechanisms for management of worker relationship in compliance with IFCs requirements. RSEPL shall provide reasonable working conditions and terms of employment for both direct and contracted workers through contractor agreements.</p> <p>The proponent shall ensure measures to</p> <ul style="list-style-type: none"> ○ Prevent child labour, forced labour, and discrimination. Freedom of association and collective bargaining shall be provided.

Performance Standard	Description	Applicability	Requirements
	<p>in the client's supply chain.</p> <ul style="list-style-type: none"> ○ To promote safe and healthy working conditions, and the health of workers. ○ To avoid the use of forced labour. 		<ul style="list-style-type: none"> ○ Wages, work hours and other benefits shall be as per the National labour and employment laws.
PS3: Resource Efficiency and Pollution Prevention	PS3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels.	<p>The PS-3 is applicable to projects resulting in increased levels of pollution and requires project to avoid, minimize, or reduce adverse impacts on human health and environment by adopting pollution preventive and control technologies throughout the Project life cycle.</p> <p>The proposed project is a clean energy project and will not have major pollution sources associated with it. The construction works for the development of project will result in generation of wastes like wastewater, waste oil and construction debris. The operation phase will result in generation of minor quantities of waste such as transformer oil.</p> <p>PS3 is therefore applicable for the proposed project.</p>	<p>RSEPL shall assess the impacts and risks associated with the generation, use, storage, release, and/or disposal of pollutants during the ESIA, planned as part of the ESMS, and implement them as per the Action Plan.</p> <p>The project proponent shall plan and implement pollution control measures right from the conception stage. Practices like minimal release of waste, handling of hazardous waste, safe disposal of waste and waste water management shall be considered prior to each phase.</p>
PS4: Community Health, Safety, and Security	PS4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. Its	This performance Standard is applicable to projects which entail potential risks and impacts to the	The proponent shall evaluate the risks associated with the project activities and will devise measures to address these

Performance Standard	Description	Applicability	Requirements
	<p>main stress is to ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.</p>	<p>health and safety of affected communities from project activities.</p> <p>The proposed project will involve transportation of construction material and movement of construction machinery which may pose safety risks to the affected communities.</p> <p>The PS4 is therefore applicable for the proposed project.</p>	<p>impacts through the Environment and Social Management System.</p>
<p>PS5: Land Acquisition and Involuntary Resettlement</p>	<p>PS5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Its main aim is to anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by providing compensation for loss of assets at replacement cost and ensuring that resettlement activities are implemented with appropriate disclosure of Information, consultation, and the informed participation of those affected.</p>	<p>The PS5 is applicable when there is physical and/or economic displacement because of the project.</p> <p>The land for the proposed project comprises of uncultivable revenue land which has been leased by the Government. The land was not being used by the community for any purpose and no encroachments were observed on the land.</p> <p>PS5 is therefore NOT applicable for the proposed project.</p>	<p>--</p>
<p>PS6: Biodiversity</p>	<p>PS6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services,</p>	<p>PS6 is applicable to projects located in modified, natural, and</p>	<p>The proponent shall evaluate the risks associated with the project activities and</p>

Performance Standard	Description	Applicability	Requirements
Conservation and Sustainable Management of Living Natural Resources	and sustainably managing living natural resources are fundamental to sustainable development. This standard is aimed to promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.	<p>critical habitats; or projects that potentially impact on or are dependent on ecosystem services or that include the production of living natural resources .</p> <p>The proposed project does not involve any diversion of forest land. The plant sites are devoid of vegetation. The project activities are not likely to have any impact on the ecology. The proposed project will involve additional traffic movement which may impact the higher fauna.</p> <p>PS6 is applicable to the project.</p>	will devise measures to address these impacts through the Environment and Social Management System.
PS7: Indigenous Peoples	PS7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development.	<p>This Performance Standard applies to communities or groups of Indigenous Peoples whose identity as a group or community is linked, to distinct habitats or ancestral territories and the natural resources therein.</p> <p>The project area or its surroundings does not support indigenous people. No material degradation or adverse impact is expected on land resources on which indigenous peoples are</p>	--

Performance Standard	Description	Applicability	Requirements
		<p>dependent.</p> <p>PS7 is therefore NOT applicable for the proposed project.</p>	
<p>PS8: Cultural Heritage</p>	<p>PS8 recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities. In addition, the requirements of this Performance Standard on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity.</p>	<p>This PS is applicable when tangible forms of cultural heritage, unique natural features or tangible objects that embody cultural values and certain instances of intangible forms of culture are impacted or are proposed to be used for commercial purposes.</p> <p>There are no culturally important sites in or around the project site.</p> <p>PS8 is therefore NOT applicable for the proposed project.</p>	<p>--</p>

3.5.1 IFC's Categorisation of Projects

As part of its review of a project's expected social and environmental impacts, IFC uses a system of social and environmental categorisation. This categorisation is used to reflect the size of impacts understood as a result of the client's social and environmental assessment and to specify IFC's institutional requirements. The categories used by the IFC are:

Category A Projects: Projects with potential significant adverse social or environmental risks or/ and impacts that are diverse, irreversible or unprecedented;

Category B Projects: Projects with potential limited adverse social or environmental risks or/ and impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures;

Category C Projects: Projects with minimal or no adverse social or environmental risks or/ and impacts, including certain financial intermediary (FI) projects with minimal or no adverse risks;

Category FI Projects: All FI projects excluding those that are Category C projects.

IFC therefore categorises the project primarily according to the significance and nature of its impacts. IFC defines the project's area of influence as the primary project site(s) and related facilities that the client (including its contractors) develops or controls; associated facilities that are not funded as part of the project (funding may be provided separately by a client or a third party including the government), and whose viability and existence depend exclusively on the project and whose goods or services are essential for the successful operation of the project; areas potentially impacted by cumulative impacts from further planned development of the project; and areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location. The area of influence does not include potential impacts that would occur without the project or independently of the project.

3.6 Equator Principles

Principle 1: Review and Categorization of the Project - Equator Principles Financial Institutions (EPFIs) are required to categorise projects according to the magnitude of its potential impacts based on the environmental and social screening criteria of IFC. Projects are designated as Category A, B or C when it represents, respectively, a high, medium or low level of risk.

Principle 2: Social and Environmental Assessment - Projects Categorized as A or B requires the borrower to conduct an ESA to assess all possible environmental and social impacts and risks.

Principle 3: Applicable Environmental and Social Standards - For projects located in non-OECD countries, the assessment should refer to the IFC Performance Standards and then the applicable industry specific guidelines, i.e. the World Bank Group EHS Guidelines.

Principle 4: Action Plan (AP) and Management System - For all Category A or B projects located in non-OECD countries, the borrower must prepare an Action Plan which addresses the relevant findings of the ESA.

Principle 5: Consultation and Disclosure - For all Category A projects and where appropriate Category B, the borrower or third party expert must have consulted with project affected communities in a structured and culturally appropriate manner. In projects with significant impacts on affected communities, the process must ensure their free, prior and informed consultation (FPIC) and facilitate the informed participation.

Principle 6: Grievance Mechanism -For all Category A projects and where appropriate Category B, located in non-OECD countries, the borrower has to ensure that the consultation, disclosure and community engagement continues throughout the construction and operation of the project, scaled to the level of risks and impacts involved at different stages, and establish a grievance mechanism as a part of the management system.

Principle 7: Independent Review - For all Category A projects and where appropriate Category B, an independent expert (environmental or social) not directly associated with the borrower will review the Assessment, Action Plan and consultation process to assist EPFI's Due-Diligence and EP compliance.

Principle 8: Covenants¹ - The borrower will covenant the following compliance requirements in the financing documents:

- To comply with all the relevant host country social and environmental laws, regulations and permits in all material respects;
- To comply with Action Plan (where applicable) during construction and operation of the project in all material aspects;
- To provide periodic reports in a format agreed with EPFIs (frequency to be agreed, but not less than annually) that documents compliance against APs, as well as against local laws and permits; and
- To decommission the facilities in accordance with an agreed decommissioning plan.

Principle 9: Independent Monitoring and Reporting - To ensure ongoing monitoring and reporting over the life of the project, the EPFIs will, for all A Category projects and where appropriate Category B, require appointment of an independent environmental and/or social expert, or require that the borrower retain qualified and experienced external experts to verify its monitoring information, to be shared with the EPFIs.

Principle 10: EPFI Reporting - Each EPFI is committed to issuing periodic public reports about project implementation processes and experience with due regard for appropriate project confidentiality.

¹ Please note that EP is for Banks, i.e. the Lenders, and therefore covenants must be prepared by the Banks and not the borrower. The borrower needs to comply with the covenant conditions, one of which is the ESAP.

3.7 ADB's Safeguard Policy Statement

3.7.1 Safeguard Policy Statement (SPS), 2009

Built upon the three previous safeguard policies on the Involuntary Resettlement Policy (1995), the Policy on Indigenous Peoples (1998) and the Environment Policy (2002), the Safeguard Policy Statement of ADB was approved in 2009. The safeguard policies are operational policies that seek to avoid, minimize or mitigate adverse environmental and social impacts including protecting the rights of those likely to be affected or marginalized by the developmental process. ADB's safeguard policy framework consists of three operational policies on the environment, indigenous peoples and involuntary resettlement. A brief detail of all three operational policies have been mentioned below:

Environmental Safeguard

This safeguard is meant to ensure the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision making process.

The proposed project involves generation of power from solar energy which is one of the cleanest sources of energy. However the construction and operational activities of the project might result in some adverse impacts on the environment which can be mitigated through implementation of appropriate mitigation measures. The Environmental Safeguard is thus applicable to the proposed project.

Involuntary Resettlement Safeguard

This safeguard has been placed in order to avoid involuntary resettlement whenever possible; to minimize involuntary resettlement by exploring project and design alternatives; to enhance, or at least restore, the livelihoods of all displaced persons in real terms relative to pre- project levels; and to improve the standards of living of the displaced poor and other vulnerable groups.

The proposed project involves transfer of uncultivable land from the Government on lease. The land was not used by the community for any purpose and no encroachments were observed on site. No physical or economic displacement is involved in the process. Therefore, adverse impact due to land procurement is not anticipated.

Indigenous Peoples Safeguard

This safeguard looks at designing and implementing projects in a way that fosters full respect for Indigenous Peoples' identity, dignity, human rights, livelihood systems and cultural uniqueness as defined by the Indigenous Peoples themselves so that they receive culturally appropriate social and economic benefits; do not suffer adverse impacts as a result of projects; and participate actively in projects that affect them.

The project area or its surroundings is not native to any indigenous people. No material degradation or adverse impact is expected on land resources on which indigenous peoples are dependent. Moreover, for the proposed project RSEPL will not be acquiring any land belonging to any vulnerable community in the region. Therefore, adverse impact on indigenous people is not anticipated.

3.7.2 Social Protection Strategy, 2001

ADB has designed a set of policies and programs for social protection in 2001, that is, to reduce poverty and vulnerability by promoting efficient labour markets, diminishing people's exposure to risks, and enhancing their capacity to protect themselves against hazards and interruption/loss of income. The basic aim of the Social Protection Strategy (SPS) is to assist individuals to break the cycle of poverty and enhance the quality of growth through adequate and developed social protection systems in the member countries of ADB. The type of risks covered through the SPS may be economic, environment or social/ governance related.

The proposed project shall ensure that the requirements of the ADB's SPS are complied with. Priority shall be given to any identified vulnerable groups. Based on the gender analysis and status of women in the project area, measures for ensuring their overall development shall be taken up by the project proponent. RSEPL shall comply with applicable labour laws in relation to the Project. RSEPL shall also take the following measures to comply with the core labour standards² for the ADB financed portion of the Project;

- (a) carry out its activities consistent with the intent of ensuring legally permissible equal opportunity, fair treatment and non-discrimination in relation to recruitment and hiring, compensation, working conditions and terms of employment for its workers (including prohibiting any form of discrimination against women during hiring and providing equal work for equal pay for men and women engaged by RSEPL);
- (b) not restrict its workers from developing a legally permissible means of expressing their grievances and protecting their rights regarding working conditions and terms of employment;
- (c) engage contractors and other providers of goods and services:
 - (i) who do not employ child labor³ or forced labor⁴;
 - (ii) who have appropriate management systems that will allow them to operate in a manner which is consistent with the intent of (A) ensuring legally permissible equal opportunity and fair treatment and non-discrimination for their workers, and (B) not restricting their workers from developing a legally permissible means of expressing their grievances and protecting their rights regarding working conditions and terms of employment; and
 - (iii) Whose subcontracts contain provisions which are consistent with paragraphs (i) and (ii) above

²The core labor standards are the elimination of all forms of forced or compulsory labor; the abolition of child labor; elimination of discrimination in respect of employment and occupation; and freedom of association and the effective recognition of the right to collective bargaining, as per the relevant conventions of the International Labor Organization.

³Child labor means the employment of children whose age is below the statutory minimum age of employment in the relevant country, or employment of children in contravention of International Labor Organization Convention No. 138 'Minimum Age Convention' (www.ilo.org)

⁴Forced labor means all work or services not voluntarily performed, that is, extracted from individuals under threat of force or penalty

3.7.3 Public Communications Policy 2011

The Public Communications Policy (PCP) of ADB, originally formulated in 2005 and revised in 2011, is aimed at promoting improved access to information about ADB's operations related to funded projects. It endorses greater transparency and accountability to stakeholders involved in a project. The PCP establishes the disclosure requirements for documents and information related to projects. It mandates project-related documents normally produced during the project cycle to be posted on the web.

3.7.4 ADB's Categorization of Projects

The project classification system of ADB is used to reflect the significance of potential environmental impacts understood as a result of the client's impact assessment and to establish ADB's safeguard requirements. The categories used by ADB are:

- **Category A Projects:** Projects which are likely to have significant adverse environmental impacts, involuntary resettlement impacts or impacts on indigenous peoples that are irreversible, diverse, or unprecedented.
- **Category B Projects:** Projects with potential adverse environmental impacts that are less in number, involuntary resettlement impacts or impacts on indigenous peoples, generally site-specific, mostly reversible and readily addressed through mitigation measures;
- **Category C Projects:** Projects with minimal or no adverse environmental impacts; involuntary resettlement impacts or impacts on indigenous peoples;
- **Category FI Projects:** Projects which involve investment of ADB funds to or through a financial investment.

3.8 Applicable Environmental Standards

The applicable environmental standards for the proposed project have been discussed in the subsequent sections. The ambient air quality standards will be applicable only during the construction phase of the project and the wastewater discharges from the project during both construction and operation phases shall be as per the general discharge standards as sector specific standards are not available for solar power projects.

3.8.1 Ambient Noise Standards

As per EHS guidelines of IFC, for residential, institutional and educational area, the one hourly equivalent noise level (Leq hourly) for day time is 55 dB(A) while the Leq hourly for night time is prescribed as 45 dB(A). Noise standards notified by the MoEF vide gazette notification dated 14 February 2000 based on the A-weighted equivalent noise level (L_{eq}) are as presented in Table 3-2:

Table 3-2: Ambient Noise Standards

Area Code	Category of Area	Limits in dB(A) Leq	
		Day time*	Night Time
A	Industrial Area	75	70
B	Commercial Area	65	55

Area Code	Category of Area	Limits in dB(A) Leq	
		Day time*	Night Time
C	Residential Area	55	45
D	Silence Zone**	50	40

Note: * Day time is from 6 am to 10 pm, Night time is 10 pm to 6.00 am;

** Silence zone is defined as area up to 100 meters around premises of hospitals, educational institutions and courts. Use of vehicle horns, loud speakers and bursting of crackers are banned in these zones.

3.8.2 Noise Standards for Occupational Exposure

Noise standards in the work environment are specified by Occupational Safety and Health Administration (OSHA-USA) which in turn are being enforced by Government of India through model rules framed under the Factories Act.

Table 3-3: Standards for Occupational Noise Exposure

Total Time of Exposure per Day in Hours (Continuous or Short term Exposure)	Sound Pressure Level in dB(A)
8	90
6	92
4	95
3	97
2	100
3/2	102
1	105
3/4	107
1/2	110
1/4	115
Never	>115

No exposure in excess of 115 dB(A) is to be permitted.

For any period of exposure falling in between any figure and the next higher or lower figure as indicated in column (1), the permissible level is to be determined by extrapolation on a proportionate scale.

3.9 Applicable International Conventions

Environmental problems which migrate beyond the jurisdiction (Trans-boundary) require power to control such issues through international co-operation by either becoming a Contracting Party (CP) i.e. ratifying treaties or as a Signatory by officially signing the treaties and agreeing to carry out provisions of various treaties on environment and social safeguards. The relevant international conventions are as provided in Table 3-4.

Table 3-4: Relevant International Conventions applicable to the Project

Sl.No.	International Conventions	Salient Features
1	Montreal Protocol on Substances That Deplete the Ozone Layer (and subsequent	India signed the Montreal Protocol along with its London Amendment on 17-9-1992 and also ratified

Sl.No.	International Conventions	Salient Features
	Amendments)	the Copenhagen, Montreal and Beijing Amendments on 3rd March, 2003.
2	UN (Rio) Convention on Biological Diversity	India is a party since: 1994-02-18 by: Ratification; Protocol - Party since: 2003-09-11
3	Conventions on the Conservation of Migratory species of wild animals and migratory species	India is contracting party to the convention on conservation of migratory species of wild animals and migratory species.
4	Kyoto Protocol	The Kyoto protocol was signed by India in August 2002 and ratified in February 2005. The convention pertains to the United Nations framework on Climate Change. The 3 rd Conference of the Parties to the Framework Convention on Climate Change (FCCC) in Kyoto in December 1997 introduced the Clean Development Mechanism (CDM) as a new concept for voluntary greenhouse-gas emission reduction agreements between industrialized and developing countries on the project level.
5	The Rotterdam Convention on the Prior Informed Consent (PIC) Procedure	The Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals & Pesticides in international Trade was adopted by India at the Conference of Plenipotentiaries at Rotterdam in 1998
6	International Labour Organization conventions	India has also ratified many of the International Labour Organization conventions that are relevant to the Project including: <ul style="list-style-type: none"> • C1 Hours of Work (Industry) Convention, 1919 (14:07:1921, ratified); • C5 Minimum Age (Industry) Convention, 1919 (09:09:1955, ratified): • C11 Right of Association (Agriculture) Convention, 1921 (11:05:1923, ratified): • C14 Weekly Rest (Industry) Convention, 1921 (11:05:1923, ratified); • C29 Forced Labour Convention, 1930 (30:11:1954, ratified) & C105 Abolition of Forced Labour Convention, 1957 (18:05:2000, ratified); • C100 Equal Remuneration Convention, 1951 (25:09:1958, ratified); • C107 Indigenous and Tribal Populations Convention, 1957 • C111 discrimination (Employment and Occupation) Convention, 1958 (03:06:1960, ratified)

4. Environment and Social Baseline Profile

This section of the report describes the baseline environmental and social scenario for the study area (defined as area falling within 5 km of the project area). The baseline data generation includes site visits, ecological surveys, social surveys and interviews, processing of satellite imagery and secondary data review from established sources such as Indian Meteorological Department and Census of India.

4.1 Site Setting

The project area is characterised by rural setup and flat barren land. The project area has a gentle slope and has an average elevation of about 207 m above mean sea level. As per the revenue records, the land use of the site is classified as uncultivable land. The site comprises of scanty vegetation and is not used by the community for grazing or any other activities. During the site walkthrough no encroachments were observed in the Project area and the same was verified during consultations with the Sarpanch (Village Head) and the community.

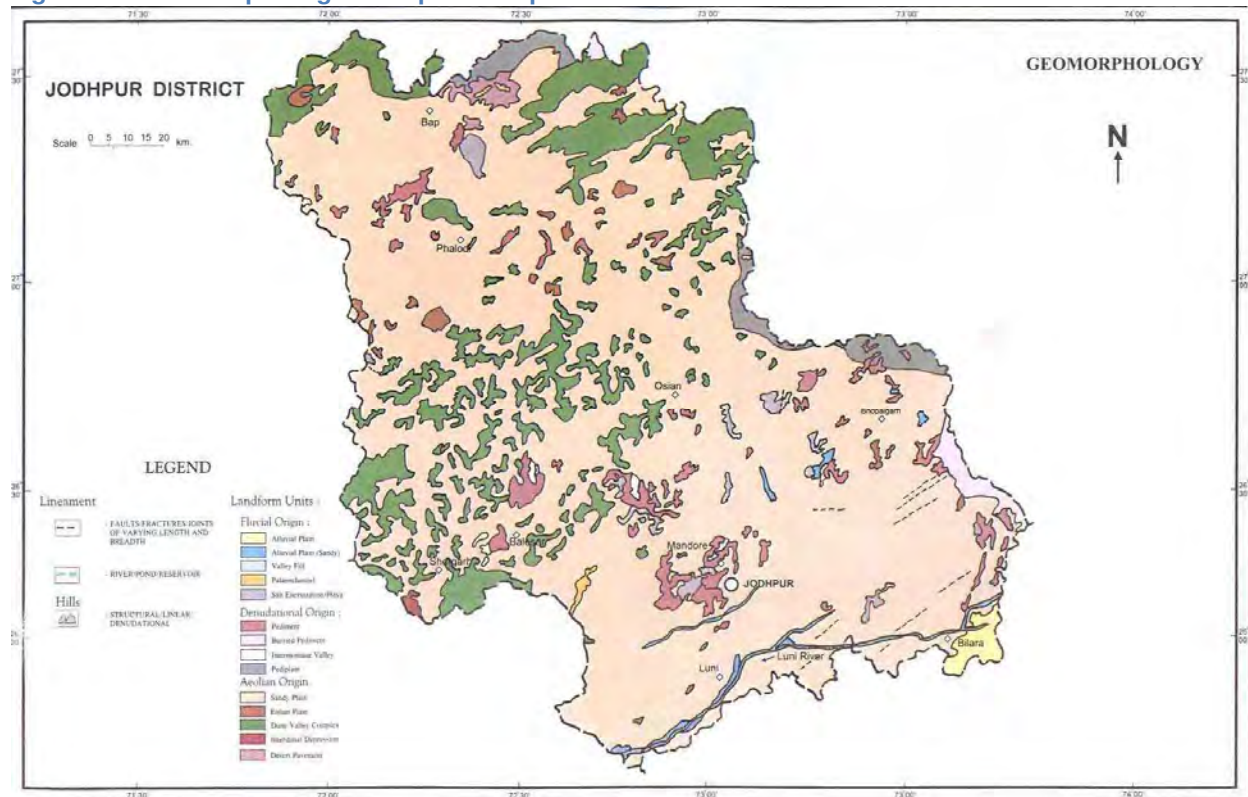
The nearest settlements include Nawagaon and Bari Seer settlement which are located at a distance of about 2 km and 3 km from the site respectively. The Indira Gandhi irrigation canal, which is also available for drinking and other domestic use, is located in proximity of the Project site. A catchment area, existing school, agricultural land and water body within the vicinity of the proposed site have been excluded by the project proponent from the project area. No wild life protection or ecological sensitive area is located within 10 km radius of the Project area.

4.2 Geomorphology and Drainage

Jodhpur district forms part of Great Thar Desert of Rajasthan and comprises of scattered sand dunes, alluvial areas dotted with few hillocks and hill chains. Bap tehsil is located in the north-western portion of the district and Sand dunes occupy a major part of the tehsil. The general elevation of plains in the tehsil is about 300 m amsl. The sand dunes are transverse and longitudinal types formed due to Aeolian action and overlie the denuded consolidated formations. Presence of boulder beds exhibit striking plain topography around Bap and similarly the low lying out-crops of limestone, shale and sandstone layers are also observed in northern part of the district near Phalodi.

Jodhpur district falls in the Luni and Barmer Basins. Major River of the district is Luni, which flows in ENE to WSW direction. The drainage of Bap tehsil is essentially ephemeral and internal.

Figure 4-1: Geomorphological Map of Jodhpur District



Source: <http://jodhpur.nic.in/maps.html> (District Administration, Jodhpur)

4.3 Soils

The soils of the Jodhpur district can be classified as follows:

Red desertic soils: These types of soils are most predominant soils in central, eastern and southern parts of the district. These are pale brown to reddish brown soils, loose and well drained and texture varies from sandy loam to sandy clay loam.

Desert soils: Desert soils occupy a considerable area of the district forming its northern and western part of the district. These are mainly windblown sand and soils of interdunal depressions.

Sand dunes: Sand dunes occupy a small part in northern and north-western margin of the district. These are sandy to loamy sand, loose, structure less and well drained.

Lithosol and regosols of hills: These types of soils are found in hills and hill slopes of central and western part of the district. These are shallow, light textured, fairly drained, reddish brown to grayish brown in colour.

4.4 Geological Framework

The geological set-up of the district is represented by various igneous, metamorphic and sedimentary rocks. Delhi Super Group litho units are very limited and in the form of isolated pockets. Erinpura

granites and Malani igneous rocks cover large area in the southern part of the district. Marwar Super Group of rocks occupies maximum geographical area of the district lying in the central, western, and eastern parts of the district. The rock units of various formations belonging to Cenozoic epoch/era represented in very small area and lies in the north-western parts of the district. In the entire district, the hard rocks are overlain by thin blanket of alluvium and wind blown sand.

4.5 Hydrogeology

Ground water occurs under unconfined to semi-confined conditions in rocks of Delhi Super Group, Jodhpur sandstone, Bilara limestone, Nagaur sandstone, Lathi sandstone and unconsolidated sediments (valley fills and alluvium). These form the chief source of ground water in the district. Confined condition is also met sometimes at deeper levels in the north western part of the district. Bap tehsil comprises of Bap boulder bed having NE-SW extension. It consists of ill-sorted boulders, pebbles, cobbles embedded in silty matrix. Ground water occurs under unconfined condition. Wells in this formation yield meagre quantity of water, which is saline.

4.5.1 Depth to Water level

As per Central Ground Water Board, Western Region, the depth to (2006) in the district ranges from 2.10 to 77.94 meters below ground level (mbgl) and 0.30 to 70.88 m during pre monsoon and post monsoon, 2006, respectively. The water levels were observed to be in the range of 4.24-13.68 m bgl and 2.77-13.08 m bgl during pre and post monsoon season (2006) respectively. The annual water level fluctuation for the year 2006 was recorded as 0.55-1.59 m rise by CGWB.

Long term pre and post monsoon decadal trend (1997-2006) indicate a fall of 0.02 m/year in pre-monsoon season and a rise of 0.01 m/year in the post monsoon season. Long term pre monsoon (1984-2006) water level data show a declining trend 0.17 m/year in Bap block.

4.5.2 Ground Water Quality

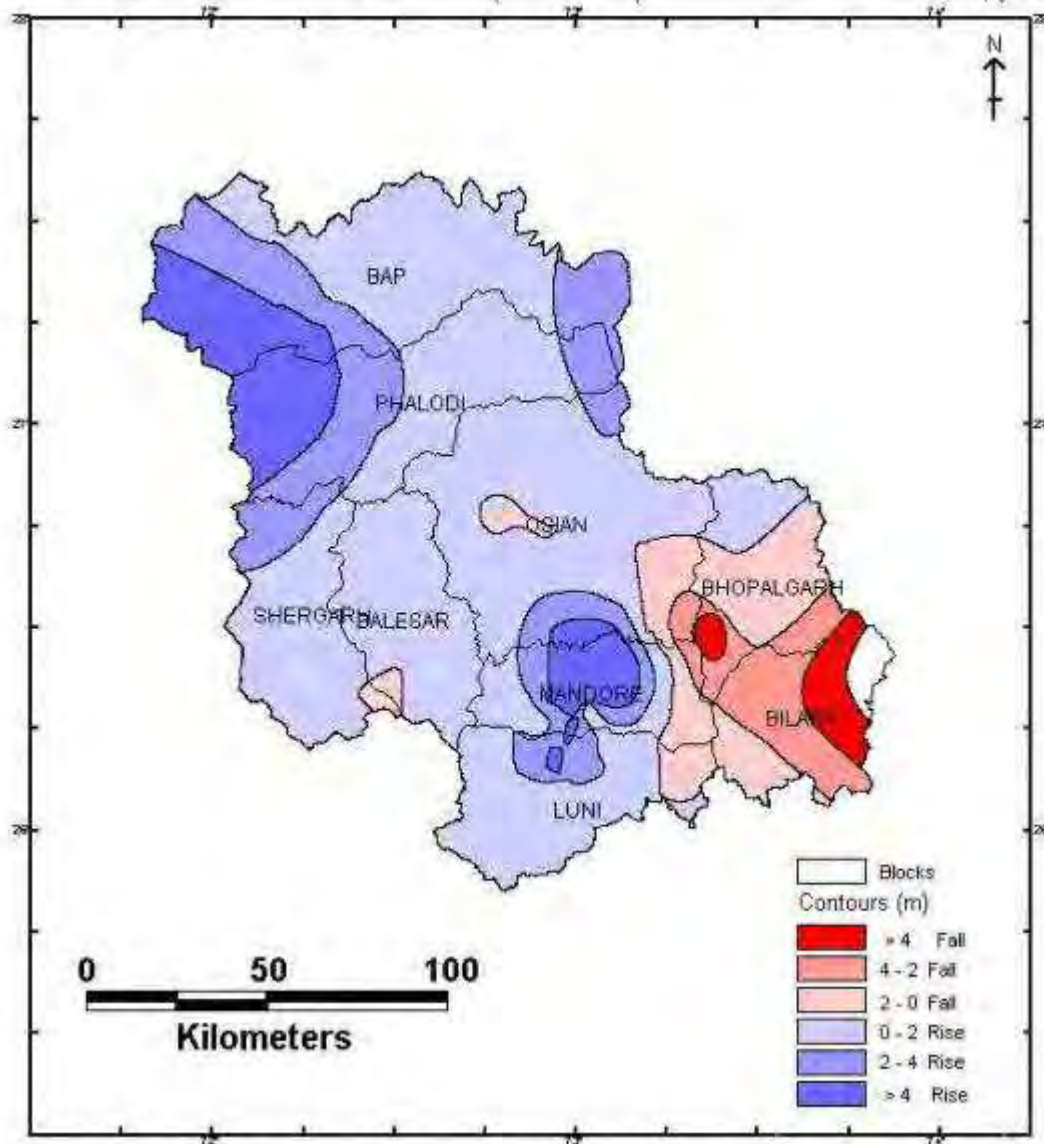
There is a large variation in chemical quality of ground water in the district depending on the characteristics of water bearing formation, movement of ground water and depth to water levels. The ground water in southern, south-eastern parts of the district, south and south west of district is saline. In northern part around Bap and extreme north, ground water quality is brackish to saline with electrical conductance generally ranging from 4000 to 10000 ms/cm at 25°C. Higher concentration of nitrate more than 100 ppm and fluoride more than 3 mg/l has been recorded for Bap Block of Jodhpur District.

4.5.3 Resource Availability

The stage of groundwater development of the district is 197 % , however the Bap tehsil falls under the safe category for groundwater development. The net groundwater availability in the Block is 59.2212 MCM and the annual gross draft is 16.2701 MCM . The stage of groundwater development of the Block is 27.47%. It is important to mention that with the coming up of the Indira Gandhi Irrigation canal, the

population of Bap block now draw water from the canal for domestic consumption and irrigation purposes. The groundwater demand has therefore further reduced in the Block.

Figure 4-2: Water level Fluctuation Map of Jodhpur District (Pre & Post monsoon -2006)



Source: Groundwater Scenario – Jodhpur, Rajasthan – Central Ground Water Board , Western Region

4.6 Climate

The district experiences arid to semi-arid type of climate. Mean annual rainfall (1971-2005) of the district is 326.8 mm whereas normal rainfall (1901-1970) is lower than average rainfall and placed at 296.1 mm. The rainy days are limited to maximum 15 in a year. Almost 80% of the total annual rainfall is received during the southwest monsoon, which enters the district in the first week of July and withdraws in the mid of September.

As the district lies in the desert area, it experiences extreme of heat in summer and cold. Both day and night temperatures increase gradually and reach their maximum values in May and June respectively. The temperature varies from 49 degree in summer to 1 degree in winter.

Atmosphere is generally dry except during the monsoon period. The humidity is highest in August with mean daily relative humidity is 81%. The annual maximum potential evapotranspiration in the district is quite high and it is highest (264.7 mm) in the month of May and lowest (76.5 mm) in the month of December.

4.6.1 Temperature

As per the Indian Meteorological Department, the mean daily maximum and minimum temperature recorded over a period of 100 years for the district is 41.4°C and 9.6°C.

Table 4-1: Average Monthly Temperature (1901-2000 year period)

Months	Mean Temperature	
	Max (°C)	Min (°C)
January	25.0	9.6
February	27.8	11.8
March	33.4	17.2
April	38.4	22.7
May	41.4	26.8
June	40.1	28.2
July	36.0	26.8
August	33.7	25.3
September	35.0	24.1
October	36.0	19.9
November	31.5	14.5
December	26.8	10.8

Source: IMD - Monthly mean maximum & minimum temperature and total rainfall based upon 1901-2000 data

4.6.2 Rainfall

Mean annual rainfall (1971-2005) of the district is 326.8 mm whereas normal rainfall (1901-1970) is lower than average rainfall and placed at 296.1 mm. The rainy days are limited to maximum 15 in a year. Almost 80% of the total annual rainfall is received during the southwest monsoon, which enters the district in the first week of July and withdraws in the mid of September.

The observations of rainfall for Jodhpur district for the last five years (2009-2013) as provided by the Hydro-met division of the India Meteorological Department is as given in Table below:

Table 4-2: Average Annual Rainfall for Jodhpur District (2007-2011)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2007	0.0	1.3	0.4	0.0	3.0	14.3	89.3	22.2	8.7	0.0	0.0	0.0	139.2
2008	0.3	0.1	0.0	1.3	0.1	22.1	109.1	147.1	111.8	0.0	40.3	8.9	441.1
2009	0.0	21.0	0.0	2.4	3.7	7.9	102.8	158.0	98.6	0.2	0.0	0.0	394.6
2010	0.5	0.0	0.0	19.0	9.3	10.9	20.6	181.3	107.0	0.1	0.0	0.1	348.8
2011	7.8	16.9	1.7	0.0	2.5	51.2	126.5	157.1	128.1	0.9	0.0	0.0	492.7
Average													363.3

Source: Indian Meteorological Department (IMD)

According to the information available for the last five years, the district receives an annual rainfall of about 363.3mm. The months of July, August and September receive most of the rainfall.

4.6.3 Wind

The average annual wind speed in the Jodhpur district is 2.6m/s. Table below gives the monthly values of the wind speed at Jodhpur.

Table 4-3: Average Annual Wind Speed for Jodhpur District (2013)

Month	Wind Speed (m/s)
January	1.1
February	1.3
March	1.5
April	1.8
May	3.0
June	3.1
July	2.9
August	2.4
September	1.7
October	1.0
November	0.8
December	0.9

Source: Detailed Project Report

4.7 Natural Hazards

4.7.1 Seismicity

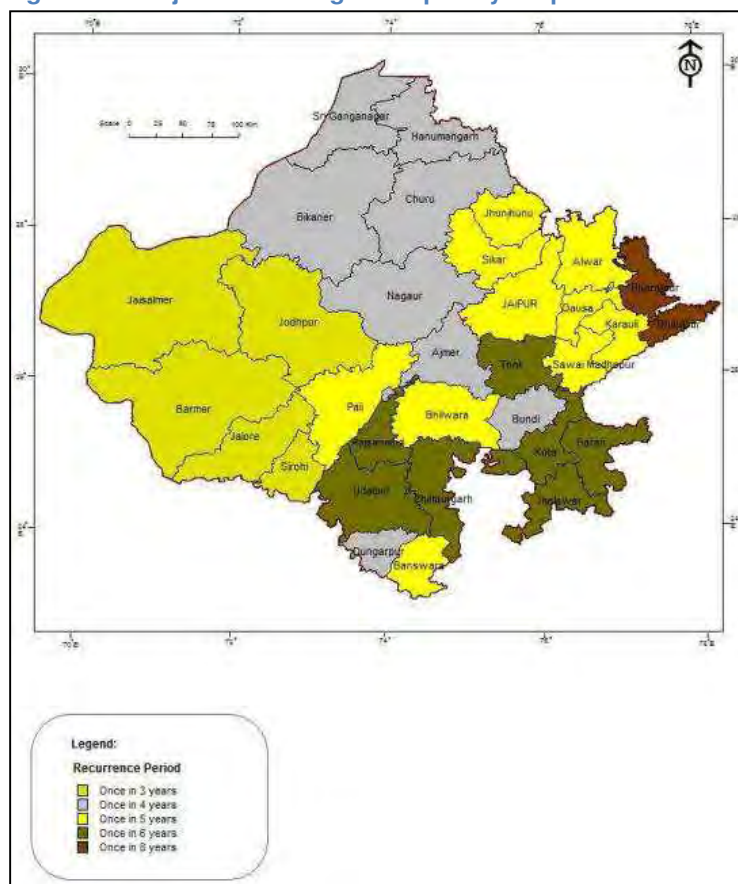
As per the seismic zoning map of India (given in the earthquake resistant design code of India [IS:1893, Part 1, 2002], the project site area falls in seismic Zone II, i.e the least active seismic zone and can be considered safe. The IScode assigns zone factor of 0.10 (maximum horizontal acceleration that can be experienced by a structure in this zone is 10% of gravitational acceleration) for Zone II.

4.7.2 Droughts

Drought analysis based on agriculture criteria indicates that the district is prone to mild and normal type of droughts. Occurrence of severe and very severe type of drought is very rare.

Drought is a phenomenon which is based on consideration of deviation of actual rainfall from normal. The study area falls in western part of Rajasthan which has semi-arid type of climate, comprising of undulating terrain, dry land cultivation (mostly rained) and barren (scrub) land. Drought is classified as 'moderate drought' if rainfall deficit is between 25 to 50% and 'severe drought' when it is more than 50%. As per the assessment undertaken by water resource department of Rajasthan, Jodhpur District has encountered six (6) droughts in period of 30 years starting from 1980 up to 2009. The severe drought was occurred in 2002 with average annual rainfall of 86.mm and last moderate drought was occurred in year of 2009 with 131.13mm as average annual rainfall. The year 2002 is the only severe drought year in the district when the average annual rainfall was 63.5% below the average. The years 1986, 1991, 1993, 1998 and 2009 are considered as moderate drought years as the average annual rainfall received is 38.2, 35.1, 32.1, 30.6 and 44.8 % below the average respectively. The drought frequency map of Rajasthan has been depicted below.

Figure 4-3: Rajasthan Drought Frequency Map



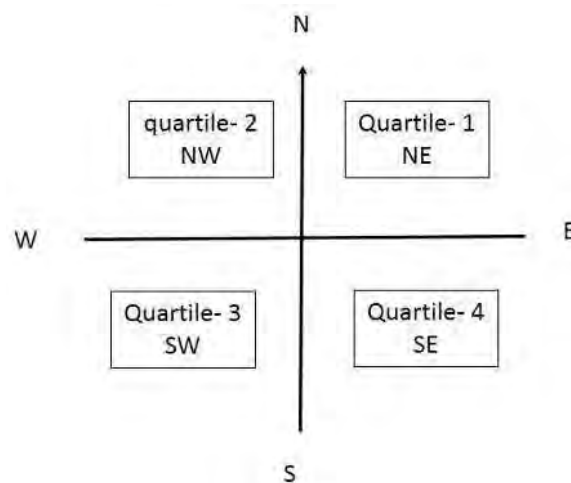
Source: Rajrelief.nic.in

4.8 Ecology

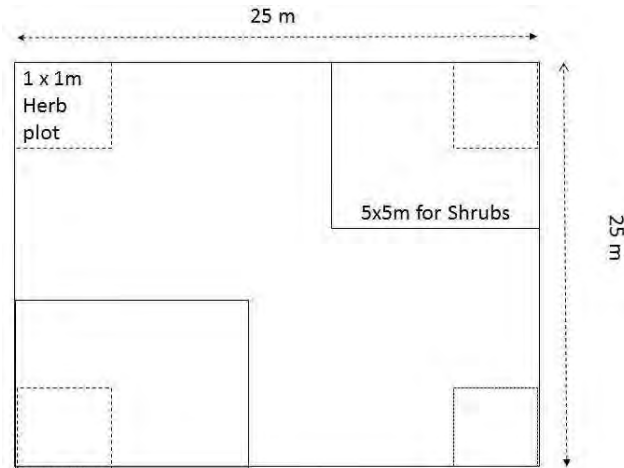
A detailed ecological assessment was undertaken in and around the Project area for a period of three days from 19th-21st July, 2014. The assessment focussed on identification of floral and faunal species, sensitive habitats, endangered species and forestland and estimating the bio-diversity indices. Secondary information was also collected from offices of Divisional Forest and Botanical and Zoological Surveys of India for ascertaining bio-diversity aspects. The approach to the ecological assessment was as follows:

Onsite Data Collection

- In order to provide representative ecological status for the study area, the 5-km buffer zone was divided into four quartiles for biodiversity sampling, i.e., NE (Q-1), NW (Q-2) SW (Q-3) and SE (Q-4). Each of the quartiles were examined for representative flora on randomly sampled quadrats for trees (25x25-m), shrubs (5x5-m) and herbs (1x1-m) depending upon prevailing geographical conditions and bio-diversity aspects of study area.



- For floral diversity assessment, a quadrat of approximately 25 m x 25 m was marked. The species of trees, as well as the number of individuals of each species, falling within this area were noted. A quadrat of approximately 5 m x 5 m was marked within this larger quadrat. The species of large and small shrubs, along with the number of individuals of each species, falling within this area were similarly noted. Smaller quadrats of 2 m x 2 m were employed for the herbs, both grasses and forbs.



- Faunal diversity was studied through direct evidence, in the form of visual sightings, and indirect evidence, such as calls, nests, burrows, droppings, scats, moults and tracks. In the case of fauna, only occurrence at a given site was noted, without seeking to enumerate the individuals sighted. To enable the study to encompass as wide a range of local faunal species as possible, the timings of the site-studies were planned to collectively capture as many faunal activity-periods as possible, from early morning till late in the evening.
- Species diversity was calculated by using Shannon and Wiener (1963) formula as follows:

$$H' = - \sum_{i=1}^R p_i \ln p_i$$

Where H' is Shannon index of general diversity, p_i is often the proportion of individuals belonging to the species in the dataset of interest.

- Other biodiversity aspects in the form of endemic status, keystone species, threatened status and IUCN, Red-data books of the Botanical Survey of India (BSI) have been screened to verify their conservation status.

Secondary Data Collection

Additional information was sourced from Forest department, available published literature, governmental institutions and local residents of the survey-area.

4.8.1 Landscape elements of the region

The study area falls in Bari Seer village, Bap Tehsil of Jodhpur district. The surrounding land use largely comprises of semi-arid region with seasonal sandy grasslands, and agricultural land use, and open wasteland (Photo 4.1). There is no ecologically sensitive area or wildlife corridor within 5-km radius of the project area. The nearest ecologically sensitive place is Gajner Wildlife Sanctuary, which is located at a distance of 80 km in north east direction from the site.

4.8.2 Overview of forest types of the region

The forest species within 5-km buffer zone belong to tropical thorn forests dominated by *Prosopis cineraria*, *P. juliflora*, *Calotropis procera* and *Capparis decidua*. Large proportion of the land is covered by sandy grass, which also acts as soil binder in the sand dune landscape. The plant species like species *Acacia Senegal* and *Khair (Capparis decidua)* found in the region also have medicinal values.

4.8.3 Biodiversity aspects of Flora

4.8.3.1 Core area

The proposed solar power plant site comprises of open semi-arid open area with the landuse covered with hard weathering rocks with grass cover (Photo 4-1) which may not be useable for any other purposes. A total of 13 plant species were recorded in randomly sampled five locations within core area (Table 4-4 and Table 4-5).

Overall herbs and grasses were observed to be distributed uniformly in core areas compared to shrubs and trees. The common herbs were *Cassia tora* followed by *Echinops echinatus*. The common grass species recorded included *Aristida mutabilis*, *Aristida sp*, *Cenchrus ciliaris*, *Lasiurus scindicus*, and *Panicum turgidum*. The commonest trees species are *Prosopis cineraria*, and *P. juliflora* (Table 4.3).

Table 4-4: Vegetation characteristics of Project Site

Core area	Habitat (total plots)	Species number	Density/ ha	Species diversity (H')	Evenness (E)
Overall	Tree (5)	2	12.8	0.945	0.945
	Shrub (10)	2	240	1.56	0.952
	Herbs (20)	4	5250	0.562	0.877
	Grass (20)	5	60 %*		

* Grass were estimated in percentage of core in 1x1 m sub plots.

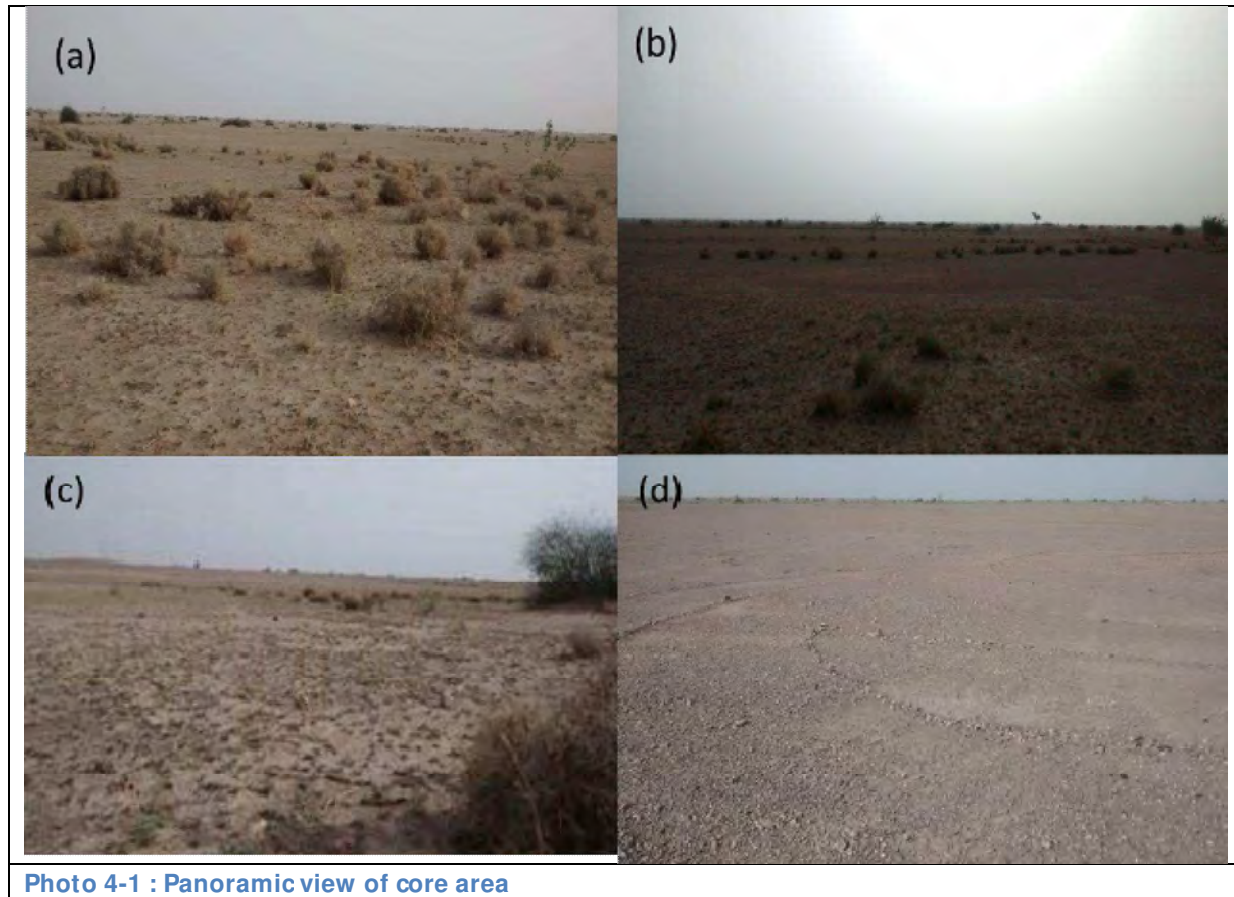


Photo 4-1 : Panoramic view of core area

4.8.3.2 Buffer area

Floral assessment

A total of 23 plant species were recorded within the buffer area encompassing 5-km radius around the project site. The details have been provided in Table 4-5 and Table 4-6. Out of the total 23 species identified, 4 belong to trees, 7 were shrubs, 7 were herbs and 5 were grass species. The life forms - trees, shrub and herbs (excluding grasses) were analysed at different quartiles given diversity, abundance, and evenness and has been presented in Table 4-5. Among the life-form tree diversity is lesser compared to shrubs and herbs. The common tree species observed were *Prosopis cineraria*, and *Prosopis juliflora* (Photo 4-2d). The most common shrub species are *Calotropis procera* and *Capparis decidua* (Photo 4-2c). The common grass species were *Aristida mutabilis*, *Aristida sp*, *Cenchrus ciliaris*, *Lasiurus scindicus*, and *Panicum turgidum* (Table 4.3).

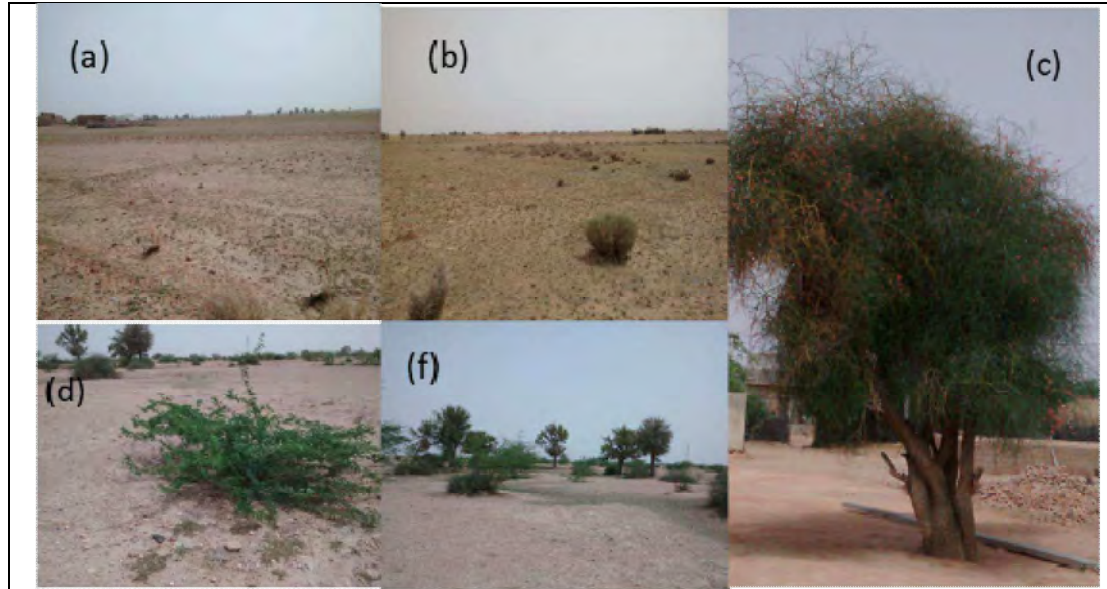


Photo 4-2 : Vegetation recorded in Buffer area (5-km)
[(a, b, d, & f) where (c) Khair (*Capparis decidua*) isa common plant species]

The flora recorded in 5-km buffer zone has been represented in four quartiles as given in Table 4-5. No significant changes in species composition were observed within the four quartiles. However, higher herb and grass were recorded in all quartile except quartile-IV which may be due to intensive agricultural practices. The quartile I (NE) & III (SW) lie along the State Highway road (MH-15), which may have disturbed the wildlife movement of both diurnal and nocturnal fauna, especially Chinkara, and many reptiles.

Table 4-5: Quartile-wise vegetation characteristics of buffer area

Quartile	Trees/ shrubs	Species number	Density/ ha	Species diversity (H')	Evenness (E)
Quartile I North-East	Tree	2	0039	0.562	0.877
	Shrubs	4	0600	1.240	0.864
	Herbs	3	2000	0.562	0.877
Quartile II North-West	Tree	2	0020	0.945	0.945
	Shrubs	4	0640	1.280	0.717
	Herbs	4	1500	1.099	0.577
Quartile III South-West	Tree	3	0010	0.945	0.945
	Shrubs	5	0240	1.560	0.952
	Herbs	2	1000	0.693	0.577
Quartile IV South-East	Tree	2	0023	0.981	0.981
	Shrubs	6	0520	1.670	0.887
	Herbs	2	0500	0.012	0.980
	Trees	4 (Total)	0023(Ave.)	0.858 (Ave.)	0.937 (Ave.)
	Shrubs	7 (Total)	0500 (Ave.)	1.437 (Ave.)	0.881 (Ave.)
	Herbs*	7 (Total)	1250 (Ave.)	0.591 (Ave.)	0.753 (Ave.)

* Grass species were excluded from the herbs

The vegetation data revealed that the number of plant species was very minimal and most of them were scattered in largely open arid area and small proportions under scrub remnant patches in the buffer

area. As per the IUCN status among the 23 species - 1 species Rare (locally) and 20 were least concern (common), 1 exotic species were recorded and 1 species could not identified (UNID). Overall 7 species were recorded as medicinal usage traditionally, and 7 species were used for livestock and fodder usage, and 1 species fruits were edible for local communities (Table 4-6: List of species recorded within core and buffer area

Table 4-6: List of species recorded within core and buffer area

Sl. No	Scientific name	Family	Core/ Buffer	Life forms	IUCN - RET/ Endemic/ Rare status	NTFP/ Medicinal value
1	Acacia catechu (Willd.)	Fabaceae	Buffer	shrub	Least concern	Medicinal plant
2	Acacia jacquemontii Benth.	Fabaceae	Buffer	shrub	Least concern	Medicinal plant
3	Acacia senegal Willd	Fabaceae	Buffer	shrub	Least concern	Medicinal plant
4	Aerva javanica (Burm.f.) Shult.	Amaranthaceae	Buffer	Herb	Least concern	
5	Aristida mutabilis L	Poaceae	Both	grass	Least concern	Livestock/ fodder
6	Aristida sp.	Poaceae	Both	grass	Least concern	Livestock/ fodder
7	Calotropis procera Aiton) W.T.Aiton	Asclepiadaceae	Both	shrub	Least concern	Medicinal plant
8	Capparis decidua (Forssk.) Edgew.	Capparaceae	Both	shrub	Least concern	Fruits edible
9	Cassia sp	Fabaceae	Both	Herb	Least concern	Medicinal plant
10	Cassia tora	Fabaceae	Both	Herb	Least concern	Medicinal plant
11	Cenchrus ciliaris L	Poaceae	Both	grass	Least concern	Livestock/ fodder
12	Dalbergia sissoo Roxb.	Fabaceae	Buffer	tree	Least concern	
13	Echinops echinatus Roxb.	Asteraceae	Both	Herb	Least concern	
14	Lasiurus scindicus Henrard	Poaceae	Both	grass	Least concern	Livestock/ fodder
15	Ocimum sp	Lamiaceae	Buffer	Herb	Least concern	
16	Panicum turgidum Forssk.	Poaceae	Both	grass	Least concern	Livestock/ fodder
17	Phyllanthus sp	Phyllanthaceae	Buffer	Herb	Least concern	
18	Prosopis cineraria (L.) Druce	Fabaceae	Both	tree	Least concern	Livestock/ fodder
19	Prosopis juliflora (Sw.) DC	Fabaceae	Both	tree	Exotic	Livestock/ fodder
20	Senna alexandrina Mill.	Fabaceae	Both	herb	Least concern	
21	Tecomella undulata D.Don	Bignoniaceae	Buffer	tree	Rare	Medicinal plant
22	Unid.sp1	Unid.sp1	Shrub	shrub	UNID	

Sl. No	Scientific name	Family	Core/ Buffer	Life forms	IUCN - RET/ Endemic/ Rare status	NTPF/ Medicinal value
23	Ziziphus nummularia Burm.f	Rhamnaceae	Shrub	shrub	Least concern	

The common plant species encountered were Prosopis cineraria, and P. juliflora in trees, and shrub - Calotropis procera (Photo 4-3) and Capparis decidua (Photo 4-4) and herbs Cassia sp., and Phyllanthus sp., and grass.



Photo 4-3 : Calotropis procera (common shrub)

4.8.3.3 Threatened species recorded in project area

Based on the primary survey, it was observed that no threatened plant species are present in the core or the buffer area. Most of the plant species are used in local traditional medicine and fruits were used as pickle (Capparis deciduas) (Photo 4-4).



Photo 4-4 : Capparis decidua common plant: flowering (right) and fruits

4.9 Biodiversity aspects of Fauna

The Bap tehsil is unique; as it forms the ecotone or transition area between the semi-arid sandy grassland and desert of west Rajasthan. Palatable grasses and larger stretchers of foraging area make this region suitable for ungulates and herbivores, along with ungulates one also comes across carnivores such as Jackal, common mongoose, Grey mongoose and Chinkara. Though there is no reserve forest within the buffer area, there is a huge open landuse which may sustain many wildlife in the region.

Most commonly seen mammals include Chinkara, Jackals, and reptiles. The vegetation sampling was carried out wherever wildlife assessment was carried out. Further, opportunistic survey to understand the habitat specific species and habitat association between certain faunal species and geological relationship were cross checked with published literatures.

4.9.1.1 Avifauna

A total of 72 species of birds were identified or were reported to be present in the study area. As per the Wildlife Protection Act 1972, two Schedule-I species were identified. Out of the 64 local resident species, 1 unclear, 3 endemic to the Indian subcontinent, 1 partially resident and altitudinal migrants, 1 winter visitor were identified (Table 4-7).

Table 4-7 : Details of Bird Species

S.N	Common name	Species name	Family	WPA schedule	Status
1	Asian pied starling	Sturnus contra	Sturnidae	Sch-IV	R
2	Barn Owl	Tyto alba	Tytonidae	Sch-IV	R
3	Barred Butonguail	Turnix suscitator	Turnicidae	Sch-IV	R

S.N	Common name	Species name	Family	WPA schedule	Status
4	Black Headed cocoo shrike	Coracina melanoptera	Campephagidae	Sch-IV	R
5	Blue-tailed Bee-eater	Merops philippinus	Meropidae	Sch-IV	M
6	Brahminy Kite	Haliastur indus	Accipitridae	Sch-IV	R
7	Brahminy starling	Sturnus pagodarum	Sturnidae	Sch-IV	R
8	Brahmny kite	Haliastur Indus	Accipitridae	Sch-IV	R
9	Brahmny Myna	Temenuchus pagodarum	Sturnidae	Sch-IV	R
10	Brown Hawk-Owl	Ninox scutulata	Strigidae	Sch-IV	R
11	Cattle Egret	Bubulcus ibis	Ardeidae	Sch-IV	R
12	Chestnut-headed Bee-eater	Merops leschenaulti	Meropidae	Sch-IV	R
13	Cinereous Vulture	Aegypius monachus	Accipitridae	Sch-IV	R
14	Common babbler	Turdoides caudata	Leiotherichidae	Sch-IV	R
15	Common green bee eater	Merops orientalis	Meropidae	Sch-IV	R
16	Common Hawk Cuckoo	Hierococcyx varius	Cuculidae	Sch-IV	R
17	Common kingfisher	Alcedo atthis	Alcedinidae	Sch-IV	R
18	Common Myna	Acridotheres tristis	Sturnidae	Sch-IV	R
19	Common Tailorbird	Orthotomus sutorius	Sylviinae	Sch-IV	R
20	Common Teal	Anas crecca	Anatidae	Sch-IV	W
21	Common woodshrike	Tephrodornis pondicerianus	Tephrodornithidae	Sch-IV	R
22	Crow Pheasant	Centropus sinensis	Cuculidae	Sch-IV	R
23	Crusted Bunting	Melophus lathami	Emberizidae	Sch-IV	RA
24	Dusky Eagle-Owl	Bubo coromandus	Strigidae	Sch-IV	R
25	Grey Francolin	Francolinus pondicerianus	Phasianidae	Sch-IV	R
26	Grey shrike	Lanius excubitor	Laniidae	Sch-IV	R/ MW
27	Honey buzzard	Pernis ptilorhynchus	Accipitridae	Sch-IV	R
28	House Crow	Corvus splendens	Corvidae	Sch-IV	R
29	House Sparrow	Passer domesticus	Passeridae	Sch-IV	R
30	House Swift	Apus affinis	Apodidae	Sch-IV	R
31	Indian Roller	Coracias benghalensis	Coraciidae	Sch-IV	R
32	Indian baya	Philippinus philippinus	Meropidae	Sch-IV	R
33	Indian Cuckoo	Megalaima merulinus	Cuculidae	Sch-IV	U
34	Indian Jungle Nightjar	Caprimulgus indicus	Caprimulgidae	Sch-IV	R
35	Indian pied kingfisher	Ceryle rudis	Cerylidae	Sch-IV	R
36	Indian Pond-Heron	Ardeola grayii	Ardeidae	Sch-IV	R
37	Indian spotted munia	Lonchura punctulata	Estrildidae	Sch-IV	RV
38	Indian tailor bird	Orthotomus sutorius	Cisticolidae	Sch-IV	R
39	Jungle Babler	Turdoides striatus	Cisticolidae	Sch-IV	R
40	Jungle Bush Quail	Perdica argoondah	Phasianidae	Sch-IV	E
41	Jungle Crow	Corvus macrorhynchus	Corvidae	Sch-IV	R
42	Jungle Owlet	Glaucidium radiatum	Strigidae	Sch-IV	R

S.N	Common name	Species name	Family	WPA schedule	Status
43	Large Indian parakeet	<i>Psittacula eupatriza nipalensis</i>	Psittaculidae	Sch-IV	R
44	Little Egret	<i>Egretta garzetta</i>	Ardeidae	Sch-IV	R
45	Little Grebe	<i>Tachybaptus ruficollis</i>	Podicipedidae	Sch-IV	R
46	Loten's Sunbird	<i>Nectarinia lotenia</i>	Nectariniidae	Sch-IV	R
47	Mottled Wood Owl	<i>Strix ocellata</i>	Strigidae	Sch-IV	E
48	Oriental Scops Owl	<i>Otus sunia</i>	Strigidae	Sch-IV	R
49	Oriental white eye	<i>Zosterops palpebrosus</i>	Zosteropidae	Sch-IV	R
50	Painted Francolin	<i>Francolinus pictus</i>	Phasianidae	Sch-IV	E
51	Paradise flycatchers	<i>Terpsiphone paradise</i>	Monarchidae	Sch-IV	R
52	Pea fowl	<i>Pavo cristatus</i>	Phasianidae	Sch-I	R
53	Pied Bushchat	<i>Saxicola caprata</i>	Muscicapidae	Sch-IV	R
54	Purple sunbird	<i>Nectarinia asiatica</i>	Nectariniidae	Sch-IV	R
55	Purple-rumped Sunbird	<i>Nectarinia zeylonica</i>	Nectariniidae	Sch-IV	R
56	Red Jungle Fowl	<i>Gallus gallus</i>	Phasianidae	Sch-IV	R
57	Red Turtle Dove	<i>Streptopelia tranquebarica</i>	Columbidae	Sch-IV	RV
58	Red-vented Bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae	Sch-IV	R
59	Red-wattled Lapwing	<i>Vanellus indicus</i>	Charadriidae	Sch-IV	R
60	Rock Pigeon	<i>Columbus livibus</i>	Columbidae	Sch-IV	R
61	Rufous Treepie	<i>Dendrocitta vagabunda</i>	Corvidae	Sch-IV	R
62	Scaly-brested Munia	<i>Lonchura kelaarti</i>	Estrildidae	Sch-IV	R
63	Shikra	<i>Accipiter badius</i>	Accipitridae	Sch-IV	R
64	Small Minivet	<i>Pericrocotus cinnamomeus</i>	Campephagidae	Sch-IV	R
65	Spotted Dove	<i>Streptopelia chinensis</i>	Columbidae	Sch-IV	R
66	Spotted Owlet	<i>Athene brama</i>	Strigidae	Sch-IV	R
67	Tawny Eagle	<i>Aquila rapens</i>	Accipitridae	Sch - I	R
68	Thick-billed Flowerpecker	<i>Dicaeum agile</i>	Dicaeidae	Sch-IV	R
69	Weaver bird	<i>Ploceus philippinus</i>	Ploceidae	Sch-IV	R
70	White browed Bulbul	<i>Pycnonotus jokokus</i>	Pycnonotidae	Sch-IV	R
71	White browed fantail	<i>Rhipidura aureola</i>	Rhipiduridae	Sch-IV	R
72	White rumped vulture	<i>Gyps bengalensis</i>	Accipitridae	Sch-IV	R

(M - Migratory, R - Resident, U - unclear, E - Endemic, V – Vulnerable; W = winter visor; MR = species as partly resident and partly altitudinal migrant).

4.9.1.2 Mammals

A total of 10 species of mammals were reported for the Bap region. The most common species sighted during the survey and reported by local community included Indian hare, Rats, Jakal and Chinkara. (Table 4-8).

Table 4-8: List of mammals reported for Bap Tehsil, Jodhpur districts, Rajasthan

S.N	Common name	Species name	Family	WPA schedule	Associate habitat **
1	Common grey mongoose	Herpestes edwardsii	Herpestidae	Sch-IV	Scrub forest/fringe of forest/ rocky regions/ open grass
2	Indian Hare	Lepus nigricollis	Leporidae	Sch-IV	Scrub forest/ grass land / woody grassland
3	Rat	Rattus rattus	Muridae	Sch-V	Scrub forest/ grass land / woody grassland
4	Nilgai	Bosephalus tragocamelus	Bovidae	Sch-III	woody grass land/ rocky cliff
5	Desert fox	Vulpus vulpes pusilla	Canidae	Sch-II	grass land / desert / semi-arid area
6	Short tailed Bandicoot rat	Nesokia indica	Muridae	Sch-V	Scrub forest/ rocky region
7	Lesser bandicoot rat	Bandicota bengalensis	Muridae	Sch-V	Scrub forest/ grass land / woody grassland
8	Jackal	Canis auries	Canidae	Sch-III	Fringe of forest/ scrub forest/ rocky regions
9	Indian Gerbil	Tatera indica	Muridae	Sch-V	Scrub forest/ grass land / woody grassland
10	Indian Gazelle (Chinkara)	Gazella bennettii	Bovidae	Sch-I	Desert and arid regions/ grass land

Source - * Sharma 2004; ** Vivek Menon 2003

4.9.1.3 Reptiles

A total 12 reptile species were reportedly present in the region, out of which 6 species of snakes and 6 species of lizards were recorded. As per the Wildlife Protection Act, Desert monitor lizard and Saw-scaled Viper falls in Schedule -II, Common cat snake in Schedule -III and 9 species under Schedule -IV were recorded within the 5-km radius. The snakes mostly preferred open grassland to semi-arid rocky habitats whereas lizards and skinks also preferred open to scrub forest bushes (**Table 4.6**).

Table 4-9: List of reptiles reported for Bap Tehsil, Jodhpur

S.N	Common name	Species name	Family	WPA schedule	Associated habitats
1	Common cat snake	Boiga trigonata	Colubridae	Sch-III	open grassland / open arid region
2	Indian cobra	Naja naja	Elapidae	Sch-IV	plains, jungles, open fields and the regions heavily populated by people
3	Barred wolf snake	Lycodon striatus	Colubridae	Sch-IV	open grassland / open arid region
4	Common Wolf Snake	Lycodon aulicus	Colubridae	Sch-IV	open grassland/ scrub forest
5	Common Krait	Bungarus caeruleus	Elapidae	Sch-IV	Rocky areas/ scrub forest/ arid region
6	Saw-scaled Viper	Echis carinatus	Viperidae	Sch-II	scrub forest/ arid region

S.N	Common name	Species name	Family	WPA schedule	Associated habitats
7	Hardwicke's Short Tail Agama	Brachysaura minor	Agamidae	Sch-IV	Open area/ dry arid regions
8	Indian chameleon	Chamaeleo zeylanicus	Chamaeleonidae	Sch-IV	Rocky areas/ scrub forest
9	Fan Throated Lizard	Stana ponticeriana	Agamidae	Sch-IV	Open area/ dry scrub forest
10	Low Lying Gecko	Microgecko depressus	Gekkonidae	Sch-IV	Open area/ scrub forest
11	Desert Monitor	Varanus griseus	Varanidae	Sch-II	Desert and arid regions/ open arid landuse
12	Indian Fringe-fingered Lizard	Acanthodactylus cantoris	Lacertidae	Sch-IV	Desert and arid regions/ open arid landuse

4.10 Socio Economic Profile and Stakeholder Consultations

A social impact assessment (SIA) and stakeholder consultation was undertaken to understand the overall social and economic status of the people residing within the vicinity of the proposed project. This comprehension will help the project planners to make an assessment of the overall impacts of the proposed project on socio-economic aspects of the communities in the area.

4.10.1 Objective of the Study

The SIA study focussed on identification of stakeholders (direct and indirect) and assessment of impacts, issues/ concerns and benefits/ expectations from the project on the population. The study provides a detailed summary of the present socio-economic baseline of the study population in Bari Seer Village. It further attempts to measure the socio-economic changes that will come about with the proposed project and its influence on the resident population by encompassing information acquired through the interviews and focussed group discussions conducted.

The following methods were used as a benchmark to attain the required information for the social baseline:

- Identification of stakeholders
- Stakeholders consultations and
- Stakeholders connection and influence levels on the project of households within 3 km radius of the project site.

The stakeholder consultations process involved:

- Consultations with relevant community representative
- Discussions with locals residing within the villages near the project site
- Discussions with women residing within the immediate vicinity of the project site

4.10.2 Study Area

RSEPL has leased 275 bigha (44.15 hectares) in Khasra No. 124 (as mentioned in the District Collector's Allotment Letter issued to M/s Ranji Solar Energy Private Limited dated 17th October 2014 and which has been attached as an **Annexure II**) of revenue land from the Government of Rajasthan for the proposed solar plant. The delineated area for the study has been identified giving significance to the area where the land is going to be leased from and the impact of the project on the surrounding areas within 3 km radius of the project site as the nearest settlements are approximately 3 km away from the proposed site.

4.10.2.1 Project Influenced Area

Within the surrounding areas of 3 km radius of the project site lies two settlements, Bari Seer village which is approximately 3 km from the project site and Nawagaon dhani which is 2 km from the project site, both of which are under the Bari Seer Panchayat.

4.10.3 Study Approach and Methodology

The approach that was adopted for the study included the following elements,

Literature Review of Secondary Data: The study included review of secondary information obtained from statistical abstracts of Census Report of India 2001 and 2011 along with District Socio Economic Reports, Economic Census, Industries Survey, Livestock Census, Rajasthan State Government and District websites which were compiled to give an overview of the socio-economic baseline.

Legislative Review: The study incorporated relevant social legislation, regulations, guidelines and standards which were reviewed and compiled.

Baseline Data Collection: A focus group discussion to gather the primary data was conducted to ensure establishment of proper baseline information.

Identification of potential social impacts: The information collected through the focus group discussion was primarily collected to identify the potential social issues and this was supplemented by guidelines of Equator Principles, ADB Safeguard Policy Statement (2009), ADB's Social Protection Strategy (2001), ADB's Public Communications Policy (2011) and IFC Performance Standards.

Impact Assessment: The socio - economic and project information were collected to assess the potential impacts of the proposed activities. The assessment covered the following aspects:

- The present baseline conditions and consultations with the local communities
- The potential changes in the social parameters likely to be affected by project related activities
- The identification of potential impacts
- The evaluation of the likelihood and significance of potential impacts
- The defining of mitigation measures to reduce impacts to as low as practicable

Methodology

A meeting with the project proponent was initially conducted to develop a common understanding of the project activities, requirements and to identify a continuous point of contact for all future correspondence.

The baseline information included aspects like demographic information, economic activities, literacy profile, land use, infrastructure resource, economic facilities, cultural heritage, life style and other value system.

The following methods were used as a benchmark to collate the baseline information:

- Stakeholders consultation meeting which included the Project Influenced Population within 3 Km radius of the project site

The delineation of Preliminary Stakeholders were based on the following points,

- the type of stakeholders, and
- their connection and influence levels on the project.

An open ended questionnaire was prepared for the focus group discussions prior to the start of the consultation process to obtain the information from the population. Different stakeholder groups were consulted to understand the concerns/ issues, expectations/ benefits and other advantages that they have on the project.

4.10.4 Administrative Set Up

Rajasthan has been divided into thirty three districts because of its sheer size of being the largest state in India accounting to 11% of the total land area. Jodhpur District is one of the larger districts of Rajasthan and comes under the Arid Zone of the State. The District covers 11.60% of the total area of the arid zone. For administrative purpose, Jodhpur District has been sub divided into seven sub divisions, namely, Pipar City, Shergarh, Osian, Luni, Bhopalgarh and Phalodi. The sub divisions have further been divided into eleven tehsils namely, Phalodi, Osian, Bhopalgarh, Jodhpur, Shergarh, Luni, Mandore, Bilara, Bawadi, Baap and Balesar and two independent up tehsils (sub tehsils) namely, Jhanwar and Tinwari. There are ten Panchayat Samities namely, Mandore, Luni, Osian, Baori, Baap, Phalodi, Shergarh, Balesar, Bhopalgarh and Bilara within Jodhpur District which works for the villages under the Tehsil level. The Panchayat Samities forms the link between the Gram Panchayat and the District Office. Below the Gram Panchayat level are the revenue villages. There are a total of 1862 revenue villages under 339 Gram Panchayats in Jodhpur District. The thematic administrative set up of Jodhpur District has been provided in Figure 4-4.

4.10.5 Demographic Profile of Jodhpur District

According to the 2011 Census, the total population of Jodhpur District was 3,687,165 which comprised 5.37% of the State's (Rajasthan) population. As compared to the 2001 Census Data, the population has seen a rise of 27.69% from 2,886,505. The male and female population as per the 2011 Census Data comprised 52.17% and 47.82% of the total population. Both the male and female population have shown a slight variation as compared to the 2001 Census Data, wherein the male population comprised of 52.44% and female population was 47.55% of the total population. The sex ratio as per the 2011 Census data was 915 females (to every 1000 males) which is higher than a decade ago (2001) with 907 females (to every 1000 males). The households in the District as per the 2011 Census Data was 649,013 which have also shown an increase from 456,877 households as was present during the 2001 Census Data. In

Figure 4-5 the decadal population growth of Jodhpur District has been provided.

Figure 4-4: Thematic Administrative set up of Jodhpur District

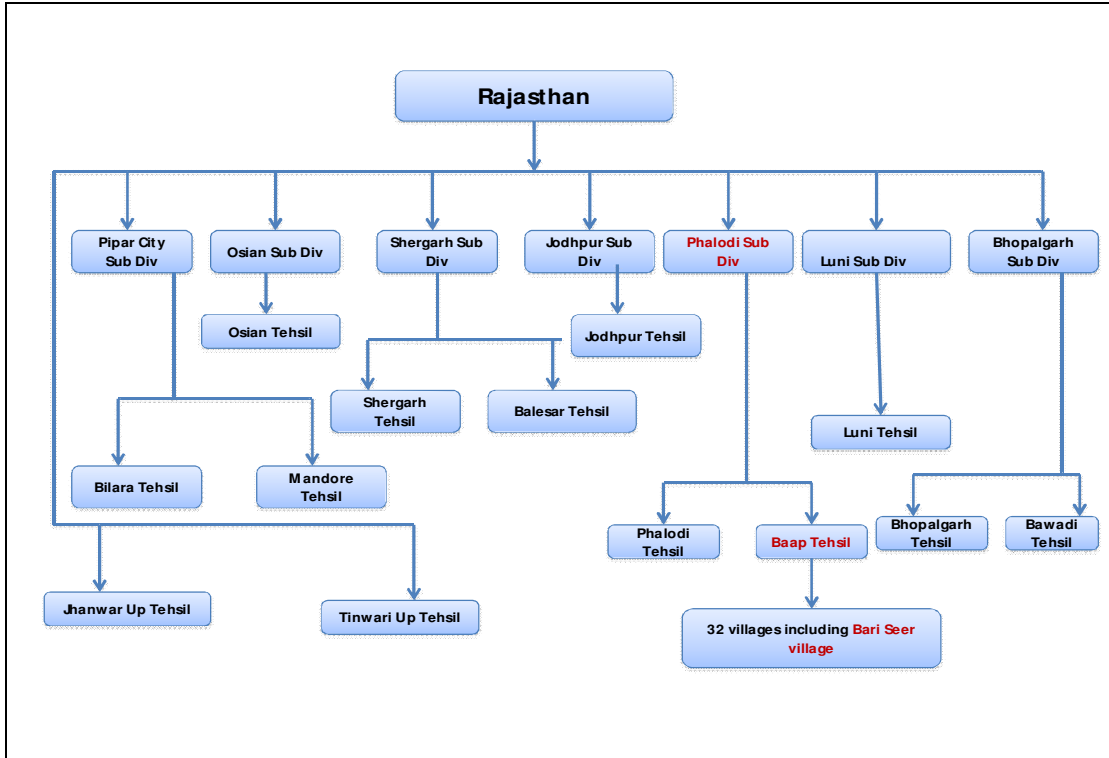
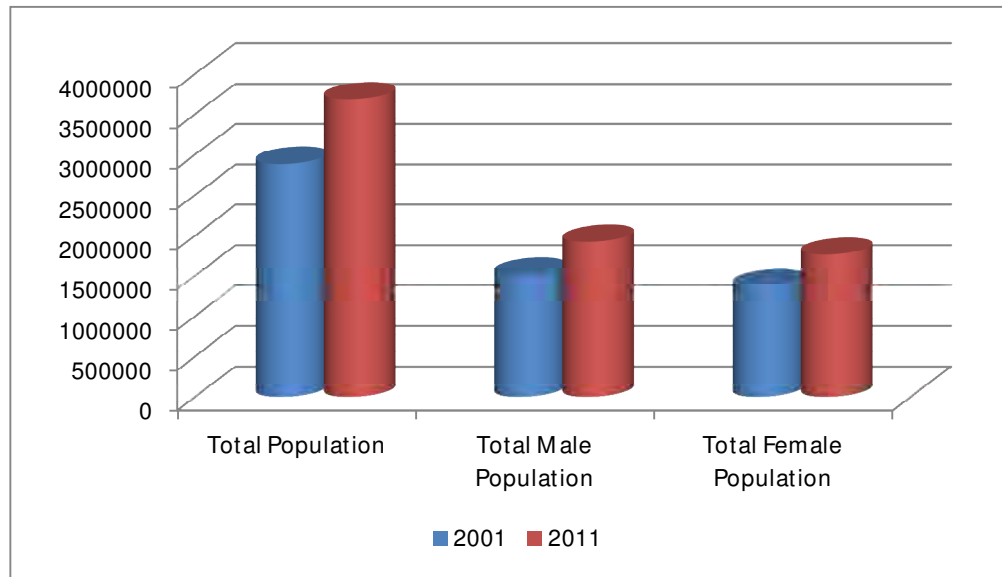


Figure 4-5: Decadal Population Growth of Jodhpur District (2001-2011)



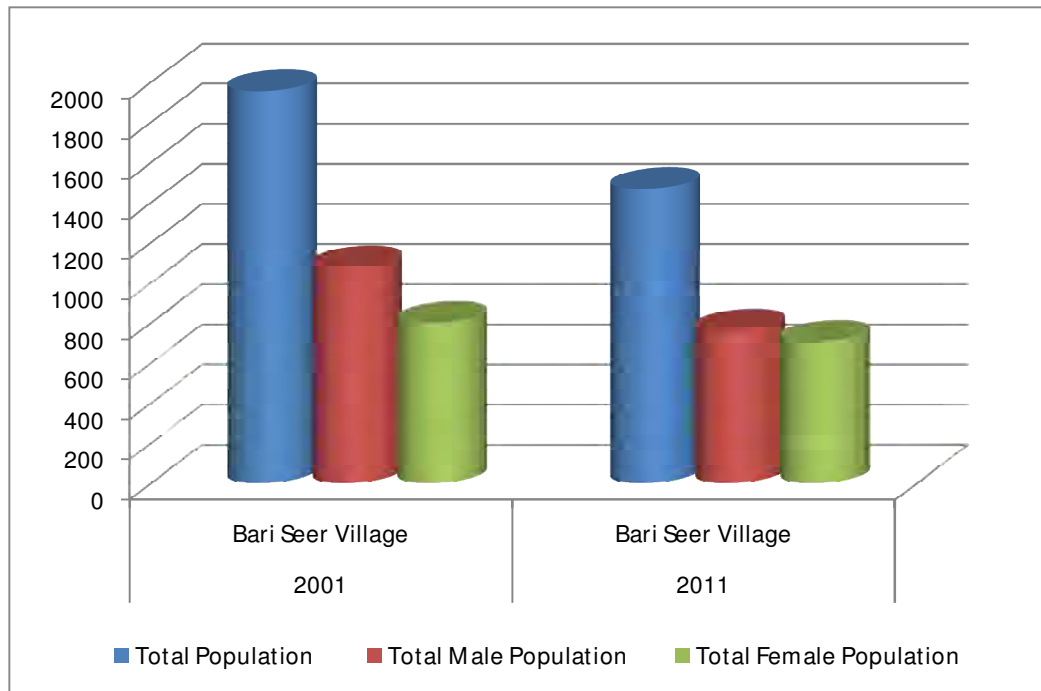
Source: 2001 and 2011 Census Data

Project Influenced Population

As per the 2011 Census Data, the total population of Bari Seer Village showed a decline at 1469 as compared the 2001 Census Data at 1955. The total male and female population as per 2011 Census Data was 51.94% and 48.05% of the total population. This was relatively higher in 2001 wherein the male and female population comprised 54.98% and 40.92% of the total population. The sex ratio as per 2011 was 925 females to every 1000 males which also were significantly higher than 2001 Census where the sex ratio was 744 females to every 1000 males. The households have also shown a decreased trend from 298 in the year 2001 to 219 in the year 2011.

As per consultations carried out with the Sarpanch of Bari Seer Panchayat, there are approximately 400 people residing in 101 household in Nawagaon dhani. It is assumed that the Census Data of Bari Seer Village has captured the population of Nawagaon dhani as well, as there is no separate reference to Nawagaon dhani in the Official Census records.

Figure 4-6: Decadal Population Growth of Bari Seer Village (2001-2011)



Source: 2001 and 2011 Census Data

Poverty Level Status

The level of poverty in an area highlights the economic status of the people and whether they are able to afford certain amenities for their survival. The Below Poverty Level (BPL) status is taken by the Government of India as an economic benchmark and poverty threshold to indicate the economic disadvantage and identify individuals and households in need of government assistance and aid.

In order to gather a sense of the level of poverty existing in Rajasthan, details of BPL status prevailing in the District and project influenced population of Bari Seer have been provided. As per the Official Government Website on BPL status in Rajasthan, 70887 BPL families are present in Jodhpur District. The details of the BPL families falling under the District and in Bari Seer Village are provided in Table 4-10.

Table 4-10 : Status of BPL Families in Jodhpur District and Bari Seer village

S. No.	Place	BPL Families	Non BPL Families	Total
1	Jodhpur District	70887	304817	375704
2	Bari Seer Village	38	229	267

Source: http://164.100.153.5/bpl/dist_wise_bpl.asp

According to the table presented above, 1.92% families of Jodhpur District's fall below the poverty line status while in Bari Seer Village, there are 2.58% BPL families present. Despite the various poverty alleviation schemes like Jawahar Rojgar Yojna and Employment Assurance Scheme adopted by the State Government in various parts of the State of Rajasthan, the improvement of poverty level is still unsatisfactory in the State. Depending upon the trend in poverty level as mentioned in the Rajasthan Human Development Report 2002, the issues which were highlighted were:

- Drought has had a severe impact on the lives of the people such as loss of land, cattle and household goods and valuables. This has been often magnified by debt and bondage which has resulted in external shock to the peasant economy. A prolonged period of drought also alters the asset base of the people by making them rely on alternate coping mechanism to reduce risks which include 1) migration of one or more male members for employment, trade and commerce seasonally or permanently; 2) animal husbandry as an additional livelihood source, during years of drought, cattle are sold or part of the families move outside the area with the cattle in search of fodder; 3) diversification to more than one livelihood/income source as a risk reduction behaviour; 4) adopting non agriculture based livelihoods including traditional skills practices by some caste groups women such as embroidery, patchwork, appliqué, wood carving and quilt making.
- Underemployment leading to migration of the population to other areas within the State and outside in period of crises is also widespread. Employment in mining and quarrying, construction and small trading and manufacturing often result in poor dividend because of the meagre wages and substandard working conditions. The large number of migrants also leads to competitive low wages especially under the unorganized labour market.

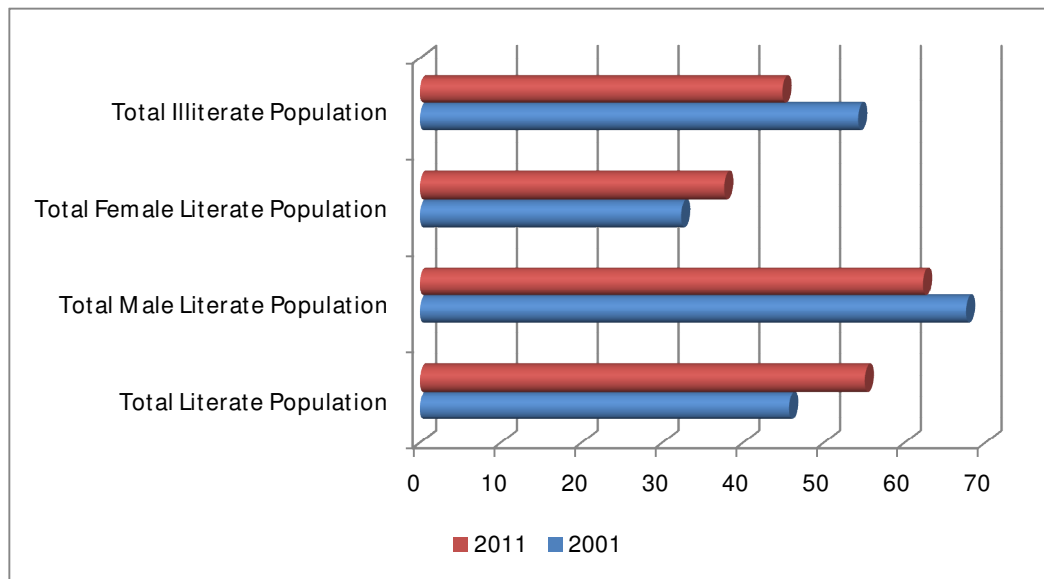
As per the consultations conducted with the communities based at Bari Seer Village and Nawagaon dhani, the people consulted confirmed that some percentage of the adult male population migrate to other parts of the State due to lack of employment opportunities in the area. However, many of the adult male population also tend to gather industrial training qualification from Industrial Training Institutes and in the process acquire semi skill qualification which helps them obtaining semi skilled jobs as drivers, mechanics, electricians and plumbers in bigger cities within the State. In addition, as a word of mouth trend within the State of Rajasthan which is prevalent in the area is that in any development projects, the local population are generally hired to undertake the activities relating to construction work. Unless the activities involve technical work wherein skilled professions are required which usually come from out of the State, almost all the other civil construction work are undertaken by the locals.

4.10.5.1 Literacy Level

The total literate population as per the 2011 Census Data in Jodhpur District was 55.09% of the total population as compared to 45.72% in 2001. The male literate population saw a slight decrease of 62.30% as compared to 67.63% in 2001. However, the female literate population showed a slight rise in 2011 at 37.69% as compared to 32.36% in 2001. The total illiterate population as per the Census data of 2011 and 2001 highlights decrease of illiterates in the District at 44.50% in 2011 as compared to 54.27% illiterates in 2001. The decadal literacy level in the district has been provided in

Figure 4-7

Figure 4-7: Decadal Literacy Level in Jodhpur District (2001-2011)

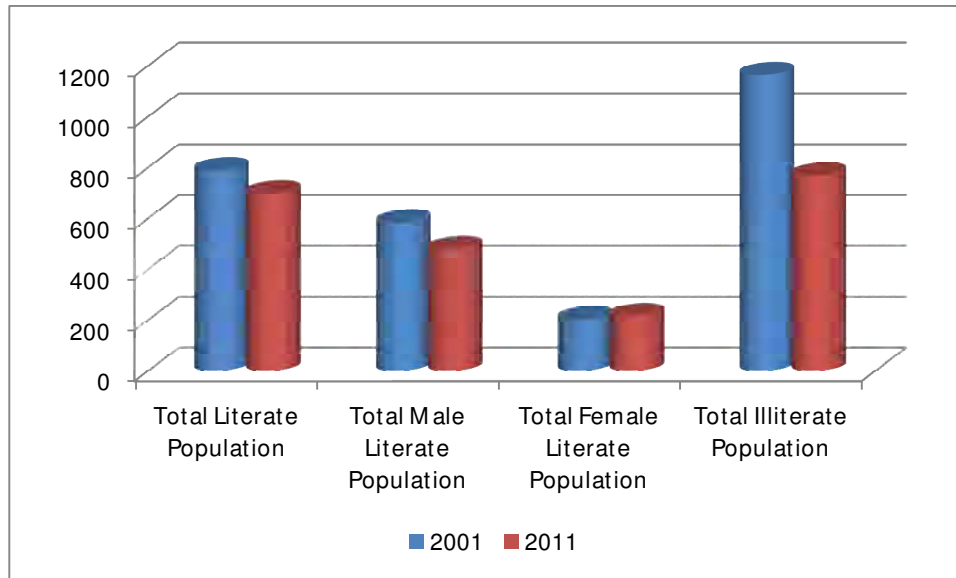


Source: 2001 and 2011 Census Data

Project Influenced Population

According to the 2011 Census Data, the total literate population in Bari Seer village was 47.58% which is slightly higher than the literate population in 2001 at 40.40%. The total male literate population has shown a slight decline in 2011 at 68.95% from 74.05% in 2001. The total female literate population has highlighted an increase at 31.04% in 2011 from 25.94% in 2001. The total illiterate population in the village has shown a marginal drop from 59.59% in 2001 to 52.41% in 2011. The decadal growth of literate and illiterate population of Bari Seer village has been given in Figure 4-8.

Figure 4-8: Decadal Growth of Literate and Illiterate Population in Bari Seer Village (2001-2011)



Source: 2001 and 2011 Census Data

As per the consultations conducted with the community members based at Bari Seer village and Nawagaon dhani, it was mentioned that most of the male population are educated till Grade X while the women are often not educated and if they are allowed to go to school, they are usually educated till Grade V. However, in recent years the younger generation of both genders are more likely to be enrolled in schools because of awareness of the importance of education in the area.

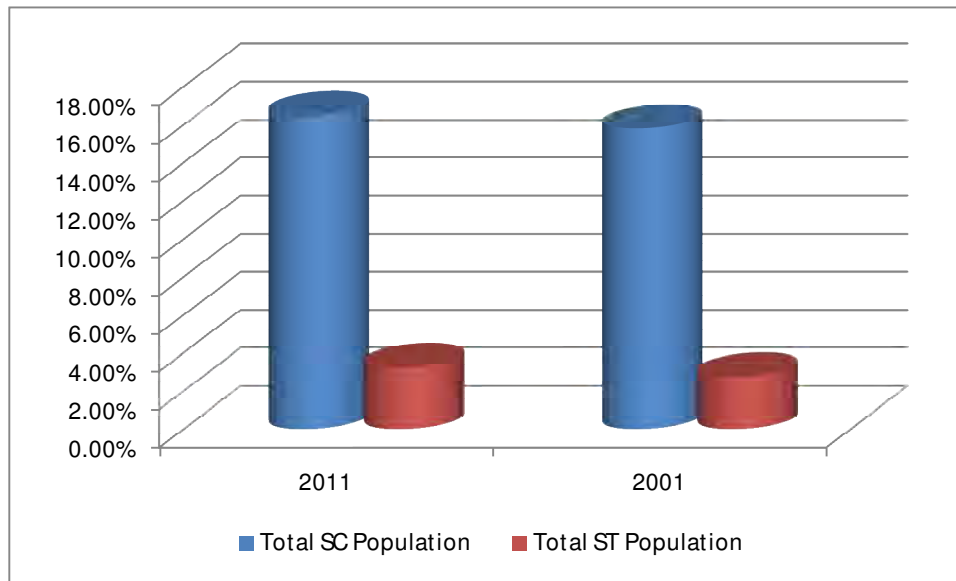
4.10.5.2 Social Stratification

Social stratification is a concept which classifies people into groups based on the hierarchical structures of class and status in any society. In India, the society is stratified along caste and tribe lineage. The terminology of Scheduled Caste and Tribe has been adopted in the Constitution of India and a sizeable amount of people fall within both these categories. These categories of people highlight the disadvantaged and oppressed classes. The Schedule Castes (SC) and Schedule Tribes (ST) population form about seventy percent (70%) and twelve percent (12%) of Rajasthan's population respectively. According to the Social Justice and Empowerment Department,⁵ Government of Rajasthan, Rajasthan has 59 Scheduled Caste, 12 Scheduled Tribes, 78 Backward Classes and 4 Special Backward Classes. The population of STs in Rajasthan is nearly double of the national average, with original inhabitants like Bhils and the Meenas forming the largest groups. A host of lesser known tribes like Sahariyas, Damariyas, Garasias, and Lohars still form important groups.

As per the 2011 Census Data, the total SC and ST population in Jodhpur District were 16.49% and 3.22% of the total population respectively. There has been a slight increase in the populations as compared to the 2001 Census Data wherein the SC and ST population were recorded at 15.81% and 2.75% of the total population. The total SC and ST population as per the Census Data 2001 and 2011 have been provided in Figure 4-9.

⁵ <http://www.sje.rajasthan.gov.in/About%20Deptt/Background.htm>

Figure 4-9: Decadal Total SC and ST Population of Jodhpur District (2001-2011)



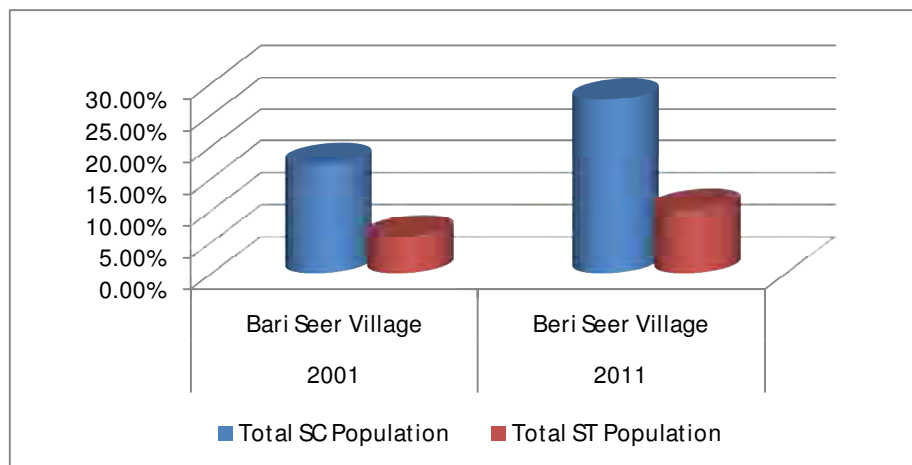
Source: Census Data 2001 and 2011

Project Influenced Population

According to the 2011 Census Data, the total SC and ST population in Bari Seer village comprised 27.36% and 10.14% of the total population respectively. As compared to the 2001 Census Data, the SC and ST population have shown a slight decrease wherein SC population comprised 17.18% and ST population 5.93% of the total population.

The total SC and ST population of Bari Seer village have been provided in Figure 4-10.

Figure 4-10 : Total SC and ST population in Bari Seer village



Source: Census Data 2001 and 2011

The consultations conducted in the village of Bari Seer and Nawagaon dhani highlighted that all the population follow Hinduism. In addition, approximately 60% of the population in Bari Seer belong to the Rajput caste, while the remaining 40% comprise population belonging to the Brahmin; lower caste like

Sunuvar, Megwar, Suthar, Chamar and Sunar; Bishois and ST's like Bhil, Jogan, Banjara and others. In Nawagaon dhani, the population mainly comprises of lower caste people and form the same group that are present in Bari Seer Village.

4.10.5.3 Workforce and occupation Participation

Work force participation rate is defined as the percentage of total workers (main and marginal⁶) as compared to the total population. The industrial category of main work comprises agriculture & allied activities, mining & quarrying, manufacturing, electricity, gas & water supply, wholesale, retail trade, hotel & restaurant, transport, storage & communications, financial intermediation, real estate, business activities and other services. In Jodhpur District as per the 2011 Census Data, the total working population comprised 40.40% of the total population. Out of the total working population, the total main and marginal workers were 70.91% and 29.08% respectively. The total non workers comprised 59.59% of the total population in Jodhpur District. The working population has shown a slight increase from 2001 wherein only 38.28% of the total population were engaged in some kind of employment. The total non workers have shown a slight decrease from 61.71% as was present in 2001. The details of main and marginal workers engaged in Jodhpur District have been provided in Table 4-11.

Table 4-11: Total main and marginal workers in Jodhpur District

Category	2001			2011		
	Total Population	Male Population	Female Population	Total Population	Male Population	Female Population
Total Workers	1105009	733195	371814	1489741	965103	524638
Main Workers	829721	635061	194660	1056479	803328	253151
Main Cultivators	375334	236982	138352	398287	253197	145090
Main Agricultural Labourers	47719	29384	18335	103001	62642	40359
Main Household Industry	26586	21687	4899	32550	25789	6761
Main Others	380082	347008	33074	522641	461700	60941
Marginal Workers	275288	98134	177154	433262	161775	271487
Marginal Cultivators	170231	51470	118761	194083	65973	128110
Marginal Agricultural Labourers	61852	19302	42550	139016	44114	94902
Marginal Household Industry	6496	2163	4333	9862	3638	6224
Marginal Others	36709	25199	11510	90301	48050	42251
Non Workers	1781496	780695	1000801	2197424	958825	1238599

Source: Census Data 2001 and 2011

As observed in the table above, the proportion of male workers are much higher than female workers largely due to the fact that women till date especially in rural areas still observe the purdah (veiled) system and are not allowed to step out of the house without men accompanying them.

⁶ Those workers who did not work for at least 183 days in the preceding 12 months to the census taking are termed as marginal workers.

Project Influenced Population

According to the 2011 Census Data, the total working population in Bari Seer Village was 41.45% of the total population wherein 57.47% and 42.52% comprised of male and female workers respectively. The main workers consisted 49.58% and marginal workers 50.41% of the total working population. The non workers comprised 58.59% of the total population wherein male non workers were 48.02% and female non workers were 51.97%. These data show a decrease in the working population as compared to 2001 Census Data where 59.33% of the total population were engaged in some kind of profession. The female working population was higher in 2001 at 55.43%. However, the non workers were higher in 2001 at 68.53%. The details of main and marginal workers in Bari Seer village have been given in

Table 4-12

Table 4-12: Details of working population in Bari Seer Village

Category	2001			2011		
	Total Population	Male Population	Female Population	Total Population	Male Population	Female Population
Bari Seer Village						
Total Workers	1160	672	488	609	350	259
Main Workers	643	474	169	302	272	30
Marginal Workers	517	198	319	307	78	229
Non Workers	795	403	392	860	413	447

Source: Census Data 2001 and 2011

According to the consultations undertaken in Bari Seer village and Nawagaon dhani, majority of the population are engaged in the cultivation of guar, bajra and peanuts while some of the population are engaged as unskilled and semi-skilled workers like daily wage, agricultural labourers, driving, carpentry, electrician and mechanics.

4.10.5.4 Existing Public Amenities

Availability and non-availability of social infrastructure amenities and facilities indicates the development pattern of the area and the well-being and quality of life of the population. The particulars of the existing public amenities in Jodhpur District have been mentioned in the following:

Education Facilities

According to the District Elementary Education (Provisional) Report Card 2011-12, Jodhpur District has a total of 5660 schools. The details of the schools present in the district have been detailed in Table 4-13

Table 4-13: Details of schools present in Jodhpur District

School Category	Total Schools		
	Government	Private	Unrecognized
Primary only	2540	191	96
Primary with Upper Primary	1054	1007	21
Primary with Upper Primary & Sec/ Higher Secondary	108	281	1
Upper Primary Only	8	0	0
Upper Primary with Secondary/ Higher Secondary	315	38	0
No Response	0	0	0

Source: <http://www.dise.in/Downloads/Publications/Publications%202011-12/DRC%202011-12.pdf>

As per the Jodhpur District website, there are 12 colleges and 3 universities present in the district. Education to a large extent depends on the presence of teachers in schools. According to the Jodhpur District Elementary Education (Provisional) Report Card 2011-2012, the teacher student ratio in the district for both primary and upper primary schools is 1:30 which is proportionate to the Right to Education teacher pupil norm of having 1:30 for primary and 1:35 for upper primary schools. The number of teachers by schools has been provided in Table 4-14.

Table 4-14: Number of Teachers by Schools

School	Government	Private
Teachers		
Primary	4980	696
Upper Primary	5425	6022
Total Enrolment of Students		
Primary	146023	20484
Upper Primary	151198	187504
Student Teacher Ratio	30 (Primary)	30 (Upper Primary)

Source: <http://www.dise.in/Downloads/Publications/Publications%202011-12/DRC%202011-12.pdf>

Basic facilities in schools have been a major concern for the poor turnout of girls' students. Lack of female teachers, water facilities in girl's toilets and distance of schools from place of residence are major concerns that girls face in rural areas. As per the District Elementary Education Report (Provisional) 2011-2012, the number of single teachers is 18.9% in Jodhpur District. In addition, there are about 32.6% of female teachers in the district as well. The details of the facilities present in the schools in Jodhpur District have been shown in Table 4-15

Table 4-15: Number of schools with facilities

Facilities	Jodhpur District (%)
Single Classroom	2.3
Single Teacher	18.9

Schools with Girls Toilets	96.9
Schools with Drinking Water Facility	97
Schools with Electricity	43.3
Schools with Playground	50.6
Schools having ramps	61.6
Schools having female teachers	35.1

Source: <http://www.dise.in/Downloads/Publications/Publications%202011-12/DRC%202011-12.pdf>

Project Influenced Population

According to the Village Directory Data 2001, in Bari Seer Village there is 1 primary and 1 middle school. A middle school is present at a distance of 5 to 10 km from Bari Seer village. For students wanting to pursue their college education, one college is situated at a distance of more than 10 km from the village.

As per the consultations conducted with the Sarpanch of Bari Seer village and the community members, at present there are 5 primary schools in Bari Seer village. In addition, there is 1 secondary school each present in Bari Seer village and Baap Tehsil.

Health Care Facilities

In 2010-2011⁷ in Jodhpur District, there were 8 Government Hospitals, 9 Block Primary Health Centres, 65 Primary Health Centres, 15 Dispensaries, 3 Child and Mother Welfare Centres, 525 Sub Centres, 1 Tuberculosis Centre, 9 Rural Family Welfare Centres, 42 Aid Post, 121 Ayurvedic Hospitals, 3 Homeopathic Hospitals and 9 Unani Hospitals.

Project Influenced Population

As per the Village Directory Data 2001, there were no health centres present in Bari Seer village. All health centres are situated at a distance of 3 kms away from the village. In cases of child birth, the traditional system of engaging a 'Dai' or 'Local Midwife' is still prevalent amongst the village women of the area.

The consultations conducted with the Sarpanch and community members revealed that at present there is a primary health centre situated at Bari Seer village and a sub centre in Nawagaon dhani. Due to lack of professionals at the Sub Centre in Nawagaon dhani, the community people either go to the Primary Health Centre based at Bari Seer village or the private hospital situated in Baap which is about 10 km from the area. In case of emergencies, people travel 130 km to Bikaner District which has a Government Hospital.

Veterinary Facilities

As some of the population in Jodhpur District own and rear cattle wherein livestock rearing and dairy production are important occupations, therefore, it is important to have good animal health centres in

⁷ http://dcmsme.gov.in/dips/DIPR_Jodhpur.pdf

the area as well. As per Jodhpur District Official Website,⁸ there are 7 A Grade Veterinary Hospitals, 84 Veterinary Hospitals and 46 Veterinary Sub Centres in the District.

As per the consultations carried out with the Sarpanch and community members of Bari Seer village and Nawagaon dhani, there are no veterinary centres in the village and people from the village have to go to the lone veterinary hospital located in Bap to avail the services there.

Road Connectivity

In 2010-11, Jodhpur District is connected with 507 km stretch of National Highway 15, 65, 112 and 114 respectively. In addition, the District is connected with 643 km stretch of State Highway 58 and 61. The main District Highway of 538.50 km, other District and Rural Roads of 1787.16 km and Kaccha (unpaved) Road of 366.42 km stretch are also present in Jodhpur District.⁹

As per the 2001 Village Directory Data, there are paved roads, mud roads and footpaths available in Bari Seer village. The site is connected to National Highway 15 which passes by both the village and the dhani. The consultations revealed that there are no paved roads within the village. Only mud roads are available which are used by the community members.

Communication Facilities

Jodhpur District as of 2010-2011¹⁰ has 79255 telephone connections, 402 post offices, 824 public call offices and 275,845 mobile connectivities.

As per the 2001 Village Directory Data, there are communications facilities present in the village and the dhani. Almost all the population have a mobile phone connection at their disposal.

Banking Facilities

In 2010-2011, Jodhpur District had 221 Commercial Banks, 83 Rural Banks and 83 Co-Operative Banks.¹¹

As per the 2001 Village Directory Data, there are no bank facilities available in Bari Seer village. The Commercial Banks are situated at Bap which is 10-12 km from Bari Seer village. This was confirmed during the consultations conducted as well.

Sanitary Facilities

Bari Seer and Nawagaon have sanitary facilities attached to individual houses with running water. This initiative was implemented by the Sarpanch of the area through the Panchayat Fund.

Power Supply

⁸ http://dcmsme.gov.in/dips/DIPR_Jodhpur.pdf

⁹ http://dcmsme.gov.in/dips/DIPR_Jodhpur.pdf

¹⁰ http://dcmsme.gov.in/dips/DIPR_Jodhpur.pdf

¹¹ http://dcmsme.gov.in/dips/DIPR_Jodhpur.pdf

Bari Seer and Nawagaon have good electricity supply due to the innumerable solar plants available in the area. As per the statement of the Sarpanch, the excessive load of the Pooling Substation is offloaded and directed to the nearby villages which have benefitted the people in the area.

Water Supply

All the houses of Bari Seer and Nawagaon receive regular water supply through pipeline connected to the Indira Gandhi Canal. In the months of May and June i.e. at the peak of the summers, the water supply becomes scarce and in order to supplement this; the villagers resort to buying water through tankers available in the area.

Other Facilities

There is one fertilizer/ seed shop and one fair price shop available in Baap which caters to the village of Bari Seer.

Government Schemes

In Bari Seer village according to the Sarpanch of the area, there are three distinct government schemes which have been implemented for the welfare of the people,

- Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (RGSEAG) – SABLA: SABLA aims at empowering Adolescent Girls of 11 to 18 years by improving their nutritional and health status, up gradation of home skills, life skills and vocational skills. The girls would be equipped with information on health and family welfare, hygiene and guidance on existing public services. The Scheme also aims to mainstream out of school girls into formal education or non-formal education. The scheme was initiated in 2011 in 200 districts throughout India of which Jodhpur District has been one of them.
- Janani Suraksha Yojana: This scheme was initiated in 2005 under the Ministry of Health and Family Welfare. In this scheme, a one-time cash incentive is given to pregnant women for institutional/ home births through skilled assistance. This has been initiated to bring down the maternal mortality rate of the region.
- Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA): This scheme has been initiated in 2005 by the Ministry of Rural Development. Here legal guarantee for one hundred days of employment in every financial year has been given to all adult members of any rural household willing to do public work-related unskilled manual work at the statutory minimum wage of Rs. 120 per day.

4.11 Stakeholder Engagement and Information Disclosure

Stakeholder Engagement is an important process through which a two way dialogue is created between the project proponent and the stakeholders. As per survey of the delineated area of the proposed solar plant site, the project influenced population was identified in undertaking stakeholder consultations.

The criteria for identifying these areas were based on the proximity to the site area, the influence of impacts on the households in the area and the socio cultural characteristics of the resident population.

4.11.1 Stakeholder Identification

The stakeholders for the project were prioritized by identifying the direct and indirect stakeholders. The key stakeholders that were consulted as part of the study included the following:

- Local Population residing near the project site area
- Panchayat Leader of Bari Seer village and Nawagaon Dhani
- NGO's working in the area

Consultations were conducted on 15th July, 13th September and 15th October 2014 with the various stakeholders by a social professional from AECOM , India.

4.11.1.1 Methodology Adopted

The stakeholder consultation comprised primarily of a social survey and consultation initiated by AECOM. As solar projects have already come up in surrounding areas and people are aware of solar plants, the consultations revolved around questions of how the general pattern of people's lives have changed with the coming of solar power plants in the area, the concerns/issues of the local population and benefits/expectations from the project. The findings are based mainly on the use of participatory methods like focus group discussions, key informant interviews and natural interviews. These methods give an in depth and intensity to the discussion and incorporates the locals point of view within a short period of time.

The process of stakeholder consultation included,

- identification of the relevant stakeholders including all those individuals, groups and organizations potentially influenced by or interested in the project
- Imparting information about the project and its potential impacts on their lives in local and simple language
- Verifying if the area proposed for the project does not infringe the formal or informal rights of the local population
- Recording of their concerns and aspirations through discussions
- Responding to their queries in a neutral manner

A questionnaire with a list of open-ended questions was used to initiate the discussion process. Individuals from Bari Seer village and Nawagaon dhani were interviewed along with the Sarpanch of Bari Seer Panchayat. In addition, the site person from ACME was also contacted to enhance the overall understanding of the project and its implications on the surrounding areas.

Focus Group Discussions

Focus group discussions were held with randomly selected population of Bari Seer village and Nawagaon dhani. This encompassed a wide age range and population comprising of both the genders.

Natural Interviews

Natural group discussions were also conducted where ever possible. Natural group discussions are interviews conducted with ‘naturally’ occurring groups. The group has the advantage of being interviewed at a time and place of their convenience and is suitable from the point of view of the interviewee. The result is frank and open discussion takes place in a more relaxed and informal manner. A sample of the questionnaire has been added as **Annexure III**.

4.11.2 Stakeholder Engagement Process Undertaken

In the following section, the various stakeholder engagement processes have been detailed out. The Table 4-16 provides key questions and broad responses obtained during the social survey, consultation and interviews held with the local community and Sarpanch of the Panchayat on 15th July 2014:

Table 4-16: Key Questions and Responses from the Survey

S. No.	Questions	Broad Response
1	Has any land from the village of Bari Seer and Nawagaon acquired for the project?	No, the land that was selected for the project site is revenue land under the Government of Rajasthan.
2	Is the land for the proposed access road and transmission line private land?	No, the access road and transmission line are on revenue land.
3	Was the vacant land ever used for grazing purposes?	No, the land that the proposed site is expected to come up on is vacant barren land. The entire stretch is sparsely vegetated and hence, no grazing activities take place.
4	Has there been any change due to the coming of solar projects in the area? How has the change affected you?	There has been employment generation in the construction phase for the locals to a certain extent. The Panchayat has received revenue from the Government for leasing the land for the sub-station and through this revenue; activities like sanitary facilities and water supply to individual houses in the area were undertaken. In addition, people have benefitted with the excessive offload from the pooling substation which have been distributed to the houses near the vicinity of the sub-station and now get 24 hours electricity supply.
5	Has the land prices increased because of the project?	The land prices have not been affected greatly as the land in the area is revenue land owned by the Government of Rajasthan.
6	What is the Community's understanding of the Project?	Solar projects do not have much impact as compared to other power related projects. As there are a number of solar plants already existing in the area, no significant impacts have been witnessed so far. Solar plants are generally set up to generate electricity for the Government. Through this, the Panchayat receives revenue from the Government, excess electricity is provided to nearby villages and employment opportunities are created among the

S. No.	Questions	Broad Response
		locals.
7	Concerns/ Issues relating to the Project	Some people interviewed were of the opinion that solar projects creates too much heat which leads to reduction of rainfall in the area.
8	Benefit/ Expectation from the Project	Generation of employment, infrastructural development of the area (roads, healthcare facilities, private schools etc.)
9	What are the overall needs of the community?	Schools are needed in the area with qualified teachers, healthcare needs to be developed and more employment opportunities need to be generated.

In addition, to the responses from the community members of Bari Seer village and Nawagaon dhani, women in these villages were also contacted to gather their viewpoints on the socio economic status and benefits of the project on them as a whole.



Photo 4-5 : Consultations with community

Women Respondents (Socio-Economic Status of Women)

To have an equal participation of views from male and females, women were also identified as stakeholders and their views were gathered. Women play an important role both as members of the household as well as income generators (agricultural labourers, beneficiaries of the MNREGA Scheme) for the families. Though not often taken at par when decisions concerning the families are made, they often do play a crucial role in the families. The patriarchy system being prominent in the area the women have strived to take on equal responsibilities concerning the families. The prevailing status of women residing in these parts has been provided below:

- Most women are uneducated and those that have received education study only till Grade V. Their families discontinue their education citing household chores, distance of schools with higher grades from their residence and safety issues of them going out of their houses.
- Most Rajput women do not come out of their houses and depend on the men for everything. They strictly practice the purdah or ghunghat (veiled) system. Women of lower caste usually work as agricultural labourers or in the MNREGA scheme. Women belonging to ST groups engage themselves in handicraft making like bangle making, tribal jewellery and sells them at the market place. The women belonging to the Jogan community are into dancing wherein they earn their livelihood through entertainment of tourists.
- Women get married at an early age of 16 years while women belonging to ST group get married when they are children.
- There are no healthcare centres catering to maternal health in the area. All the homes in the area mostly depend upon the local 'dai' or 'midwife' for childbirth. Family planning is rarely practised among the people in the area.
- Due to the supply of water to households and sanitary facilities within individual households, going to toilets have become safer and more hygienic for women.
- There are no women group or self help groups in the area catering specifically for women.

The concerns and expectations of the women have been mentioned below:

- Illiteracy being quite prominent among the women folk, the women were of the opinion that schools and training centres catering to girls and women should be opened so that their skills could be developed.
- The women were concerned that with no medical facilities being present in the area, it becomes difficult if an emergency occurs to travel long distances. They were of the opinion that a medical facility or the existing health centre in the village should be upgraded to cater to women patients and that a visiting doctor should be provided so they could attain some benefit.
- The women were of the opinion that self help groups should be created for the women in the area.

Indigenous Population

Based on the social survey conducted, it was observed that even though there is a small population of Scheduled Tribe population in Bari Seer village like Bhil, Jogan and Banjara; they are part of the mainstream population and live within the village..

Cultural Heritage

As per the consultations carried out, there were no sites of cultural significance in the vicinity of the project site area.

Non Governmental Organisations (NGOs)

At present, there are three local NGOs which are currently working in Bari Seer village. Due to unavailability of personnels from these NGOs at Bari Seer village, interviews with them could not be carried out. However, their area of activities has been provided below based on the Sarpanch's observation so that in future stakeholder engagement exercises, they could be included.

- Murthal Samajik: Murthal Samajik has been working in the health sector. They usually hold health camps for children and promote immunization of children in the area.
- Arthik avam Uthaan Samiti: Arthik avam Uthaan Samiti has been working for the economic upliftment of the people in the area.
- Grameen Vikas Samiti: Grameen Vikas Samiti has also been working for the rural upliftment of the area. Their focus area is safe drinking water.

ACM E's Representative at the Site Level

The land aggregator and site contact from ACME was also contacted and an interview was held to gather his viewpoints which have been highlighted below:

Table 4-17 provides key questions and broad responses from ACME's representative at the site level:

Table 4-17: Key Questions and Responses from ACM E's Representative

S. No.	Questions	Broad Response
1	<p>Land Procurement Process:</p> <ul style="list-style-type: none"> • What type of land is in the process of being leased for the proposed project? • Has any private land been acquired or leased? • Have you obtained a No Objection Certificate from the Bari Seer Panchayat, Baap Tehsil? • Do you have in your possession the government lease records for the land leased? 	<ul style="list-style-type: none"> • Khasra No. 113 of revenue land ('Gair Mumkim Faida' or 'barren non agricultural land' as per Government records) from the Government of Rajasthan is in the process of being leased for the project including the access roads and transmission lines • No private land has been leased or purchased for the project • Yes, a No Objection Certificate has been obtained from Bari Seer Panchayat, Baap Tehsil. (Attached as an Annexure IV)) • The lease papers are yet to be received. However, a letter from the Jodhpur District Collector recommending ACME's interest in leasing the land from the Government of Rajasthan is present. (Attached as an Annexure II)
2	<p>Community Engagement:</p> <ul style="list-style-type: none"> • How was the community informed about the proposed project? • Has any prior meetings been undertaken by ACME with the local 	<ul style="list-style-type: none"> • Till date the community has not been formally informed about the proposed project as the lease formalities is still underway. • There were no meetings conducted with the local community by ACME.

S. No.	Questions	Broad Response
	<p>community?</p> <ul style="list-style-type: none"> Was an information disclosure meeting conducted with the local authority? 	<ul style="list-style-type: none"> A No Objection Certificate has also been obtained from the Local Panchayat with regards to the proposed project area.
3	<p>Corporate Social Responsibility/ Community Development Programme</p> <ul style="list-style-type: none"> Activities undertaken (if any) CSR Plan for future Documented Records (if any) 	<ul style="list-style-type: none"> No CSR or Community Development Programmes have been initiated till date as this is ACME's first project in the area. There would be CSR Plans undertaken in future, talks are still underway and no finalisation of it has been concluded till date. It is just a thought, not sure if it's committed on paper as of yet. No information on documented records of meetings or activities that are planned.
4	<p>Grievance Redressal Procedure</p> <ul style="list-style-type: none"> Has any formal grievance redressal mechanism been set up by ACME for the Community? Identified Persons Responsible as contact point 	<ul style="list-style-type: none"> Till date no formal grievance redressal mechanism has been set up for the project. However, there are plans for setting one up for the project. The identified person from the Community will be the Sarpanch and from ACME will be the site supervisor. Details of the site supervisor are yet to be finalised.

In addition to the above responses provided by the local population of Bari Seer and Nawagaon as well as ASEPL's site representative, two more site visits were undertaken on 13th September and 15th October 2014 to survey the entire land area proposed for the project as well as to identify and verify the land use of the area by the local population, if any.

It was observed during the site surveys that the area comprised of dry and arid land with no traces of seasonal cultivation taking place on the allotted area. The catchment area, agricultural area and geographical structures like school, water pond and boundary wall were noted to be excluded from the proposed project area.

5. Analysis of Alternatives

This section of the report presents the analysis of the alternatives considered for the proposed solar power project. The following scenarios have been considered:

- No project Scenario;
- Alternate Location for the proposed project;
- Alternate Methods of power generation;
- Alternate Technology for proposed project;
- Alternate routes for transmission lines

5.1 No Project Scenario

As per the Load Generation Balance Report, Ministry of Power, Government of India the anticipated energy requirement for the state of Rajasthan as 62540 MU against the availability of 57197 MU for the year 2014-2015. The power requirement and availability for the year 2014 – 2015 has been estimated as 11000 MW and 10271 MW respectively indicating a power deficit of 729 MW. The forecasts for the power requirement for the state of Rajasthan as per Central Electricity Authority (CEA)¹² have been presented in Table 5-1

Table 5-1: Power Forecasts for Rajasthan

Parameter	2016-17	2021-22
Electrical Energy Requirement (GWh)	67767.236	92376.811
Peak Electric Load (MW)	11404.490	15100.779

Source: Central Electricity Authority

The current power supply scenario and the future forecasts indicate a progressive deficit in supply. In order to bridge this gap between the demand and supply, renewable/non-conventional sources of power are required to supplement the conventional sources. The proposed project being a non-conventional source of power generation intends to contribute towards bridging the demand supply deficit as projected.

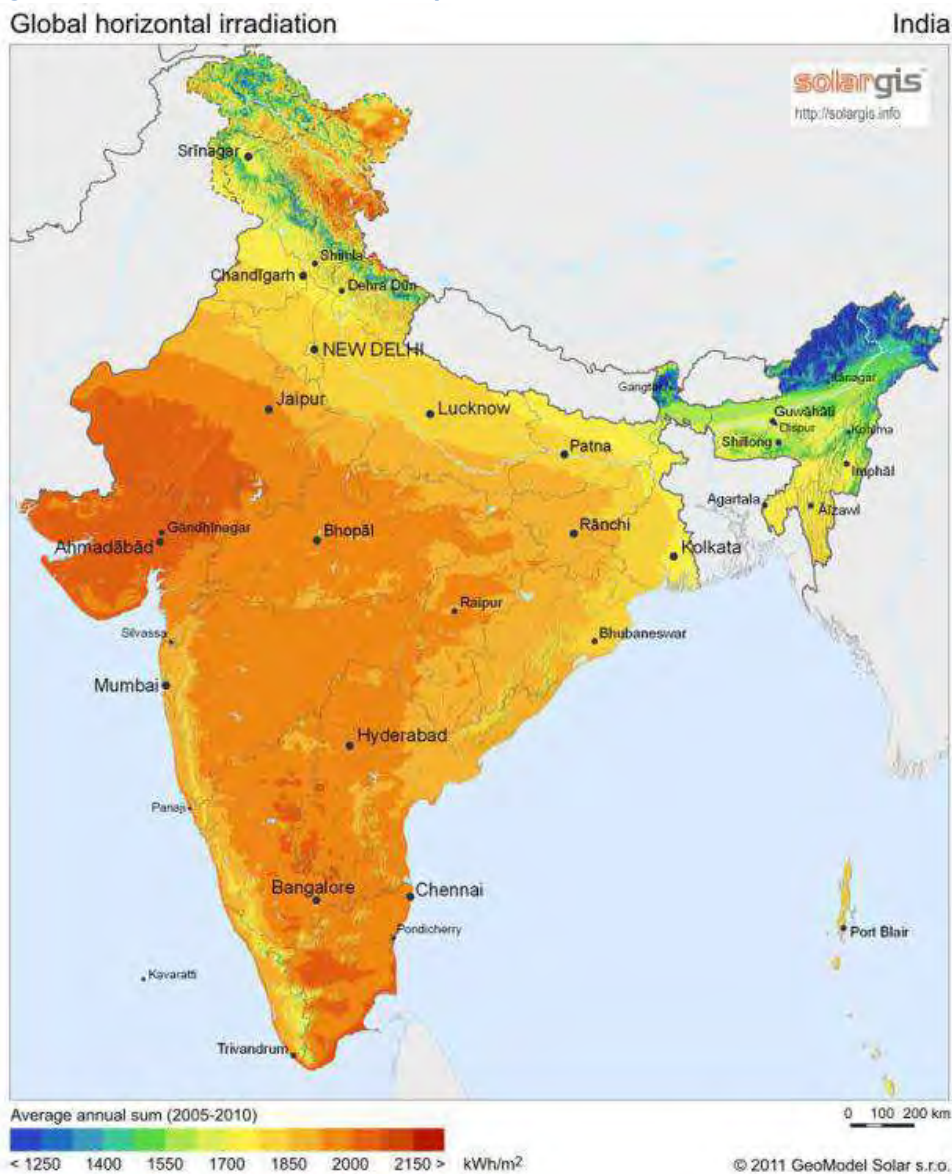
India is located in the equatorial sun belt of the earth, thereby receiving abundant radiant energy from the sun. The Meteorological Department of India maintains a nationwide network of radiation stations, which measure solar radiation, and also the daily duration of sunshine. In most parts of India, clear sunny weather is experienced 250 to 300 days a year. The annual global radiation varies from 1600 to 2400 kWh/ m², which is comparable with radiation received in the tropical and sub-tropical regions. The equivalent energy potential is about 6,000 million GWh of energy per year. Figure 3.2 below shows the map of India with solar radiation levels in different parts of the country. It can be observed that highest annual global radiation is received in Rajasthan, northern Gujarat. Parts of Andhra Pradesh, Maharashtra, Rajasthan and Ladakh region also receive fairly large amounts of radiation as compared to many parts of the world especially Japan, Europe and the United States, where development and

¹² 17th Electric Power Survey

deployment of solar technologies are maximum. Theoretically, a square piece of land, 55 kilometres each side, in the empty desert, is enough to meet India's current energy demand. With more than 300 sunny days each year, large parts of Rajasthan, Gujarat, Rajasthan, Andhra Pradesh, Tamil Nadu can produce 6-6.4 kilowatts per square metre. Sparsely populated, these areas are ideal for solar energy.

The proposed project is an opportunity to utilize the solar potential of the state for power generation. A "No Project Scenario" will not address the issue of power shortage. An alternative without the project is undesirable, as it would worsen the power supply-demand scenario, which would be a constraint on economic growth.

Figure 5-1: Solar Power Potential Map of India



5.2 Alternate location of the project site

Solar power projects are non polluting energy generation projects and are dependent on the availability of sufficient solar irradiation. The whole of India and particularly the state of Rajasthan receives good amount of solar irradiation. The project proponent has carried out assessment studies in order to understand the power generation potential of the site. Mean global daily irradiation on a horizontal plane was observed to be in the range of 5.09-5.76 KWh/ m²/day for the proposed site using different solar irradiation data sources. The following additional criteria have been considered for site selection:

- The sites are located away from major settlements.
- The sites do not fall under any reserved or protected forests;
- The land procured for the sites comprises of revenue land which was not used by the community for any purpose;
- No environmentally sensitive features such as water bodies , forests, archaeological sites are located in the immediate site surroundings;

While land selected for the project is revenue land, there have been efforts taken up to minimise impacts, including issues related to titleholders and informal users. Avoidance of government lands that are seasonally cultivated and used for grazing purposes has been carried out.

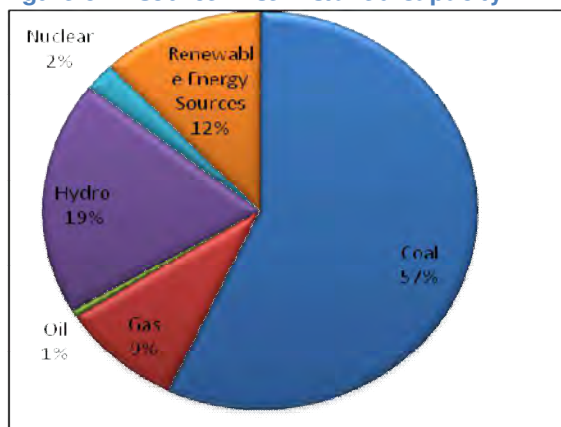
Therefore, considering all the above details of the location and site settings, the identified site was chosen as a suitable option for the project.

5.3 Alternate Methods of Power Generation

5.3.1 Sources of Electricity Generation

India has an installed capacity of 225.793 GW of track changes as of 31st July, 2013. In terms of fuel, coal-fired plants account for 57% of India's installed electricity capacity followed by hydropower which accounts for 19%, renewable energy for 12% and natural gas for about 9%. The source wise installed capacity in India is presented in Figure 5-2.

Figure 5-2: Source wise Installed Capacity



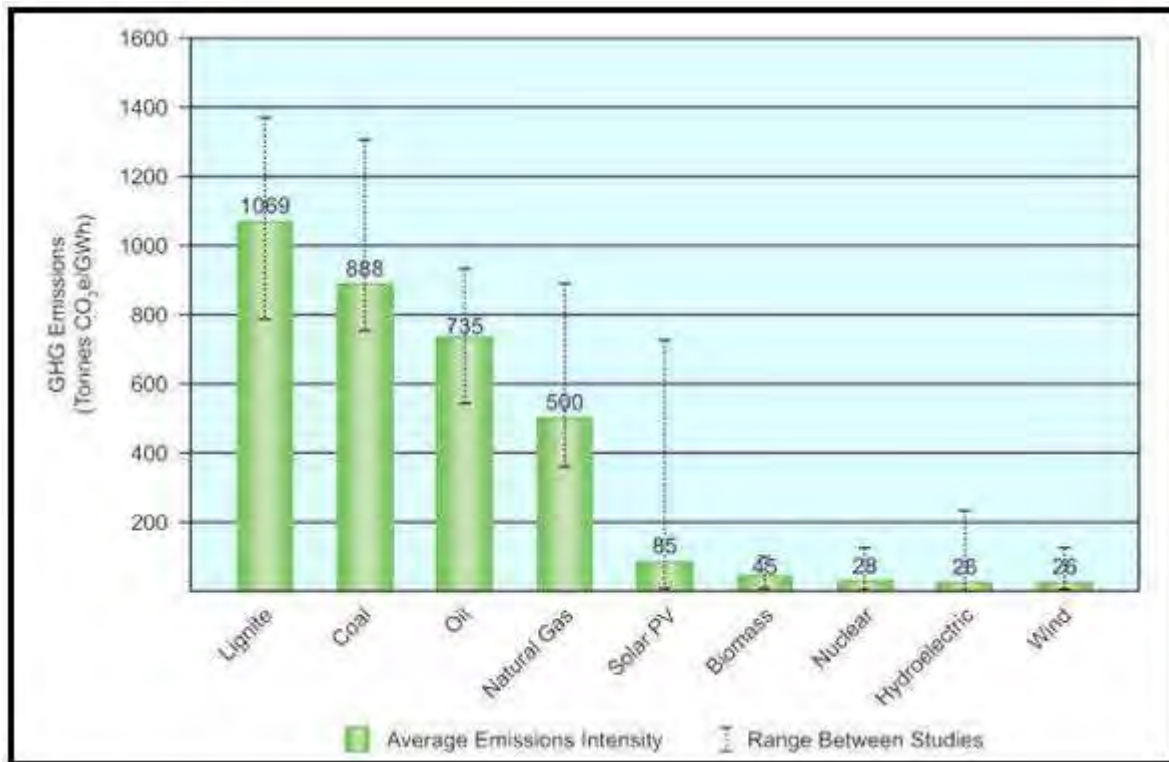
Source: Ministry of Power, 2012

5.3.2 Greenhouse Gas Emissions

Coal fired power plants have the highest GHG emission intensities on a lifecycle basis. Although natural gas, and to some degree oil, have noticeably lower GHG emissions, biomass, nuclear, hydroelectric, wind, and solar photovoltaic all have lifecycle GHG emission intensities that are significantly lower than fossil fuel based generation.

World Nuclear Association (WNA)'s report places solar energy's 85 tonnes CO₂e/ GWh emission intensity at 17% of the emission intensity of natural gas, and only 9.5% of the emission intensity of coal fired power plants. In addition, the lifecycle GHG emission intensity of solar power generation is consistent with renewable energy sources including biomass, hydroelectric and nuclear. Among other non conventional sources, only, nuclear power is better than solar power with respect to emissions. However, nuclear power is not a viable option in the identified site and require longer gestation period.

Figure 5-3: Lifecycle GHG Emissions Intensity of Electricity Generation Methods



Source: World Nuclear Association Report, July 2011

Greenhouse gas (GHG) emissions resulting from the provision of energy services have contributed significantly to the historic increase in atmospheric GHG concentrations. The IPCC Fourth Assessment Report (AR4) concluded that "Most of the observed increase in global average temperature since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations.

The table above indicates that the GHG emissions for Solar is significantly lower than that of coal or gas based technologies. Considering the significance in difference of CO₂ equivalent generated from various stages of setting up and operation of a solar power plant, it can be easily concluded that it reduces the potential for climate change.

5.3.3 Cost and Reliability of Power Generation

The various power generation options as discussed in the earlier section can be evaluated on the levelled cost of power generation which includes the capital and O&M costs, reliability of power generation in terms of plant load factor and the greenhouse gas (GHG) emission. The comparative analysis of various power generation options based on these factors has been presented in Table 5-3.

Table 5-2: Comparative analysis of Various Power Generation Options

Alternative	Cost (₹/ kWh) *	Plant Load Factor **	Average Lifecycle GHG Emission (tonnes CO ₂ e/ GWh)***
Coal	2.5	65-85%	888
Natural Gas	3.9	70-85%	500
Hydro	3.8	30-50%	26
Nuclear power	2.5-5.7	65-85%	28
Wind Energy	4.2	25-40%	26
Solar	15.3-17.1	10-15%	85

Source: * - LBNL, CERC, CSTEP & NPCIL

** - Renewable UK

*** - World Nuclear Association Report

Although power generation options using conventional sources offer advantages such as lower levelled costs of power generation and higher plant load factors, the operation and maintenance of solar power projects does not involve air emissions or effluent discharges. There are no fuel requirements or large quantities of water required for the operation of the plant. Other environmental pollution (stack emissions, ash management etc) issues are also insignificant. Also, there are no significant social issues associated with solar power projects.

5.3.4 Statutory and Policy Requirements

India being a signatory to the United Nations Framework Convention on Climate Change (UNFCCC) has formulated a National Action Plan on Climate Change (released in June 2008) to promote the development of renewable energy in the country. The Ministry of New and Renewable Energy (MNRE), GOI has been promoting new and renewable energy sources in a big way in India. The government of India envisages 14,000 MW capacity additions during the 11th five year plan (2007-12) from renewable power generation. While about 10,000 MW is expected to be generated from wind power, the balance is to be realized by solar and other renewable energy systems. The Electricity Act 2003 clearly mandates state electricity boards to adopt a minimum percentage for the procurement of electricity from renewable energy sources.

Accordingly, about 13 state electricity regulatory commissions (SERC) have initiated action to meet this requirement. MNRE has formulated the guidelines on Generation-Based Incentive (GBI) for grid interactive solar power projects. Presently various states like Orissa, Gujarat, Rajasthan, Maharashtra etc. have declared their solar policies which are in line with GBI policy of MNRE. The benefits of the Jawaharlal Nehru National Solar Mission (JNNSM) which is part of the eight mission documents under India's National Action Plan on Climate Change (NAPCC), and a significant contribution to low carbon sustainable development strategy for the Indian economy are as follows;

- To create an enabling policy framework for the deployment of 20,000 MW of solar power by 2022
- To create favourable conditions for solar manufacturing capability, particularly solar thermal for indigenous production and market leadership
- To promote programmes for off-grid applications, reaching 1000 MW by 2017 and 2000 MW by 2022
- To achieve 15 million sq. meters solar thermal collector area by 2017 and 20 million by 2022
- To deploy 20 million solar lighting systems for rural areas by 2022.

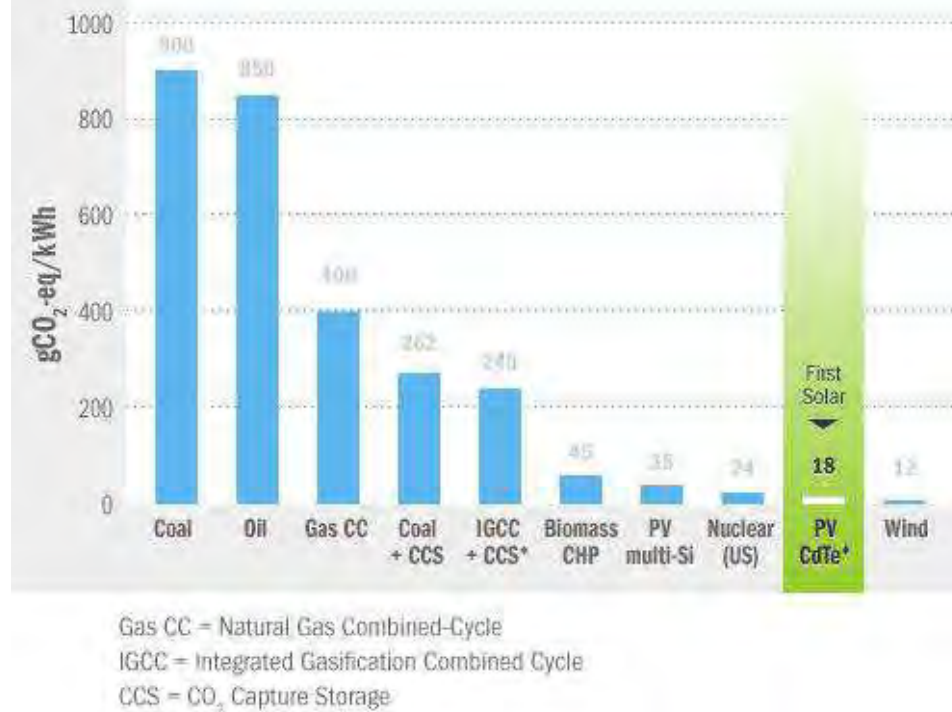
Therefore, considering various factors such as favorable environmental and social settings; low GHG emissions during the entire project life cycle; availability of appropriate lands, solar power generation is the most appropriate alternative in the Project area.

5.4 Alternate Technology for Project

There are different types of solar panels available for accumulation of solar energy, the proposed project intends to utilise tandem structure/thin film solar PV technology. The production of current generation photovoltaics is an energy intensive process, especially the poly crystalline and the mono-crystalline modules. They also require large quantities of bulk materials. Thin film modules have less primary energy requirement per W than poly crystalline or mono-crystalline modules.

Thin film materials include Copper Indium, Diselenide, Cadmium Telluride, and Gallium Arsenide, etc., typically a few μm or less in thickness is directly deposited on glass, stainless steel, ceramic or other compatible substrate materials. Some of these metals are considered hazardous metal as per Schedule II of the Hazardous Waste Rules 2008. Based on lifecycle assessment, the Cd-Te thin film technology selected for the proposed project of First Solar make has one of the smallest carbon footprints as compared to any other PV technology.

Figure 5-4: Lifecycle carbon footprint assessment of the selected Cd-Te Thin Film PV technology



Source: <http://www.firstsolar.com/en/technologies-and-capabilities/pv-modules/first-solar-series-3-black-module/cdte-technology>

Further, the semiconductor material utilized in the proposed thin film module technology is sustainably sourced from by-products of the zinc and copper industries. Cadmium, a waste by-product of zinc refining, and tellurium, a by-product of copper refining, are converted into a stable CdTe compound.

The energy accumulated from the solar panels will be converted from DC to suitable AC power for feeding to the grid. This process is environmentally advanced than creating battery bank for storage of energy, which minimises the hazards related to handling and disposal of batteries.

5.5 Alternate routes to transmission lines

The route for the transmission line has been selected based on the following factors:

- Transmission line route has been planned to avoid any habitations along the route;
- No house or community structures are located under the transmission line;
- Areas requiring extensive clearing of vegetation have been avoided;
- Selection of the transmission route avoids any environmental sensitive site if identified;
- Right of way/ access roads will be shared with the common user of the substation.

The shortest possible route after considering the above factors has been selected for the transmission lines. Consideration of all the above factors has reduced the environmental and social footprint of the transmission line.

6. Impact Assessment and Mitigation Measures

This chapter describes the various environmental and social impacts identified and assessed for the construction and operation phases of the proposed Project. The identification of impacts has been done based on the review of available project information; discussions with the local community; representatives of the project proponents and other sector specific professionals.

This section also identifies and assesses the range of potential impacts and extent of their severity on environment, ecology, socio-economic resources, demographics, livelihood issues. Mitigation measures for the identified impacts are also suggested with a management plan for the proposed mitigation measures.

6.1 Impact Appraisal Criteria

The criterion which has been used to appraise impacts on various social and environmental components is as presented as Table 6-1 below.

Table 6-1: Impact Appraisal Criteria

Criteria	Sub-Classification	Defining Limit	Remarks
Spread: refers to area of direct influence from the impact of a particular project activity.	Insignificant / Local spread	impact is restricted within the foot prints of the Project boundary	except for ecology (which is defined as limited loss of vegetation only at site)
	Medium Spread	impact is spread up to 2 km around the project area	except for ecology (which is defined as loss of vegetation at site including large trees with limited disturbance to adjoining flora & fauna)
	High spread	impact is spread beyond 2 km from footprint boundary of the Project	except for ecology (which is defined as loss of vegetation at site and/or damage to adjoining flora and fauna)
Duration: based on duration of impact and the time taken by an environmental component to recover back to current state	Insignificant / Short Duration	when impact is likely to be restricted for duration of less than 2 years	the anticipated recovery of the effected environmental component within 2 years
	Medium Duration	when impact extends up to five years	With an anticipated recovery of the effected environmental component within 5 years
	Long Duration	when impact extends beyond five years	with anticipated recovery of prevailing condition to happen within 5 years or beyond or

Criteria	Sub-Classification	Defining Limit	Remarks
			upon completion of the project life
Intensity: defines the magnitude of Impact	Insignificant intensity	when the changes in the environmental baseline conditions is up to 10%	However, it shall be reconsidered where the baseline values are already high.
	Low intensity	when the changes in the baseline conditions is up to 20%	for ecology it refers to minimal changes in the existing ecology in terms of their reproductive capacity, survival or habitat change
	Moderate intensity	when the changes in the baseline conditions is up to 30%	for ecology, it refers to changes that are expected to be recoverable
	High intensity	when change resulting in the baseline conditions beyond 30%	While for ecology, high intensity refers to changes that result in serious destruction to species, productivity or critical habitat.
Nature: refers to whether the effect is considered beneficial or adverse	Beneficial	--	Useful to Environment and Community
	Adverse	--	Harmful to Environment and Community

A significance assessment matrix was developed to assess the impact based on the appraisal criteria developed above which is as given in Table 6-2.

Table 6-2: Impact Significance Criteria

Spread	Duration	Intensity	Overall Significance	
			Adverse	Beneficial
Local	Short	Low	Insignificant	Insignificant
Local	Short	Moderate	Minor	Minor
Local	Medium	Low		
Local	Medium	Moderate		
Medium	Short	Low		
Local	Long	Low		
Local	Short	High	Moderate	Moderate
Local	Medium	High		
Local	Long	Moderate		
Medium	Short	Moderate		

Spread	Duration	Intensity	Overall Significance	
Medium	Medium	Low		
Medium	Medium	Moderate		
Medium	Long	Low		
Medium	Long	Moderate		
High	Short	Low		
High	Short	Moderate		
High	Medium	Low		
High	Medium	Moderate		
High	Long	Low		
Local	Long	High	Major	Major
Medium	Short	High		
Medium	Long	High		
High	Short	High		
High	Medium	High		
High	Long	Moderate		
High	Low	Low		
High	Low	High		

The impacts for the proposed project have been presented in the following subsections:

- Construction Phase
- Operational Phase

6.2 Impact Identification

Based on the activities involved, an impact interaction matrix for construction and operation phases has been prepared for the project. The impact identification matrix is presented in Table 6-3 below.

Table 6-3: Impact Identification Matrix – Construction and Operation Phases

S.No	Main Activities	Environmental and Social Components										
		Land Use	Ecology	Water Resources	Ambient Air Quality	Soil Resources	Ambient Noise Quality	Water Quality	Traffic / Transport	Social/ Livelihood/ Cultural	Occupational Health & Safety	Visual Aesthetics
I.	CONSTRUCTION PHASE											
1	Site Preparation											
	Procurement of land	√								√		
	Site Grading		√			√						
	Site /Vegetation clearance		√			√						
2	Labour Engagement											
	Employment of workers									√	√	
	Water requirement			√								
	Power requirement				√							
	Waste handling and disposal					√						
	Sewage disposal					√		√				
3	Material Handling and Storage											
	Transportation and Unloading of construction material				√	√	√		√	√	√	
	Transportation, storage and handling of solar modules, mounting structures				√	√	√		√	√	√	
4	Construction Works											
	Preparation/Mixing of construction material			√	√	√	√	√			√	
	Utilities (Water, power, sanitation etc)				√	√		√				
	Operation of construction machinery				√	√	√				√	
	Handling and Disposal of construction wastes		√				√				√	
	Laying of transmission lines	√									√	√

S.No	Main Activities	Environmental and Social Components										
		Land Use	Ecology	Water Resources	Ambient Air Quality	Soil Resources	Ambient Noise Quality	Water Quality	Traffic / Transport	Social/ Livelihood/ Cultural	Occupational Health & Safety	Visual Aesthetics
5	De-Mobilisation of Construction Equipment											
	Dismantling of temporary support construction structures/equipments				√	√	√					√
	Removal of construction machinery					√					√	
	Transportation of Construction / Dismantled wastes				√				√		√	
II.	OPERATION PHASE											
1	Solar power generation										√	
2	Washing of solar panels			√		√		√				
3	Repair and maintenance works					√					√	
4	Power Transmission		√									

6.3 Construction Phase

This section presents the impacts identified primarily for the construction phase of the proposed plant. Based on the activity – impact interaction matrix for construction phase, following impacts have been identified:

- Soil Resources and Quality;
- Land Use;
- Waste Generation, Storage and Disposal;
- Water Resources and Quality;
- Ecology;
- Traffic and Transport;
- Ambient Air Quality;
- Ambient Noise Quality;
- Occupational Health and Safety;
- Cultural Heritage;
- Socio-economic

6.3.1 Soil Resources and Quality

Impacts

The construction works for the proposed project will involve excavation and compaction of soil which may impact the soil structure and quality. Further, the transport of materials, equipment will involve additional movement of vehicles, construction machinery which will also lead to some degree of compaction. The project site comprises of flat land with gentle slope, but will involve levelling works for the preparation of site. The excavated soil if kept uncovered and unprotected will be rendered vulnerable to loss from erosion due to wind and rain. The areas excavated for foundation of solar panels and switchyard building will be backfilled by the excavated soils which will re-assemble the order of the original soil layers.

The site does not support much vegetation and only comprises of small shrubs. The removal of vegetation during construction work would not be significant but will render the soil vulnerable to erosion.

The project will also involve use of paints for solar panels and switch yard structures during construction which if not handled and used properly, may lead to contamination of soil. Improper disposal of hydraulic fluids, lubricating oils and other used oils can also result in contamination of soil. Improper storage of construction material can also result in unwanted dispersal into adjoining areas.

Mitigation Measures

The topography of the project site is flat, therefore extensive levelling and backfilling will not be required. This will reduce the potential for compaction and disturbance to soil layers due to backfilling at site. The scale of construction being small will have limited heavy machineries at site and for limited duration, which will further diminish the potential for compaction. Movement of

trucks and other vehicles will be maintained along dedicated paths to avoid disturbance to land and soil.

Loose soil kept at the site will be well protected to avoid loss from wind and water erosion. Adequate measures will be taken for storage and use of paints and other construction material. During painting of panels and switchyard structures, it will be ensured that the land beneath is covered with a sheet of impervious material in order to prevent contamination of soil.

RSEPL has to ensure that waste/ used oils generated from generator and other machinery will be securely stored and disposed to RPCB approved authorised recyclers at regular intervals.

Impact Significance

The impact on soil will have moderate intensity with a local spread for a short duration which will result in an overall minor impact without mitigation. However with proper implementation of suggested mitigation measures the overall impact will be insignificant.

Table 6-4: Impact Significance – Soil Resources and Quality

Aspect	Scenario	Spread	Duration	Intensity	Overall
Soil Resources and Quality	Without Mitigation	Local	Short	Moderate	Minor
	With Mitigation	Local	Short	Low	Insignificant

6.3.2 Land Use

Impacts

The project involves leasing of 275 bighas of government revenue 'Gair Mumkim Raida' or 'barren non agricultural' land. During consultations with the local community, it was established that the site was not used for any grazing activities as it was barren with sparse vegetation. With the development of the proposed Project, the land use of the site will alter from barren to industrial land use. Other potential impacts on land use may be due to development of approach roads to the Project site. The right of way for the transmission line will not affect the land use pattern of the surrounding areas as there is no grazing or agricultural land in the vicinity of the project site.

Mitigation Measures

The project developer has considered all aspects of siting and design prior to selection of the proposed site. RSEPL has to ensure that the construction activities will be restricted within the boundary of the solar plant and will not alter the land use of the adjacent areas.

Impact Significance

Impact due to change of land use will have low intensity with a local spread for a long duration which will result in an overall minor impact without mitigation, which will remain a minor impact owing to permanent change in land use.

Table 6-5: Impact Significance – Land Use

Aspect	Scenario	Spread	Duration	Intensity	Overall
Land Use	Without Mitigation	Local	Long	Low	Minor

	With Mitigation	Local	Long	Low	Minor
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6.3.3 Waste Generation, Storage and Disposal

The construction activities such as site clearance, excavation works, setting up of labour camps, installation of modules will generate different types of solid and hazardous wastes. The construction demobilisation which will entail removal of machinery, workers, campsite and other temporary structures will also result in generation of waste. The following types of wastes will be generated due to construction of the project:

- Domestic solid waste from labour colonies;
- Waste oil from generator and other construction machinery;
- Packaging waste such as gunny bags, plastics, etc;
- Empty paint containers, metal scrap, etc;
- Construction debris;
- Sewage from labour colonies

Impacts

The construction debris generated due to the construction activities will have the potential for spread to areas outside the plant boundary during construction. The debris generated from construction activities can be carried along with the wind into nearby areas. Improper disposal of construction debris can lead to contamination of water bodies in the proximity of the Project.

Improper disposal of solid waste from the labour camps at site and lack of proper sanitation facility for labour can lead to unhygienic conditions and spread of diseases in the area. It can lead to discontent of local community and result in conflicts with the labour engaged at site.

Improper disposal of packaging materials, boxes, plastics and ropes can lead to littering in the construction site and surrounding areas. Hazardous wastes such as waste oil, lubricants, hydraulic oil etc can cause contamination of soil and water bodies if adequate precautions for management and handling are not undertaken. Use of chemicals such as paints, curing chemicals can lead to contamination of soil.

Mitigation

The quantity of domestic waste generated daily from the labour camps will be small and limited. However the construction contractor shall ensure that the campsites provided at site have adequate sanitation and waste disposal facilities. Common latrines and bathing facilities, duly segregated for male and female labour, shall be provided at the campsites. Provision of segregated toilets for male and female workers in the ratio of 1:15 and 1:10 (toilet to workers) respectively shall be made at the campsites in order to maintain hygienic and clean surroundings. Disposal of sewage shall be made through a septic tank – soak pit arrangement. Arrangements for collection of garbage in dustbins and daily disposal to the nearest dumpsite shall be made.

Waste/ used oil generated from generators and construction machinery and equipment will be stored on paved surface in a secure location at the project site. The waste oil will be sold to RPCB approved vendors at frequent intervals. Empty paint containers will also be stored at a secured area designated for scrap and sold to authorised vendors. All packaging material will be also be collected at the storing area and sold to vendors.

Construction debris and excavated material will be stored in a confined area to prevent spread by wind or water. The construction debris will be used for backfilling of excavated areas and for foundation works at site and excess soil will be given to the local villagers for filling up of low lying areas in the vicinity.

Significance of Impact

The impact due to waste disposal will have moderate intensity with a local spread for a short duration which will result in an overall minor impact without mitigation. However with proper implementation of suggested mitigation measures the overall impact will be insignificant.

Table 6-6: Impact Significance- Waste Disposal

Aspect	Scenario	Spread	Duration	Intensity	Overall
Waste Disposal	Without Mitigation	Local	Short	Moderate	Minor
	With Mitigation	Local	Short	Low	Insignificant

6.3.4 Water Resources and Quality

Impact

About 100-150m³ of water will be required for construction depending on various stages of the process besides domestic requirement of the workers at site. The water for the construction works shall be sourced from authorised tankers. No usage of groundwater is proposed for the construction phase of the Project.

The construction at site can alter the natural drainage pattern of the area at a micro level. There is potential of contamination of low lying areas due to sediment runoff from construction activities. Improper disposal of sewage and wastewater from labour camps and construction debris can contaminate the ground water resources in the area.

Mitigation

Water for construction activities, flushing and washing purpose is partly sourced from four existing bore wells at site. Remaining requirement is met through authorized water tankers. Drinking water in the labour camps is being supplied through packaged water cans. RSEPL has to ensure that roof top rain water harvesting structures are installed for office buildings and workers colony. It is also to be ensured that the quality of water from the bore wells is monitored regularly to check the contamination levels.

The natural slope of the site will be maintained to the extent possible in order to avoid any change in the drainage pattern. Adequate arrangement for storm water management during construction

period will be made to avoid sediment runoff from the site. Storm water flow will be directed to the existing channels with silt traps to avoid sedimentation of the channels or the receiving water body.

Significance of Impact

The impact on water resources will have moderate intensity with a medium spread for a short duration which will result in an overall moderate impact without mitigation. However with proper implementation of suggested mitigation the impact will be reduced to minor.

Table 6-7: Impact Significance - Water Resources

Aspect	Scenario	Spread	Duration	Intensity	Overall
Water Resources	Without Mitigation	Medium	Short	Moderate	Moderate
	With Mitigation	Local	Short	Moderate	Minor

6.3.5 Ecology

IFC Performance Standard 6 recognizes that protecting and conserving biodiversity—the variety of life in all its forms, including genetic, species and ecosystem diversity—and its ability to change and evolve. This Performance Standard reflects the objectives of the Convention on Biological Diversity to conserve biological diversity and promote use of renewable natural resources in a sustainable manner. Principle 3 of Environmental Safeguards of ADB asserts the importance of analysing the impacts on ecology related with project area. Mitigation measures should be designed to achieve at least no net loss of biodiversity.

Impact

Site clearing activities prior to start of construction involves removal of vegetation from the site, which will mainly include shrubs and grasses. This will result in potential loss of habitat for small mammals and birds. Noise from construction and frequent movement of vehicles can also disturb the avifauna of the area.

Mitigation

Prior to procurement, the project site comprised of barren land. The project site was also devoid of dense vegetation and will not involve felling of trees during site clearing. Therefore the loss of vegetation at site is considered to be limited. No major loss of habitat or fragmentation due to construction activities is envisaged.

All project activities to be undertaken with appropriate noise mitigation measures to avoid disturbance to faunal population in the region. Activities generating high noise will be restricted to day time and will be mitigated to minimise the noise level outside the site boundary.

Movement of construction and transport vehicles will be restricted to dedicated paths to minimise any harm to small mammals within the site. Transportation of construction material will be kept to day time hours in order to minimise noise and disturbance to fauna in the area.

Significance of Impact

The impact on fauna and flora will have minor intensity with a local spread for a short duration which will result in an overall minor impact without mitigation. However with proper implementation of suggested mitigation the impact will be reduced to insignificant.

Table 6-8: Impact Significance - Ecology

Aspect	Scenario	Spread	Duration	Intensity	Overall
Ecology	Without Mitigation	Local	Short	Moderate	Minor
	With Mitigation	Local	Short	Moderate	Insignificant

6.3.6 Traffic and Transport

Impact

The construction phase shall involve transportation of construction materials, solar modules and mounting structures. The proposed project will be accessible through the approach roads from the National highway-15. The project construction activities will lead to additional traffic and increased risk of traffic related accidents and injuries to local on activities community and to workers. The increase in traffic due to the project is however going to be marginal as no village roads will be used. The traffic density along the National Highway is low and has adequate carrying capacity to accommodate the additional traffic due to the construction activities.

Mitigation

For minimising the impacts due to the increased traffic, it is recommended that the access roads are constructed prior to site clearance activities. Only trained drivers with valid license shall be recruited by the construction contractor. Training programs shall be conducted at regular intervals for all the drivers for raising awareness about road safety and adopting best transport and traffic safety procedures once in every six months.

Mitigation measures such as emphasizing on safety amongst drivers, adopting limits for trip duration and arranging driver roster to avoid overtiredness and avoiding dangerous routes and times of day to reduce risk of accident shall also be implemented.

Significance of Impact

The impact due to traffic and transport will have moderate intensity with a medium spread for a short duration which will result in an overall moderate impact without mitigation. However with proper implementation of suggested mitigation the impact will be reduced to minor.

Table 6-9: Impact Significance: Traffic and Transport

Aspect	Scenario	Spread	Duration	Intensity	Overall
Traffic/ Transportation	Without Mitigation	Medium	Short	Moderate	Moderate
	With Mitigation	Medium	Short	Low	Minor

6.3.7 Atmospheric Emissions

Impacts

Construction activities will lead to generation of dust due to excavation works for foundations, mixing of construction materials in batching plant, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind.

Other sources of atmospheric emissions during construction phase may include emissions from diesel engines of earth moving equipment, as well as from open burning of solid waste on-site. The increase in traffic volumes during the construction will also generate dust. Improper storage of soil and construction material can also increase dust emission from the site.

Mitigation

RSEPL shall ensure reduction and control of air emissions from construction activities by minimising dust from material handling sources. Sprinkling of water is being carried out to suppress dust from construction, stock piles and transport movement. It shall be ensured that all stock piles are covered and storage areas provided with enclosures to minimise dust from open area source. Stock piling and storage of construction material will be oriented after considering the prominent wind direction.

The scale of construction being small will require only a limited number of construction machinery and for limited duration, therefore emissions from heavy machinery are considered to be insignificant. Open burning of solid waste or packaging material will be strictly prohibited. Vehicles engaged for the project will be required to obtain "Pollution Under Control" certificates.

Significance of Impact

The impact on ambient air quality will have a local spread, moderate intensity and will last for a short duration primarily limited to construction related activities which will result in an overall minor impact without mitigation. However with proper implementation of suggested mitigation the impact will be reduced to insignificant.

Table 6-10: Impact Significance - Ambient Air Quality

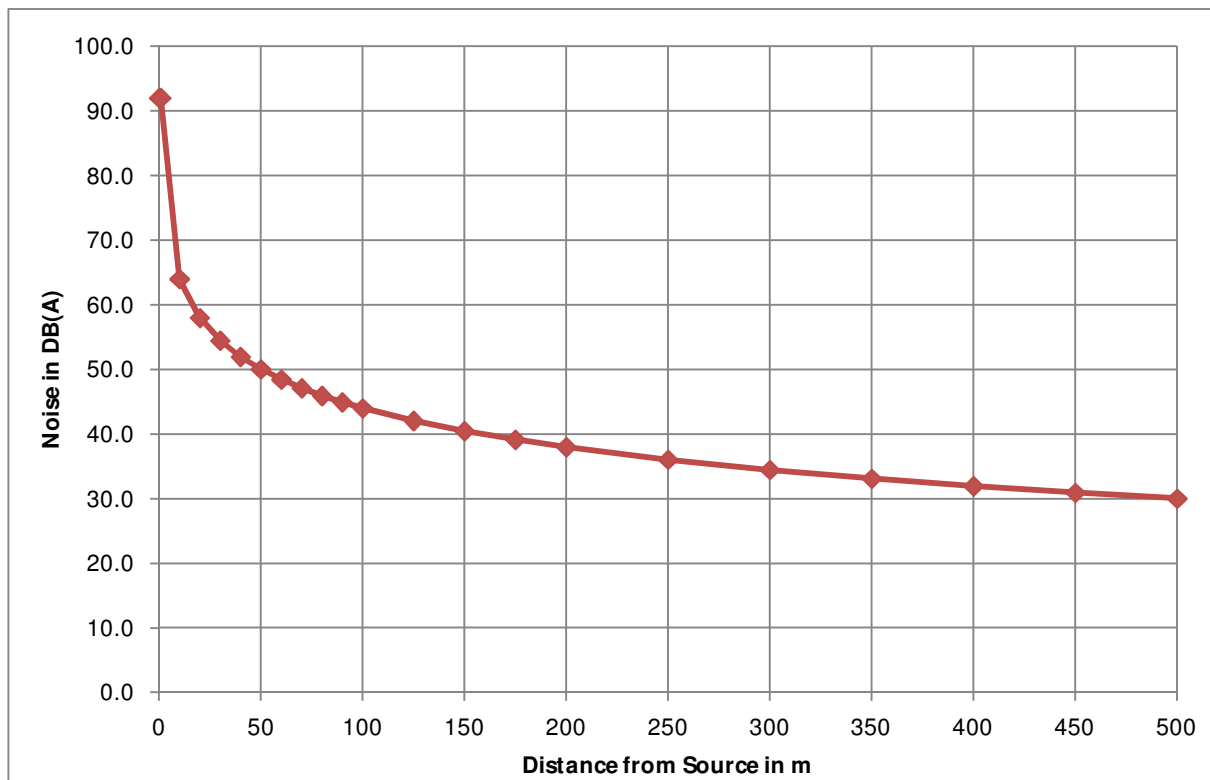
Aspect	Scenario	Spread	Duration	Intensity	Overall
Ambient Air Quality	Without Mitigation	Local	Short	Moderate	Minor
	With Mitigation	Local	Short	Low	Insignificant

6.3.8 Noise and Vibration

Impacts

Noise and vibration will be caused by the operation of earth moving and excavation equipment, concrete mixers, cranes and the transportation of equipment, materials and people. There is potential for disturbance to habitations in proximity of construction site. Movement of traffic during night hours can also disturb the local community. About 90-92 dB(A) of noise is generated from construction activity which will attenuate to less than 45dB(A) i.e night time prescribed noise level at about 80m. The nearest habitation is located at a distance of over 2km and therefore the impact due to the noise will not be significant.

Figure 6-1: Noise Attenuation with Distance



Mitigation Measures

Most of the construction activities involving excavation and foundation for solar panels will be done manually and therefore will have limited noise. Mobile noise sources such as cranes, earth moving equipment and HGVs shall be routed in such a way that there is minimum disturbance to receptors. RSEPL shall instruct its contractor to arrange for inherently quiet construction equipment and machines to maintain the noise level to minimum. Only limited construction activities shall be carried out during night-time.

All loud and sudden noises will be avoided wherever possible and fixed noise sources shall be located at least 50m away from the site boundary. Rubber padding/noise isolators will be used for equipment/machinery used for construction. Temporary noise barriers shall be provided surrounding the high noise generating construction equipment. The personnel involved in high noise generating activities shall be provided with personal protective devices to minimise their exposure to high noise levels. Construction vehicles and machinery will be well maintained and not kept idling when not in use.

Significance of Impact

The impact due to noise and vibration will have moderate to minor intensity with a local spread for a short duration which will result in an overall minor impact without mitigation. However with proper implementation of suggested mitigation the impact will be reduced to insignificant.

Table 6-11: Impact Significance - Noise and Vibration

Aspect	Scenario	Spread	Duration	Intensity	Overall
Noise and Vibration	Without Mitigation	Local	Short	Moderate	Minor
	With Mitigation	Local	Short	Low	Insignificant

6.3.9 Health and Safety Hazards

Impacts

During construction works, physical injury can result due to road accidents, construction accidents and other occupational hazards. Overexertion and ergonomic injuries and illness are potentially the most common health hazards associated with construction activities. Further there is potential for slips and fall on the same elevation associated with poor housekeeping, such as excessive waste debris, loose construction material, liquid spills and uncontrolled use of electrical cords and ropes on ground, which results in injuries and time loss during construction.

Hazards associated with fall of construction material or tools, as well as collapse of constructed slabs, walls and roofs can result in injury to head, eyes and extremities. Transportation and movement of vehicles are associated with road accidents and related hazards, which can lead to injuries and fatalities.

Mitigation

RSEPL shall formulate a site specific Emergency Preparedness and Response Procedure The On-Site emergency procedure shall provide details of the anticipated emergencies, the emergency organisation, facilities, emergency procedures and roles and responsibilities. RSEPL shall ensure that adequate training is provided to staff about raising awareness about use of Personal Protection Equipment (PPE) and emergency response measures.

RSEPL shall introduce administrative controls into work processes such as job rotation, rest and stretch breaks etc to reduce overexertion. Work site layout will be well planned to avoid manual transfer of heavy loads. It shall also ensure good housekeeping at the construction site to avoid slips and falls. Excessive waste debris and liquid spills will be cleaned up regularly, while electrical cords and ropes will be placed along identified corridors marked for attention of everyone at site. Use of personal fall arrest system, such as full body harnesses as well as fall rescue procedures to deal with workers whose fall has been successfully arrested shall also been carried out.

Dropping/lowering of construction material or tool will be restricted and undertaken only under strict supervision, if required. PPEs such as safety glasses with side shields, face shields, hard hats and safety shoes shall be mandatory at construction site. Ear plugs shall be provided for workers placed at high noise areas.

Significance of Impact

The health and safety impacts will have high intensity with a local spread for a short duration which will result in an overall moderate impact without mitigation. However with proper implementation

of suggested mitigation the intensity can be reduced to low and the overall impact will be insignificant.

Table 6-12: Impact Significance - Health and safety

Aspect	Scenario	Spread	Duration	Intensity	Overall
Health and Safety	Without Mitigation	Local	Short	High	Moderate
	With Mitigation	Local	Short	Low	Insignificant

6.3.10 Socio-Economic Impacts

The project will have potential socio-economic impacts on the community and the surrounding areas. Such impacts have been identified and assessed in this section:

Impacts due to Land Acquisition

The proposed project comprises of revenue land classified as ‘uncultivable land’ as per the revenue records. Based on discussions with the community, the land being leased for the Project did not serve any use to the community. No physical or economic displacement is anticipated due to the project.

Further, the transmission line and the access roads to the site are also proposed on the same revenue land and will not result in any significant impacts.

Mitigation

A defined Grievance Redressal Mechanism shall be formulated and communicated to community to express their concerns associated with the project.

Access to Common Property Resources

The land leased for the Project does not block access to any of the common property resources.

Increased Community Expectations

The project area is predominantly rural. The advent of the project has created several expectations among the local community which centres on employment opportunities and improvement of infrastructure facilities.

The consultation undertaken with the community indicate that the community expects:

- jobs for local villagers in the construction and operation phases of the project,
- business for local contractors and traders

Mitigation

RSEPL shall provide employment to local villagers as labour in the project construction activities.

Labour Related Issues

The construction work for the project will extend to a total of 6 months as reported by the project proponent. In the construction phase, skilled workers might be engaged in the project to perform technical work and they might come from outside the area. The project proponent will have to arrange for the accommodation of these workers. This influx of outside workers might bring about concerns related to limited resources in the area which might bring about differences between them and the resident local population. This might get further aggravated if the local population are surpassed in favour of workers migrating to the area for work. The potential impacts that might arise in reference to labour related issues have been mentioned below,

- Influx of migrant labourers: Once the construction activity for the project gets underway, there is a possibility that there will be an inflow of migrant workers from other parts of the country to this project area. This will create an economic impact to some extent as the workers will be employed over the local population.
- Impact on existing resources: The influx of migrant workers might put pressure on the existing resources like water supply, supply of fuel, provision of basic facilities, waste handling and sewage disposal of the project influenced population which might create frictions between them and the resident population of the area.
- Impact on the local custom and tradition: With the influx of migrant workers to the project area, the local custom and tradition of the local population might get eroded to a certain extent. With new population, threat to the local adhered norms might see a changing trend which might occur in this case as well.
- Community health impacts from migrant workers: With the inflow of migrant workers and their interaction with the local population, health issues among the local community might emerge. Health problems like STD's and HIV Aids might spread in the area because of this floating population.

Mitigation Measures

- For unskilled work in the construction phase, the local population and its surrounding areas should be given first preference so that there is no ill feeling generated amongst the locals.
- If recruitment of migrant labourers in the construction phase takes place, the project proponent should be responsible in giving an orientation to the migrant labourers on the local custom and tradition followed by the local population.
- Construction Management Plan and Waste Disposal Plan (Domestic) should be created and adopted by the project proponents to minimise the impact created by the inflow of migrant workers in the area.
- A medical check up should be conducted and copy of the medical certificate should be collected by the project proponent to be included as part of their records.
- Regular medical camps should be conducted amongst the labourers and the local population to make them aware about diseases like STD's and HIV Aids.

Significance of Impact

The impact on socioeconomics will have moderate intensity with a medium spread for a short duration which will result in an overall moderate impact without mitigation. However with proper implementation of suggested mitigation the impact will be reduced to minor.

Table 6-13: Impact Significance - Socio-economic

Aspect	Scenario	Spread	Duration	Intensity	Overall
Socio-economic	Without Mitigation	Medium	Short	Moderate	Moderate
	With Mitigation	Medium	Short	Low	Minor

6.3.11 Archaeological, Historic and Cultural Aspects

Impact

Based on the preliminary survey, it is observed that there are no archaeological and historical sites of importance in proximity to the site. There are no temples, religious symbols or related cultural activities in and around the site. There is potential for cultural differences due to influx of migrant labourers.

Mitigation

RSEPLRSEPL shall ensure that the unskilled workforce engaged for construction is hired locally and from the nearby villages. This would reduce any potential for cultural difference amongst the workers. The project proponent will not engage in any kind of bias on basis of religious or cultural differences and shall communicate the same to its subcontractors. Though there are reportedly no cultural or religious site in the project area, cultural/religious practices and sensitivities will be taken into consideration while undertaking activities like extraction of water and informal symbols of worship.

In case of any chance find during construction, all work will be stopped and relevant local offices will be informed about the same. The Chance Find Procedure as recommended to be developed within the ESMS of ASEPL is to be implemented here.

Significance of Impact

The impact on archaeology, historic or cultural aspect will have moderate intensity with a local spread for a short duration which will result in an overall minor impact without mitigation. However with proper implementation of suggested mitigation the impact will be reduced to insignificant.

Table 6-14: Impact Significance - Archaeology, Historic or Cultural Aspect

Aspect	Scenario	Spread	Duration	Intensity	Overall
Archaeology, Historic and Cultural	Without Mitigation	Local	Short	Moderate	Minor
	With Mitigation	Local	Short	Low	Insignificant

6.4 Operation Phase

6.4.1 Waste Disposal

Impacts

Operation of solar photovoltaic panels for power generation will not have any direct impact on soil. Once the plant is commissioned there will be limited disturbance to soil, however repair and maintenance of underground cables and associated utilities will lead to generation of hazardous wastes such as used transformer oil. The defunct/ damaged photo voltaic cells will also be generated and storage/disposal on unpaved ground can lead to contamination of soil.

Mitigation

Disturbance to soil from repair and maintenance activity will be limited and will ensure proper restoration of soil wherever excavation is undertaken. RSEPLRSEPL shall explore the option of buyback agreements for defunct panels and for replacement and disposal of transformer oil by the supplier, otherwise will make arrangements for disposal of defunct panels and waste oil by RPCB authorised recyclers.

Significance of Impact

The impact on soil will have moderate intensity with a local spread for a short duration (of activity) which will result in an overall minor impact without mitigation

Table 6-15: Impact Significance- Waste Disposal

Aspect	Scenario	Spread	Duration	Intensity	Overall
Waste Disposal	Without Mitigation	Local	Short	Moderate	Minor
	With Mitigation	Local	Short	Low	Insignificant

6.4.2 Aesthetics and Visual Impact

Impacts

There will be a change of landscape due to installation of solar panels and related structures. Visual impact due to glare generated from the solar panel is also anticipated. The change in landscape and glare from the panels can affect the habitation as well as faunal of the area.

Mitigation

The solar panels will be installed at a low height and will be kept closer to the ground so that it does not pop out of the general landscape of the area. The panels will be arranged in a systematic manner which will give an aesthetic sense to it.

Glare due to reflection from the solar photovoltaic panels are similar to those from a corn field or a water body. Reflections will be observed only during morning and evening hours when the sun is low. Moreover, the site is located away from any habitations in the close vicinity (nearest habitation being two kilometres away). The intensity of glare from reflection is considered to be poor and shall not have any impact on avifauna or other small mammals.

Significance of Impact

The impact on aesthetics and visual aspects will have low intensity with a local spread for a long duration which will result in an overall minor impact without mitigation. The residual minor impact, even after control of intensity and spread, will remain minor owing to the duration of project.

Table 6-16: Impact Significance - Aesthetics and Visual

Aspect	Scenario	Spread	Duration	Intensity	Overall
Aesthetics and Visual	Without Mitigation	Local	Long	Low	Minor
	With Mitigation	Local	Short	Low	Insignificant

6.4.3 Water Resource and Quality

Impacts

The domestic water consumption for the Project is estimated to be 2-3 m³/day and will be met through the canal water which is also available for domestic water demands. With a cleaning schedule of twice/thrice a month, it is estimated that approximately 35-40 m³/day of water will be required for cleaning purposes.

The water requirements for the project will be met through groundwater. The Bap Block falls in the Safe Category as per the Central Ground Water Board with the stage of groundwater development in the Block being only 27%. Further, with the Indira Gandhi Irrigation Canal, the domestic and the irrigation water requirements of the project are being met by the canal thereby reducing the stress on the groundwater resources. The extraction of the groundwater for the project activities will impact the availability of the groundwater resources.

Mitigation Measures

Meters shall be installed at the borewells to monitor the abstraction of water. The plant site will be provided with adequate drainage facility to drain off wash wastewater and prevent any water-logging at site or in the surroundings. Wastage of water during cleaning of panels shall be avoided.

Rooftop rainwater harvesting system will be provided for the switchyard cum administration building. The water harvested will be directed to a recharge pit. The staff quarters shall be provided with sewage line and the collected sewage shall be channelized to a septic tank with soak pit arrangement.

Significance of Impact

The impact on water resources will have moderate intensity with a local spread for a long duration which will result in an overall moderate impact without mitigation.

Table 6-17: Impact Significance - Water Resources

Aspect	Scenario	Spread	Duration	Intensity	Overall
Water Resources and Quality	Without Mitigation	Local	Long	Moderate	Moderate
	With Mitigation	Local	Long	Moderate	Moderate

6.4.4 Ecology

Impacts

Solar photovoltaic power plant does not generate any significant noise or air emission during its operation to affect the faunal and floral population of the area. However there is potential for avian distraction due to glare/ reflection from solar panels. The impact to flora from the operation will be limited to the routine clearance of vegetation near the solar plant to avoid shadows and hindrance to sunlight on solar panels.

Mitigation

Solar panels will absorb most of light falling on them which will be then converted to electricity. In addition, solar panels will have an anti-reflective coating to minimize the light reflecting off of the panels. Thus there will be very less impact due to glare from the panels. The glare is reported to be similar to that of a corn field or small water body, which implies insignificant distraction for the avifauna. Clearing of vegetation will be limited to removal of undergrowth or shrubs at the plant site. It will have no impact on the flora of the area.

Significance of Impact

The impact on fauna and flora will have low intensity with a moderate spread for a long duration which will result in an overall moderate impact without mitigation.

Table 6-18: Impact Significance - Fauna and Flora

Aspect	Scenario	Spread	Duration	Intensity	Overall
Ecology	Without Mitigation	Moderate	Long	Low	Moderate
	With Mitigation	Local	Long	Low	Minor

6.4.5 Health and Safety Risk

Impacts

Electromagnetic Fields (EMF) emanate from any wire carrying electricity. Possible effects associated with the electric and magnetic fields from transmission lines (or similar electrical sources) fall into two categories:

- short-term effects that can be perceived and may represent a nuisance
- possible long-term health effects.

The issue of whether there are long-term health effects associated with exposure to fields from transmission lines and other sources has been investigated for several decades. There is little evidence that electric fields cause long-term health effects. Estimates of magnetic-field exposures have been associated with certain health effects in studies of residential and occupational populations. Research in this area is continuing to determine whether such associations might reflect a causal relationship.

Mitigation

The lists of exposure limits for general public/ occupational exposure to electric and magnetic fields published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) is as given in Table 6-19 and Table 6-20.

Table 6-19: ICNIRP exposure limits for general public exposure

Frequency	Electric Field (V/ m)	Magnetic Field (μ T)
50 Hz	5000	100
60 Hz	4150	83

Source: ICNIRP (1998) : "Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz).

Table 6-20: ICNIRP exposure limits for occupational exposure

Frequency	Electric Field (V/ m)	Magnetic Field (μ T)
50 Hz	10,000	500
60 Hz	8300	415

There are no specific standards or guidance on EMF in India however the Indian Electricity Act and Rules clearly stipulate the minimum clearances required. Hence the ICNIRP standards and guidelines have been considered. For the general public (up to 24 hours a day) an exposure level of 1,000 mG or 100 μ T is suggested. The EMF generated by 33 KV unit will be lesser than the suggested value.

Workers handling electricity and related components will be provided with shock resistant gloves, shoes and other protective gears. Adequate training regarding health and safety will be provided to the workers. The switchyard building will be provided with fire extinguishers and sand buckets at all strategic locations to deal with any incident of fire. Safety incidents will be recorded and monitored with an aim that numbers are never significant, and gradually reduce.

Significance of Impact

The impact on health and safety will have high intensity with a local spread for a long duration which will result in an overall major impact without mitigation. However with proper health and safety measures the intensity of impact can be reduced to low resulting in an overall minor impact.

Table 6-21: Impact Significance - Health and Safety

Aspect	Scenario	Spread	Duration	Intensity	Overall
Health and Safety	Without Mitigation	Medium	Long	Moderate	Moderate
	With Mitigation	Local	Long	Low	Insignificant

6.4.6 Socio-economic Impacts

Impacts on Local Economy

During the operational phase of the project, the impact on socio economic environment is likely to be positive as the project will lead to increase in local employment opportunities, increased taxation revenue, increased demand for materials and services through local contracting. The power

generated from the Project is being transmitted to the local grid and is likely to increase the power supply situation in the region.

Up-gradation of Local Infrastructure

Although the project is not likely to involve any creation of additional infrastructure, RSEPL is likely to engage in community development activities like improvement of the school, support to the health centre and other such activities in coordination with the local Panchayat. This will lead to a beneficial impact on the upgrading of local infrastructure.

Mitigation

The measures for improved engagement with community suggested are to:

- Collaborate with local govt. and industry for any community development programs to share the resources and cut cost;
- Avoid duplicating existing infrastructure and emphasize on improving or upgrading the quality and quantity of the same.

Significance of Impact

The impact on socio-economic will have low intensity with a local spread for a long duration which will result in an overall minor impact without mitigation. However implementation of mitigation measures, engagement of community an enhanced positive impact is expected.

Table 6-22: Impact Significance - Socio-economic

Aspect	Scenario	Spread	Duration	Intensity	Overall
Socio economic	Without Mitigation	Local	Long	Low	Minor
	With Mitigation	Local	Long	Low	Insignificant

6.5 Cumulative Impact Assessment

ASEPL has signed a PPA for developing five projects of 20 MW each in Bap Village. Apart from this, several other solar power projects of about 300-400 MW capacity has been proposed in Bari Seer Region of Bap Tehsil. Thus a total of 500-600 MW of solar power projects will be developed in the region. The cumulative impact assessment due to development of solar projects in the region has been discussed below:

6.5.1 Land Use

The land use of the region largely comprises of barren land. With the existing and proposed solar power projects in the region, the land use of the region will change from barren/agricultural to industrial. Considering an average area requirement of 8-10 acres per MW of solar power generation, the land use of about 3200-5000 acres of land will be altered.

The analysis of land use pattern of the region suggests that majority of the land comprises of barren/uncultivable land and it is likely that the solar power projects will be developed on such areas. Considering that the land will be used for some industrial activity and will result in generation

of revenue, the change in land use is considered to be minor positive. Further, no impact on the agriculture related activities is expected.

Significance of Impact

The cumulative impact on land use will have low intensity with a local spread for a long duration which will result in an overall minor positive impact without mitigation.

Table 6-23: Cumulative Impact Significance – Land Use

Aspect	Scenario	Spread	Duration	Intensity	Overall
Land Use	Without Mitigation	Local	Long	Low	Minor
	With Mitigation	Local	Long	Low	Minor

6.5.2 Water Resources

The existing and proposed solar power projects in the region will require water for cleaning of panels. It is estimated that about 700-1000 m³/day of water will be required for 400-500 MW of solar power. The water use is more during the dry season as dust in atmosphere is high, owing to the topography of the area. The water requirement for the projects is likely to be sourced from groundwater. Considering the demand of water for the projects, the impact is assessed to be significant. The impacts will be in the form of more generation of waste water, depletion of ground water.

It is recommended that an application for providing water supply from the industrial line to the solar power projects in the region is submitted as soon as possible to reduce the stress on the groundwater resources of the region. Water harvesting and water conservation is to be practised at the site. Channels and culverts are constructed to harvest rainwater in the plant site. Also, the water used for washing solar panels can be reused for gardening purposes.

Significance of Impact

The cumulative impact on water resources is envisaged to be low intensity with a local spread for a long duration which will result in an overall minor impact with mitigation.

Table 6-24: Cumulative Impact Significance – Water Resources

Aspect	Scenario	Spread	Duration	Intensity	Overall
Water Resources	Without Mitigation	Local	Long	Moderate	Moderate
	With Mitigation	Local	Long	Low	Minor

6.5.3 Climate Change

The proposed solar farm is based on Photovoltaic technology which generates electricity using solar energy from the sun through photo-electric effect, which depends upon solar flux of the area. It is defined by the Global Horizontal Irradiance (GHI) of the area, wherein shortwave radiations received by the surface at a high temperature get absorbed and individual electrons in bonds moves into a higher energy level. This absorption of energy does not cause any change in temperature of the area. It is also very well understood that there can be an increase in temperature, which will be

confined only to the site. Also there will be no impact on the precipitation of the area the climatic conditions (prevailing cloud cover, position of the sun) will not be altered due to operation of solar farms.

The solar plants reduce carbon emission equivalent for the same amount of energy which would have been generated by a thermal power plant, which eventually results in reduced potential for climate change.

Significance of Impacts

The cumulative impact on climate change is envisaged to be of low intensity with a local spread for a long duration which will result in an overall minor impact with mitigation.

Table 6-25: Cumulative Impact Significance – Water Resources

Aspect	Scenario	Spread	Duration	Intensity	Overall
Climate Change	Without Mitigation	Local	Long	Low	Minor
	With Mitigation	Local	Long	Low	Minor

6.6 Decommissioning Phase

Project decommissioning would be expected to comprise dismantling of the solar modules and trackers, and all associated electrical infrastructure and site buildings. Access tracks would be decommissioned and gravel stockpiled for future use. The impacts associated are:

- Improper disposal of demolition waste and obsolete machineries will lead to contamination of soil and discontent of community, because of the arid region.
- Demolition activity will lead to generation of dust which can be carried downwind to habitations
- Such are associated with health and safety issues such as trip and fall and electrical hazard.

Demobilisation will require removal of machinery, workers and other temporary structures. Access roads and hardstand areas would be rehabilitated. Decommissioning would involve a smaller work force although it is likely to be undertaken over a significantly shorter time frame. However, the quantum and nature of truck movements and their distribution/ routes will be similar to that of the construction process. The mitigation measures for demobilisation shall include:

- The proponent shall inform the workers and local community about the duration of work;
- The old, redundant panels can be disposed of (at a registered disposal facilities designated for this purpose);
- The workers shall be clearly informed about the expected schedule and completion of each activity;
- The reduction in workers shall be done based only on the requirement of his/ her skill set and not guided by any other factor;
- All waste generated from demobilization phase shall be collected and disposed off at the nearest municipal disposal site; and
- All necessary Personal Protection Equipment (PPE) shall be used by the workers during demolition work. ;

Significance of Impact

Impact value for decommissioning is assessed to be moderate without mitigation and minor with preventive measures.

Table 6-26: Decommissioning Impact Significance

Aspect	Scenario	Spread	Duration	Intensity	Overall
Land Use	Without Mitigation	Medium	Short	Medium	Moderate
	With Mitigation	Short	Short	Low	Minor

7. Environmental Management Plan

The importance of managing social and environmental performance throughout the life of a project is highlighted by the IFC Performance Standard-1. An efficient environmental and social management system ensures a continuous communication process between the project proponent, workers (including contractors), local community and other key stakeholders.

RSEPL is committed to ensure compliance to all its commitments towards Environment, Social, Health and Safety Standards for all their projects. The Environment and Social Management Plan intends to delineate management measures to minimize such impacts by allocating management responsibility for implementation of these measures during construction and operation phase.

7.1 Environment and Social Management System

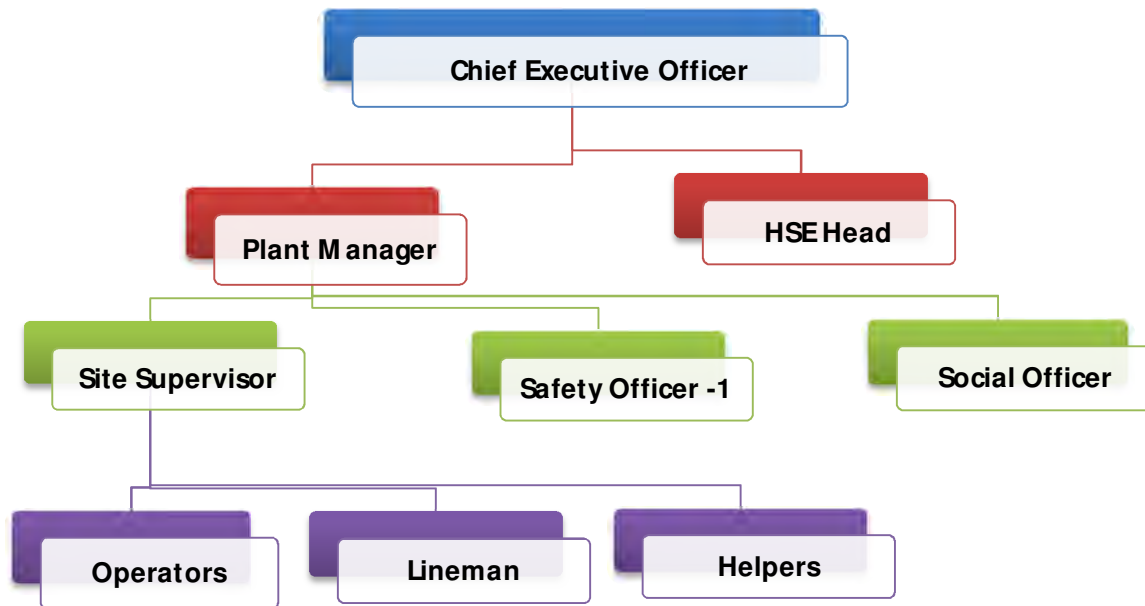
The proposed project is being developed by RSEPL which is a subsidiary of ASEPL. ASEPL Management has developed an Environment and Social Management System (ESMS) Manual which covers Quality systems, Environment, Health & Safety Management Systems and Social Management Systems.

The ESMS Manual has been developed in compliance with the requirements of International Finance Corporation's (IFC) Performance Standard 2012 and ISO 14001: 2004 and is being amended to include requirements of ADB's Safeguard Policy Statement, 2009 as well. The ESMS Manual developed by ASEPL is a three tier document with the policies being the umbrella document which defines the commitment of the management for addressal of EHS and Social issues associated with the operations, apex manual which lays the objectives, programs, resource management, product realization, measurement, analysis and improvements. Operational Control Procedures and (instructional) checklists are defined as second and third tier document. The Management systems has been developed to provide generic guidelines to all future and present solar projects of ASEPL and its subsidiaries, irrespective of specific site or project conditions.

7.2 Organisation Structure (Environment, Social, Health and Safety)

The overall management and coordination of the project will be managed through Chief Executive Officer (ASEPL) who will be supported by the Plant Manager and Head (HSE). The Head - EHS will overview, monitor and control the activities of Site Manager and Safety officer.. The contractors will be controlled by the site manager during construction phase. The construction contractor shall have an Health, Safety and Environment supervisor in their team who shall work in coordination with the HSE officer. The proposed organizational structure to implement the ESMP during the construction phase is presented in Figure 7-1.

Figure 7-1: Proposed Organizational Structure



7.2.1 Roles and Responsibilities

HSE Head and Safety officers

The HSE head and his/ her team will have the following responsibilities:

- Ensuring availability resources and appropriate institutional arrangements for implementation of ESMP;
- Compliance of legislative and IFC's requirements;
- Carryout audits, and inspection of all the project activities;
- Preparation of necessary documents and record keeping system; and
- Review and updating of ESMP for effective its implementation.

Social Officer

The social officer will have the following responsibilities

- Liaison with the government authorities and all project stakeholders;
- Managing all grievances of the project and their outcomes;
- Implementing, monitoring and updating the ESMP;
- Undertaking community development initiatives in the affected villages;
- manage all the human resource issues, contractor and training issue;
- Address training needs of contractors and other employees for social and community issues

7.2.2 Contractors Management

RSEPL shall thus ensure that the ESMP is implemented by its contractors through contractual arrangements. General environmental awareness will be increased among the project's team to encourage the implementation of environmentally sound practices and compliance requirements of the project activities. The same level of awareness and commitment will be imparted to the contractors and sub contractors prior to the commencement of the project.

RSEPL shall ensure that the job specific training and HSE Induction Training needs are identified based on the specific requirements of ESMP and existing capacity of site and project personnel (including the Contractors and Sub-contractors) to undertake the required actions and monitoring activities. Special emphasis will be placed on traffic management and operation of Cranes.

An environmental and social management training programme will be conducted to ensure effective implementation of the management and control measures during construction and operation of the project. The training programme will ensure that all concerned members of the team understand the following aspects:

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

Occupational training program and specialty courses should be provided, as needed, to ensure that workers are oriented to the specific hazards of individual work assignments. Training shall be provided to management, supervisors, workers, and occasional visitors to areas of risks and hazards. Workers with rescue and first-aid duties shall receive dedicated training so as not to inadvertently aggravate exposures and health hazards to themselves or their co-workers.

Through appropriate contract specifications and monitoring, the employer should ensure that service providers, as well as contracted and subcontracted labour, are trained adequately before assignments begin.

7.3 Community / Stakeholder Engagement and Grievance Redressal

The two important elements of community engagement will be disclosure and consultation. This implies that as a first step, the findings of the ESIA, especially the ESMP will have to be disclosed to the community. The ESMP should be finalized through consultation with the community and an action plan shall be developed. Further, the community should be regularly updated about the implementation of the ESMP and all other relevant information pertaining to the construction phase, activities and health and safety risks. The community shall also be made aware of the available job opportunities from time to time.

The project will engage with the local community to understand the stakeholders concerns and issues regarding the proposed project.

In order to understand community expectations and manage any local concerns, RSEPL shall constitute a Grievance Redressal Mechanism to be managed by the Social Officer. This grievance mechanism will respond to the concerns and grievances of local communities, NGOs, Panchayats and any other aggrieved party or stakeholder. The project will share information about these mechanisms to the stakeholders through locally appropriate communication tools.

The Grievance Redressal procedure will also outline the process and steps to be taken and the time limit within which the issue would need to be resolved to the satisfaction of the complainant. The project will endeavour to get all complaints recorded and addressed in a uniform and consistent manner. For disputes that cannot be internally resolved, the project will set up an independent mechanism with representation from community, Panchayats and locally respected citizens of the area to sort these conflicts. If it has a legal implication the district administration will be approached.

7.4 ESMP Review and Amendments

The project ESMP is a social and environment management tool which shall be reviewed periodically (at least once in 2 years or earlier) to address changes in the project design, life cycle processes and activities, organisation and regulatory requirements.

7.5 Inspection, Monitoring & Audit

In order to implement the ESMP, the on-site team will develop a time-bound and action-oriented Environmental and Social Action Plan to implement the mitigation measures provided for each of the identified environmental and social impacts. This ESMP will have to be monitored on a regular basis, quarterly or half-yearly and all outcomes would need to be audited in accordance with existing EHS commitments.

The monitoring process will cover all stakeholders including contractors, labourers, suppliers and the local community impacted by the project activities and associated facilities. Inspection and monitoring of the environmental and social impacts of construction and operation phase activities will increase the effectiveness of suggested mitigations. Through the process of inspection, audit, and monitoring RSEPL shall ensure that all the contractors comply with the requirements of conditions for all applicable permits including suggested action plans. The inspections and audits shall be done by RSEPL/ ASEPL's trained team and external agencies/experts. The entire process of inspections and audits will be documented. The inspection and audit findings will be implemented by the contractors in their respective areas.

7.6 Reporting and Review

RSEPL shall develop and implement a programme of reporting through all stages of the project - construction and commissioning, operation and decommissioning. Contractors will be required to fully comply with the reporting requirements in terms of timely report submission with acceptable level of details. Reporting will be done in form of environmental, health, safety and social check list, incident record register, environmental, health, safety and social performance reports (weekly, monthly, quarterly, half yearly, yearly etc).

7.6.1.1 External Reporting and Communication

All complaints and enquiries are to be appropriately dealt with and records be maintained in a Complaint/Enquiry Register by HSE Head or other delegated staff.

7.6.1.2 Internal Reporting and Communication

Inspection and audit observations along with their improvement program are to be regularly reported to the senior management for their consideration. The same are also to be communicated within the staff working on the project. To maintain open communication between the staff and management on EHS&S issues the following shall be used:

- Team Briefings,
- On-site work group meetings;
- Key Incidents/accidents and lessons learnt
- Work Specific Instructions; and
- Meeting with stakeholders.

7.7 Documentation and Record Keeping

Documentation and record keeping system has to be established to ensure updating and recording of requirements specified in 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:

- Documented Environment management system;
- Legal Register;
- Operation control procedures;
- Work instructions;
- Incident reports;
- Emergency preparedness and response procedures;
- Training records;
- Monitoring reports;
- Auditing reports; and
- Complaints register and issues attended/closed.

7.8 Proposed Environment and Social Management Plan

An Environment and Social Management Plan has been developed following the delineation of impacts and mitigation measures. These measures will be adopted by the project proponent and imposed as conditions of contract of the sub contractor employed for respective phases of the power project. The mitigation measures suggested during operation will be made part of the regular maintenance and monitoring schedule.

The ESMP includes the following:

- Mitigations suggested for adverse environmental and social impacts and associated risks;

- Institutional arrangement - management tools and techniques for the implementation of environmental impacts and risk mitigations;
- Monitoring and reporting of requirements and mechanisms for the effective implementation of the suggested mitigations;
- Monitoring arrangements for effective implementation of suggested mitigations for the proposed project; and
- Reporting requirement to the regulatory agencies and funding institutes

Table 7.1: Environment and Social Management Plan

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility	Estimated Cost (INR) and Source
CONSTRUCTION PHASE				
Soil Resources and Quality				
Erosion and compaction Contamination of soil	<ul style="list-style-type: none"> • Use of existing roads for transport of man and material to the extent possible • Loose soil to be protected from wind and runoff • All construction material to be kept within the footprint of the area acquired. • Loose construction material to be covered to avoid being carried into adjoining areas by wind. • Painting of panels, switchyard structures to be undertaken after covering the land beneath with a sheet of impervious material. • Fuel storage for DG sets to be done on paved surfaces 	<ul style="list-style-type: none"> • RSEPL's representative to make daily observations on storage and handling of soil and construction material. • Workers handling painting activity to be briefed about the need to prevent contamination. • Drivers to be instructed about use of dedicated tracks within the site 	Site supervisor Construction Contractor	Routine Activity
Land Use				
Change of land use from agriculture to industrial	RSEPL has considered all aspects of siting and design prior to selection of the sites	-	-	-
Waste Generation, Storage and Disposal				
Accumulation of construction waste Runoff into rain water channels Unhygienic condition for labours	<ul style="list-style-type: none"> • Construction waste to be properly stored and disposed off to local municipal waste disposal site • Domestic waste generated by workers to be collected and composted at site • Other wastes like wood packaging material, metal jute etc. will be sold to scrap dealers. • Provision of segregated toilets for male and female workers in the ratio of 1:15 and 1:10 (toilet to workers) 	<ul style="list-style-type: none"> • Workers to be instructed to use dustbins and toilets at the site • Contractors will be briefed about the need for proper storage and disposal construction waste 	Site manager To be mentioned in the contract with the construction contractor Site supervisor to make observations and convey it to the	Routine Activity

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility	Estimated Cost (INR) and Source
	<p>respectively;</p> <ul style="list-style-type: none"> Waste oil shall be stored on paved surfaces Empty paint containers shall be stored in earmarked area and sold to authorised vendors. 		contractors	
Water Resource and Quality				
<p>Ground water extraction</p> <p>Runoff into rain water channels</p> <p>Wastage of water</p>	<ul style="list-style-type: none"> Water for construction to be arranged by the construction contractors through authorised tanker water suppliers. Domestic water requirement of the workers at site to be met through irrigation canal. Adequate arrangement for storm water management during construction period to be made to avoid sediment runoff from the site. Optimal utilization of water to be ensured throughout the construction phase Storm water flow during monsoons to be directed to the existing channels with silt traps to avoid sedimentation of the channels or the receiving water body. Curing chemicals to be used to reduce water requirement. 	<ul style="list-style-type: none"> Daily consumption of water to be recorded and assessed on weekly basis for wastage Workers to be instructed about optimal use of water Storm water arrangements to be monitored for clogging on weekly basis 	<p>Site manager</p> <p>To be mentioned in the contract with the construction contractor</p> <p>Site supervisor to make observations and convey it to the contractors</p>	Routine Activity
Ecology				
<p>Clearing of vegetation</p> <p>Cutting of trees</p> <p>Disturbance to avifauna</p>	<ul style="list-style-type: none"> Tree cutting will be limited to those directly affecting the solar panels. Workforce to be instructed to avoid any other activity likely to affect the local flora & fauna. High noise generating activities to restricted to daytime with proper mitigation measures Transportation to be undertaken along identified paths 	<ul style="list-style-type: none"> Construction contractor to instruct and inform workers about need to refrain from activities that may adversely affect the ecology 	<p>Site supervisor</p> <p>To be mentioned in the contract with the construction contractor</p>	Routine Activity
Traffic and Transport				
Arbitrary movement of	<ul style="list-style-type: none"> Training of drivers about road safety to be organised ; Vehicle movement and parking within the Project 	<ul style="list-style-type: none"> Necessary training to the driver of construction vehicles for speed 	<p>Site supervisor</p> <p>To be mentioned in</p>	25,000 INR- To be Provisioned by

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility	Estimated Cost (INR) and Source
vehicles leading to congestion and accidents Improper parking of vehicles used by workers and for movement of material can lead to discomfort to other users.	premises shall be manned properly to avoid accidents <ul style="list-style-type: none"> • Routes for use by construction traffic to be planned to minimize impact on adjoining activities. • Dedicated path within the site for exclusive entry and exit of the construction vehicles to be provided. • Regular maintenance of vehicles to be taken up. 	restrictions and to crewmembers on do's and don'ts during construction vehicles movements. <ul style="list-style-type: none"> • Drivers to be assessed for their knowledge on traffic rules before engagement. 	the contract with the construction contractor	RSEPL and EPC Contractor
Atmospheric Emissions				
Fugitive dust Emissions from diesel engines and DG sets	<ul style="list-style-type: none"> • Dust generating activities to be avoided in conditions of very high wind and covers to be provided for loose construction material at construction site. • It is to be ensured that construction equipment's are properly maintained to minimise smoke in the exhaust emissions. • Machinery to be turned off when not in use. • Housekeeping of the area to be maintained • The impact of emissions from vehicles bringing construction material to be minimised by proper upkeep of maintenance of vehicles, sprinkling of water on unpaved roads at the construction site and planned movement of such vehicles. • Vehicle speed to be restricted to 15km/hour at site to minimize potential for dust generation in the surroundings 	<ul style="list-style-type: none"> • Dust deposition in adjoining areas to be physically monitored by RSEPL personals on weekly basis. 	Site supervisor To be incorporated in the contract with contractor	Routine Activity

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility	Estimated Cost (INR) and Source
	<ul style="list-style-type: none"> Trucks / dumpers to be covered by tarpaulin sheets during off site transportation of friable construction materials and spoil All the vehicles entering the site to be asked to have updated PUC (Pollution under control) certificate. Generator to be optimally used with proper orientation and adequate stack height 			
Noise and Vibration				
Disturbance to habitations Disturbance to fauna Occupational Hazard	<ul style="list-style-type: none"> Use of inherently quiet plant and equipment as far as reasonably practicable and regular maintenance to ensure noise emissions are maintained at design levels. Integral noise shielding to be used where practicable and fixed noise sources to be acoustically treated, for example with silencers, acoustic louvres and enclosures. Provision of rubber paddings/ noise isolators at equipment/ machinery used for construction Construction vehicles to be well maintained and not idling equipment or vehicles when not in use. Provision of make shift noise barriers near high noise generating equipment to minimise horizontal propagation of noise Loud, sudden noises to be avoided wherever possible. Fixed noise sources to be located away - more than 50m inside from site boundary. Noise prone activities will be restricted to the extent possible during night time 2200 to 0600 hours to reduce the noise impact. Site workers working near high noise equipment use personal protective devices to minimise their exposure to 	<ul style="list-style-type: none"> Arrangements for noise reduction to be monitored on weekly basis Schedule of activities to be discussed and finalised between site manager and the contractor 	Site manager Construction Contractor	To be included in Project Budget- RSEPL and EPC Contractor

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility	Estimated Cost (INR) and Source
	high noise levels			
Health and Safety Hazards				
Accidents leading to injuries fatalities Occupational health hazards	<ul style="list-style-type: none"> All the required safety measures based on individual job profile to be provided (as per working guidelines, use of personal protective equipments like gloves, helmets, ear muffs, safety belts etc.) for construction worker through the contractors. Ensure effective work permit system for hot work, electrical work, working at height, working in confined space etc. Ensure personal protective equipment for all personnel present at site are made available. Arrangement for fire control measures Display of phone numbers of the city/local fire services and hospitals at site. Ensure good housekeeping at the construction site to avoid slips and falls. Dropping/lowering of construction material or tool to be restricted and undertaken only under strict supervision, if required. Provision of proper sanitation at the labour camp. 	<ul style="list-style-type: none"> Proper training of the workers regarding health and safety procedures Workers to be trained through sub contractors regarding use of Personal protection equipment and its importance. 	Site Manager Safety Officer To form part of the contractor's contract.	In house Training-RSEPL and EPC Contractor
Socio Economic Impacts				
Access to Common Property Resources Common village approach road to the site;	<ul style="list-style-type: none"> The project shall avoid using community /village roads for project activities. Alternative access roads will be constructed and used; 	<ul style="list-style-type: none"> The site personnel is to ensure that that during the construction phase there are no additional encumbrances to block access to alternative areas due to material storage etc. 	On-site personnel and contractors	-

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility	Estimated Cost (INR) and Source
Access to fuel wood sourcing areas.				
Increased Community Expectations Heightened community expectations for employment and other local benefits	<ul style="list-style-type: none"> The project will initiate an early dialogue with the local community to understand their concerns as well as expectations from the project; The project will communicate and discuss with the community in a transparent manner about employment/contract and other opportunities on a regular basis and demonstrate the efforts being made to accommodate as many people as possible. The projects will ensure that there is a transparent process of giving jobs/contracts and other benefits. 	<ul style="list-style-type: none"> Increased Community Expectations Heightened community expectations for employment and other local benefits 	Social Officer	RSEPL is required to formulate annual CSR Budget
Influx of Migrant Workers Social Impacts; Health Impact; Economic Impacts.	<ul style="list-style-type: none"> Accommodation: It shall be ensured that a minimum space of 4-4.5 m2 is allocated per person. Common latrines and bathing facilities duly segregated for male and female labour - Number of toilets and sanitary fittings shall be considered as 1 toilet, 1 urinal and 1 bathroom per 15 male workers. Arrangement for female workers shall be 1 toilet and 1 bathroom per 10 female workers. Water supply through borewells and authorized water tankers- Adequate provisions of water with about 150 litres per capita per day shall be made. Disposal of sewage through a septic tank – soak pit arrangement. Arrangements for collection of garbage in dustbins and disposal through daily collection. Provisions of food – it shall be ensured that the food 	<ul style="list-style-type: none"> RSEPL shall ensure that the onsite administration team to look after contractors will monitor all compliances to the terms and conditions. In addition, personnel will need to be aware of the applicable regulatory requirements for ensuring compliance to good working and labour law compliance. 	RSEPL, the local procurement team and the labour contractors.	7,000 INR per Toilet with sanitary Fittings- total cost depends upon number of toilet provided- EPC Contractor

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility	Estimated Cost (INR) and Source
	<p>provided to workers contains an appropriate level of nutritional value and shall take into account the different religious/cultural backgrounds;</p> <ul style="list-style-type: none"> Supply of fuel wood and LPG cylinders in order to avoid encroachment in adjoining areas 			
<p>Community Health Safety and Security Common approach road to the site; Nuisance from air emissions and noise due to transportation; Traffic impacts like accidents.</p>	<ul style="list-style-type: none"> Ensure proper training of drivers and planning for transport of construction machinery, material and manpower. All workers whether local or migrants will be instructed to follow strict code of conduct Local security personnel shall preferably be engaged at site. To the extent possible, labour to be housed in camps, with good living conditions and access to amenities. Health and safety training of the labour, raising awareness about STDs, and HIV, and maintaining behaviour standards while moving in the community should be a priority; Any complaints or concerns with respect to labour should be addressed without delay. 	<ul style="list-style-type: none"> RSEPL to provide training to drivers, workers and security personnel 	RSEPL/ Contractor	25,000 INR- To be Provisioned by RSEPL and EPC Contractor
<p>Impact on adjacent lands Crop loss during construction; Encroachment.</p>	<ul style="list-style-type: none"> Ensure that all the project activities are restricted to the existing site boundary. The use of land outside the boundary for purposes like parking of vehicles, storage of material during construction etc warrants prior consent of the owner of that land as well as adequate compensation for such a use; The project should proactively discourage any encroachment around the project area and involve the local panchayat authorities in the same; 	<ul style="list-style-type: none"> RSEPL will need to monitor the compliance of the contractor to these measures and ensure that any non-compliance is adequately addressed. 	RSEPL/ Contractor	-

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility	Estimated Cost (INR) and Source
	<ul style="list-style-type: none"> Any structures which are constructed outside the boundary should be dismantled after use. 			
OPERATION PHASE				
Waste Disposal				
Domestic waste from staff quarters Waste transformer oil and solar panels	<ul style="list-style-type: none"> Transformer oil to be replaced and retained by the supplier of transformers Buy back arrangement with solar panel manufacturer/supplier Authorised supplier to be identified for disposal 	<ul style="list-style-type: none"> RSEPL staff to be briefed about the need for proper storage and disposal waste oil 	Plant Manager Safety Officer Transformer / PV module Suppliers	-
Aesthetics and Visual Impact				
Visual intrusion Glare	<ul style="list-style-type: none"> Panels to have a low profile. Glare from panel to be of low intensity Anti glare coatings are provided on the panels 	-	Plant Manger	-
Water Resource and Quality				
Water requirement for cleaning Ground water extraction Water logging	<ul style="list-style-type: none"> Avoid wastage of water during washing of panels Adequate storm water drainage 	<ul style="list-style-type: none"> Metering and monitoring of ground water usage Daily consumption of water to be recorded and assessed on weekly basis for wastage Workers to be instructed about optimal use of water 	Safety Officer Plant manager	10,000 INR is required for testing of a sample as per IS10500 Standards- RSEPL Bacteria testing kit
Ecology				
Distraction to avifauna Routine clearance	<ul style="list-style-type: none"> Solar panels to have an anti-reflective coating to minimize the light reflecting off of the panels. Clearing of vegetation to be limited to removal of undergrowth or shrubs at the plant site 	-	Safety Officer Plant manager	-
Health and Safety				

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility	Estimated Cost (INR) and Source
Electromagnetic field Accidents leading to injury/fatality	<ul style="list-style-type: none"> EM F generated to be of weak in intensity Personal protective equipment to be provided for all personnel at road construction and transmission line. 	<ul style="list-style-type: none"> Proper training of the workers regarding health and safety procedures Workers to be trained for use of Personal protection equipment and its importance. 	Site Manager	To be built in the project cost- RSEPL and EPC contractor In-house Training
Social				
Impacts on Local Economy	<ul style="list-style-type: none"> In case of development of local enterprise in the vicinity of the project, these should be encouraged through sourcing opportunities. 	-	Procurement team	-
Upgrades to Local Infrastructure	<ul style="list-style-type: none"> Collaborate with local govt. and industry for any community development programs to share the resources and cut cost; Avoid duplicating existing infrastructure and emphasize on improving or upgrading the quality and quantity of the same. 	--	RSEPL	-
DECOMMISSIONING PHASE				
Impacts due to disposal of panels, contamination of soil, generation of wastes and associated health and safety risks	<ul style="list-style-type: none"> The proponent shall inform the workers and local community about the duration of work; The old, redundant panels can be disposed of (at a registered disposal facilities designated for this purpose); The workers shall be clearly informed about the expected schedule and completion of each activity; The reduction in workers shall be done based only on the requirement of his/her skill set and not guided by any other factor; All waste generated from demobilization phase shall be collected and disposed off at the nearest municipal disposal site; and 	<ul style="list-style-type: none"> Proper training of the workers regarding health and safety procedures Workers to be trained for use of Personal protection equipment and its importance. 	RSEPL	-

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility	Estimated Cost (INR) and Source
	<ul style="list-style-type: none"> All necessary Personal Protection Equipment (PPE) shall be used by the workers during demolition work. 			

8. Conclusion and Categorization of Project

The project is assessed to generate some environmental and social issue owing construction related activity, water resource requirement, movement of traffic and requirement of land for transmission line. Mitigation measures for potential impacts on various environmental and Socio-economics have been specified through proper

- follow up of best practice of compensation, public disclosure, and grievance management;
- planning & designing of power plant, site preparation and access route, construction, drainage and traffic movement
- application of standards for Health and Safety
- clearances and permits required for each sub activity

Environmental Management Plan and Social Management Plan describe implementation mechanism for recommended mitigation measures together with monitoring to verify overall project performance. This ESIA study together with mitigation measures and follow up of recommendations on management actions will help RSEPL in complying with the environmental standards and meet the IFC performance standards.

The Project is a renewable energy projects which uses solar energy for power generation. Renewable energy projects are considered to be cleaner compared to fossil fuel based energy projects. In accordance to the screening criteria of the IFC, AECOM has categorized Project as Category B. With respect to ADB classification, the project has been categorised as Category B for Environment, Category C for Involuntary Resettlement and Indigenous People. The basis for categorisation is as follows:

- The potential environmental and social impacts of the Project are limited as the project is a clean project and does not involve any emission or rehabilitation issues.
- The land for the proposed project comprises of revenue land which is not used by the community for any purpose;
- The water demand due to the cumulative solar power generation proposed in the region will impact the groundwater resource availability in the region;
- The duration and extent of construction activities is also limited; thereby resulting in minimal environmental and social impacts;
- Any adverse environmental and social impacts may be readily addressed through mitigation measures as outlined in the Environmental and Social Management Plan (ESMP).

Annexure I: Tentative List of Solar Power Projects in the area

Existing Solar Projects			
S. No.	Projects	Capacity	Location
1	Greentech Power Private Limited	5 MW	Baap Tehsil, Phalodi, Jodhpur
2	Punj Llyod Solar Power Limited	5 MW	Baap Tehsil, Phalodi, Jodhpur
3	PAR Solar	3 MW	Baap Tehsil, Phalodi, Jodhpur
4	OPG Energy Private Limited	5 MW	Baap Tehsil, Phalodi, Jodhpur
5	Juwi India Renewable Energies Private Limited	26, 500 kw	Baap Tehsil, Phalodi, Jodhpur
6	Shri Rangam Brokers & Holdings Ltd	10 MW	Baap Tehsil, Jodhpur
7	Sun Edison	5 MW	Phalodi, Jodhpur
Proposed Solar Projects			
1	Enfield Infrastructure Limited	10 MW	Phalodi, Jodhpur
2	Green Infra Solar Energy Limited	20 MW	Phalodi, Jodhpur
3	Green Infra Solar Energy Limited	5 MW	Phalodi, Jodhpur
4	Kiran Energy Solar Power	20 MW	Phalodi, Jodhpur
5	Mahindra Solar One Private Limited	20 MW	Phalodi, Jodhpur
6	Mahindra Solar One Private Limited	10 MW	Phalodi, Jodhpur
7	Sunborne Energy	5 MW	Baap Tehsil, Phalodi, Jodhpur

Source: <http://www.pv-insider.com/development-india/documents/PV-Utility-Scale-Map-India-Final.pdf>

Annexure II: District Collector's Allotment Letter

राजस्थान सरकार
कार्यालय जिला कलक्टर जोधपुर

पत्रांक: प-12 (3-)राज/आवं/एकमे/14/ 4460

दि: 17/10/2014

:- आवंटन आदेश :-

निदेशक (तकनीकी) राजस्थान रिनीवेबल एनर्जी कॉर्पोरेशन लिमिटेड जयपुर द्वारा एनर्जी सोर्सिज पर आधारित पावर प्लान्ट के स्थापना हेतु मैसर्स Ranji Solar Energy Private Limited (रजि.नं. एस/944/2011) को 20 मेगावाट ग्रिड इन्टरेक्टिव सोलर पीवी0 पावर प्रोजेक्ट की स्थापना हेतु राजस्थान सोलर पॉलिसी-2011 के तहत भूमि आवंटन की अनुशंसा की गयी। तत्पश्चात माननीय राजस्थान उच्च न्यायालय जयपुर द्वारा एस.बी.सिविल रिट याचिका संख्या 7978/14 व 7974/14 में पारित आदेश दिनांक 03.09.2014 की पालना में उपखण्ड अधिकारी बाप से भूमि आवंटन के प्रस्ताव चाहे गये। माननीय राजस्थान उच्च न्यायालय, जयपुर द्वारा पारित आदेश दिनांक 03.09.2014 के सन्दर्भ में उपखण्ड अधिकारी बाप एवं तहसीलदार, बाप की भूमि आवंटन हेतु प्राप्त प्रस्ताव राजस्व विभाग, राजस्थान जयपुर को भूमि आवंटन किए जाने हेतु प्रेषित किए गए।

संयुक्त शासन सचिव, राजस्व(ग्रुप-3) विभाग, राजस्थान जयपुर ने अपने पत्र क्रमांक प. 2 (114)राज-3/14 जयपुर दिनांक: 09.10.2014 द्वारा मैसर्स Ranji Solar Energy Private Limited (रजि.नं. एस/944/2011) को 20 मेगावाट ग्रिड इन्टरेक्टिव सोलर पीवी पावर प्रोजेक्ट की स्थापना हेतु ग्राम बडीसिड तहसील बाप स्थित आ0ख0न0 124 किस्म गै0मु0 रडा मे से 275.00 बीघा भूमि की किस्म खारिज कर 20 मेगावाट ग्रिड इन्टरेक्टिव सोलर पी वी पावर प्रोजेक्ट की स्थापना हेतु मैसर्स Ranji Solar Energy Private Limited को राजस्थान भू-राजस्व (नवीनीकरणीय उर्जा स्रोतो पर आधारित शक्ति संयंत्र स्थापित करने के लिए भूमि आवंटन) नियम 2007 एवं नियम 2007 में जारी संशोधन अधिसूचना राजस्व (ग्रुप-6)विभाग, राजस्थान जयपुर की अधिसूचना क्रमांक F-6(28)Rev.6/2014/9 Jaipur Dated 4/8/2014 के तहत कीमतन आवंटन किये जाने की राजकीय स्वीकृति प्रदान की है।

संयुक्त शासन सचिव राजस्व (ग्रुप-3) विभाग, राजस्थान जयपुर के क्रमांक प. 2 (114)राज-3/14 जयपुर दिनांक: 09.10.2014 की स्वीकृति की अनुपालना में मैसर्स Ranji Solar Energy Private Limited (रजि.नं.एस/944/2011) को 20 मेगावाट ग्रिड इन्टरेक्टिव सोलर पीवी पावर प्रोजेक्ट की स्थापना हेतु निम्नलिखित विवरण अनुसार भूमि राजस्थान भू-राजस्व (नवीनीकरणीय उर्जा स्रोतो पर आधारित शक्ति संयंत्र स्थापित करने के लिए भूमि आवंटन) नियम 2007 एवं नियम 2007 में जारी संशोधन अधिसूचना राजस्व (ग्रुप-6)विभाग, राजस्थान जयपुर की अधिसूचना क्रमांक F-6(28)Rev.6/2014/9 Jaipur Dated 4/8/2014 एवं राजस्थान सोलर पॉलिसी-2011 में वर्णित शर्तों एवं उपबन्धों की पालना की शर्त पर कीमतन आवंटित की जाती है:-

क्र.सं.	ग्राम	खसरा नम्बर	आवंटित रकबा बीघा में	डीएल सी दर प्रति बीघा	देय कीमत एवं लीजरेन्ट प्रथम दो वर्ष के लिए प्रति वर्ष (दो वर्ष पश्चात लीजरेन्ट गत वर्ष के लीजरेन्ट में प्रतिवर्ष 5 प्रतिशत वृद्धि कर लिया जायेगा)	जमा का विवरण		
						चालान सं.	दिनांक	राशि
1	बडीसिड	124	275.00	90405	भूमि की कीमत 2,48,61,375/-	GRN 3737482	16.10.14	24861375/-
					लीजरेन्ट प्रथम वर्ष का 12,43,069/-	GRN 3737627	16.10.14	1243069/-
कुल रकबा 275 बीघा						योग		26104444/-

नोट: उक्त लीजरेन्ट आवंटन दिनांक से प्रथम दो वर्ष के लिए प्रतिवर्ष देय है तथा आवंटन के दो वर्ष पश्चात गतवर्ष के लीजरेन्ट पर प्रतिवर्ष 5 प्रतिशत वृद्धि कर लीजरेन्ट देय होगा।

उपरोक्तानुसार ग्राम बडीसिड तहसील बाप के खसरा नम्बर 124 में से कुल रकबा 275.00 बीघा भूमि को निम्नलिखित शर्तों पर लीज पर आवंटित किया जाता है:-

1. यह भूमि 30 वर्ष की लीज (पट्टा पर) आवंटित की जाती है। उक्त अवधि के पश्चात 10 वर्ष के लिये लीज अवधि नियमानुसार और बढ़ायी जा सकेगी, जिसके लिये पट्टाधारी समय पर आवेदन करेगा।
2. लीज अवधि की समाप्ति के पश्चात भूमि समस्त प्रभारों से रहित होकर राज्य सरकार मे पुनर्निहित होगी।

3. पट्टाधारी (लीज होल्डर) उन समस्त शर्तों की पालना हेतु आबद्ध रहेगा जो कि लीज डीड में वर्णित है।
4. पट्टाधारी राज्य सरकार एवं आर.आर.ई.सी. द्वारा समय-समय पर जारी दिशा निर्देशों तथा आवंटन शर्तों की पालना हेतु पाबंद रहेगा।
5. पट्टाधारी को पट्टाधृत भूमि पर रिनीवेबल एनर्जी पावर प्लान्ट की स्थापना तक ही सीमित अधिकार होंगे। भूमि का उपयोग अन्य किसी भी कार्य हेतु नहीं होगा अन्यथा, राज्य सरकार में पुनर्निहित हो जावेगी।
6. पट्टाधारी, पट्टाकर्ता की पूर्वलिखित सहमति के बिना पट्टा विलेख के अधीन अपने पट्टाधृत अधिकारों को न तो अवर-पट्टे, उप-पट्टे पर दे सकेगा। और न ही बेचान कर सकेगा। तथापि पट्टेदार को इसके द्वारा पट्टान्तरित अपने पट्टाधृती अधिकार को पावर प्लान्ट स्थापना जिसके लिये उक्त भूमि पट्टेदार को पट्टे पर दी गयी है, विकास के लिये वित्तीय संस्थाओं से सहायता प्राप्त करने के लिये, ऐसी वित्तीय संस्थाओं के पक्ष में समनुदेशित करने या बंधक रखने का अधिकार होगा, परन्तु भूमि पर प्रथम प्रभार राज्य सरकार का रहेगा।
7. उक्तानुसार आवंटित कुल भूमि 275.00 बीघा का 1243069/-रूपये (अक्षरे रूपये बारह लाख तैयालीस हजार उनसीतर मात्र) प्रतिवर्ष लीजरेन्ट प्रथम दो वर्ष के लिए प्रतिवर्ष आवंटन दिनांक से नियमानुसार देय होगा प्रथम वर्ष का 1243069/- रूपये लीजरेन्ट चालान नम्बर जीआरएन 3737627 दिनांक 16.10.2014 द्वारा राजकोष में जमा कराये जा चुके है। आगामी वर्ष के प्रारम्भ में प्रथम सप्ताह में वार्षिक लीज रेन्ट (आवंटित सम्पूर्ण भूमि का) पट्टाधारी द्वारा तहसील बाप के माध्यम से जरिये चालान राज-कोष में जमा कराया जावेगा। प्रथम दो वर्ष के पश्चात गत वर्ष की लीजरेन्ट पर प्रति वर्ष 5 प्रतिशत वृद्धि के लीजरेन्ट राजकोष में जमा कराया जावेगा। प्रत्येक पुनर्निर्धारण के समय लीज रेन्ट में तत्समय प्रभावी नियमानुसार वृद्धि की जावेगी।
8. भूमि आवंटन की तिथि से 2 वर्ष/आरआरईसी लि0, द्वारा निर्धारित समय के भीतर सोलर पीवी पावर प्रोजेक्ट स्थापना का कार्य पूरा कर इस कार्यालय को लिखित में सूचना देनी होगी तथा प्रोजेक्ट निरन्तर चालू रहेगा। यदि निर्धारित अवधि में भूमि का उक्त प्रयोजनार्थ उपयोग नहीं होगा तो भूमि समस्त भारों से रहित होकर राज्य सरकार के हक में पुनर्निहित हो जावेगी।
9. आवंटन तिथि से 45 दिन के अन्दर आवंटिती निर्धारित प्रारूप में लीजडीड प्रस्तुत करेगा। जिसमे लीज की समस्त शर्तों का उल्लेख होगा। लीजडीड निर्धारित अवधि में निष्पादन नहीं करने पर आवंटन स्वतः निरस्त हो जावेगा।
10. पावर प्रोड्यूसर लीज डीड के निष्पादन के बाद ही आवंटित भूमि पर गतिविधियां प्रारम्भ कर सकेगा।
11. पट्टाधारी या उप-पट्टाधारी द्वारा जब भी पट्टा की शर्तों का उल्लंघन किया जायेगा या राजस्थान भू राजस्व अधिनियम 1956 (1956 का अधिनियम 15) ओर इन नियमों या विधि में

M. K.

उल्लेखित किसी प्रावधान जो कि विद्युत उत्पादन से सम्बन्धित हो का उल्लंघन किये जाने की स्थिति में लीज समाप्त कर दी जावेगी तथा भूमि राज्य सरकार में पुनर्निहित हो जायेगी। ऐसी स्थिति में पट्टाधारी स्वयं के खर्च से समस्त निर्माण हटायेगा यदि वह ऐसा करने में असमर्थ रहे तो, जिला कलक्टर को विकासकर्ता या विनियोगकर्ता या दोनो के खर्च पर समस्त निर्माण हटाने का अधिकार होगा।

12. आवंटन आदेश जारी होने के बाद आर.आर.ई.सी. लि0, के पास प्रतिभूति राशि एवं प्रीमियम जमा होने के पश्चात ही जिला कलक्टर द्वारा लीज डीड पर हस्ताक्षर किये जावेंगे।
13. अंकेक्षण के दौरान भविष्य में नियमों के अन्तर्गत किसी प्रकार की राशि देय होने पर पट्टाधारी/उप-पट्टाधारी देय राशि जमा कराने के लिये सदैव बाध्य होंगे।
14. आवंटित भूमि पर स्थिति पेड़, वृक्ष, झाड़ियां आदि सक्षम प्राधिकारी की अनुमति के पश्चात ही हटाये जा सकेंगे। जितने पेड़, वृक्ष हटाये जाते हैं उसके बदले में कम्पनी को 3 गुना पेड़ लगाना अनिवार्य है।
15. पॉवर प्रोड्यूसर को राजस्थान प्रदूषण निवारण मंडल की विभिन्न शर्तों के अनुरूप कार्य करना होगा।
16. भविष्य में उक्त भूमि में सार्वजनिक रास्ते निकालने का अधिकार सुरक्षित रखा जायेगा। इस हेतु भूमि उपलब्ध करवाये जाने पर कोई मुआवजा देने का प्रावधान नहीं होगा।

तदनुसार तहसीलदार बाप मैसर्स Ranji Solar Energy Private Limited (रजि.नं.एस/944/2011) के विधिक प्रतिनिधि को नियमानुसार उक्त वर्णित आवंटित भूमि का कब्जा नियमानुसार सुपुर्द कर राजस्व अभिलेख में अमल दरामद करेंगे तथा राजस्व मानचित्र में तरमीम भी करायेगें।

(डॉ.प्रीतम बी.यशवन्त)
जिला कलक्टर,
जोधपुर

पत्रांक: प-12 (3-)राज/आवं/एकमें/14/4461-68

दि: 17/10/2014

प्रतिलिपि निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित है :-

1. प्रमुख शासन सचिव, राजस्व विभाग, राजस्थान जयपुर।
2. निदेशक (तकनीकी) आर.आर.ई.सी.लि. ई-166 युधिष्ठिर मार्ग सी-स्कीम,जयपुर।
3. संयुक्त शासन सचिव, राजस्व(ग्रुप-3) विभाग, राजस्थान-जयपुर।
4. प्रभारी अधिकारी,जिला राजस्व लेखा शाखा कार्यालय हाजा।
5. उपखण्ड अधिकारी, बाप।
6. तहसीलदार बाप।
7. मैसर्स Ranji Solar Energy Private Limited. 152, Sector-44, Gurgaon-122002
8. गार्ड पत्रावली

जिला कलक्टर,
जोधपुर

Rajasthan Government
Office District Collector Jodhpur

Letter No.: P-12 (3-) Raj/Allotment/ACME/14/4460

Date: 17/10/2014

--: Allotment Order :-

The recommendation for the allotment of land under Rajasthan Solar Policy-2011 was made for the establishment of 20 Megawatt Grid Interactive Solar PV Power Project to Messrs Ranji Solar Energy Pvt. Ltd. (Regn No. S/944/2011) for establishing a power plant based on energy sources by Director (Technical) Rajasthan Renewable Energy Corporation Ltd, Jaipur. After that, in compliance of the order issued by Hon'ble High Court of Rajasthan on 03.09.2014 in response to the Writ Petition no. 7978/14 and 7974/14, the proposals for allotment of land were sought from the depositary, Bap.

In context of the order issued by Hon'ble High Court of Rajasthan dated 03.09.2014, the proposals for land allotment from Sub-section Officer, Bap and Depositary, Bap were sent to Revenue Department, Rajasthan, Jaipur for the same.

Joint Administrative Secretary, Revenue (Group-3) Department, Rajasthan, Jaipur in his Letter No. P. 2 (114) Raj-3/14, Jaipur, dated 09.10.2014, has granted state approval for allotment of the 275.00 Bigha of land from 275 Bigha of land from khasra No. 124 type **गैर मुमकिन राडा** (Gair Mumkin Raida), thus total Killa area 275 Bigha cancelled and assigned to Messrs Ranji Solar Energy Pvt. Ltd. (Regn No. S/944//2011 for establishment of 20 Megawatt Grid Interactive Solar PV Power Project located in village Badi Sid, tehsil Bap priced under the notification serial no. F-6 (28) rev.6/2014/9 Jaipur, dated 04/08/2014 of Revision Notification Revenue (Group-6) Department, Rajasthan, Jaipur issued in Rajasthan Land-revenue (land allotment for establishing power plants based on renewable energy sources) Provision 2007 and Provision 2007.

In compliance of the approval granted by Joint Administrative Secretary Revenue (Group-3) Department, Rajasthan, Jaipur through his letter no. P.2 (114) Raj-3/14, Jaipur, dated 09.10.2014 land is allotted to Messrs Ranji Solar Energy Pvt. Ltd (Regn No. S/944/2011) for the establishment of 20 Megawatt Grid Interactive Solar PV Power Project as per the following details on the condition of compliance of terms and provisions of the Revision Notification Revenue (Group-6) Department, Rajasthan, Jaipur issued in notification of Rajasthan Land-revenue (land allotment for establishing power plants based on renewable energy sources) Provision 2007 and Provision 2009 under Notification No.F-6(28) Rev.6/2014/9 Jaipur, dated 04/08/2014 and Rajasthan Solar Policy-2011.

S. No.	Village	Khasra No.	Allotted Land Area In Bigha	DLC Rate Per Bigha	Payable Rent for first two years (after two years lease rent will be charged with an increment of 5 percent	Details of the Deposit		
						Challan No.	Date	Amount

					per annum on the previous year's rent			
1	Badi Sid	124	275.00	90405	Rent for the land 2,48,61,375/-	GRN 3737482	16.10.14	24861375/-
					Lease rent for the first year 12,43,069/-	GRN 3737627	16.10.14	1243069/-
Total Land Area 275.00 Bigha						Total		26104444/-

Note: Above-said lease rent is payable for two years from the date of allotment, and after two years of allotment, the lease rent will be payable with 5 percent increment on the previous year's lease rent per annum.

As said above, 275 Bigha land which land in total from khasra no. 124, is allotted on lease on the following terms:-

1. This land is allotted on lease for 30 years. After that period, the lease period could be extended for 10 more years as per the rules, for which the lease holder will apply within time.
2. The moment the lease period is over the land, being free of all charges, would be re-vested in the state government.
3. The lease holder will be bound to follow all the conditions detailed described in the lease deed.
4. The lease holder will be liable to follow the guidelines and the allotment provisions issued from time to time by the state government.
5. The lease holder will be allowed to set up only a renewable energy plant. The land will not be used for any other purpose except it, otherwise it will return to the state government.
6. Without prior written permission of the leasing party, the lease holder will not be able to give his/her lease rights mentioned in the lease deed either on under-lease or on sub-lease. Neither would he be able to negotiate or endorse them. Though the lease holder will have the right to assign or hypothecate his lease rights obtained under lease agreement with financial institutions to get financial assistance from them with a view to set up the power plant for which the land has been leased to him/her , but the first right on the land will remain to the state government.
7. As stated, the lease rent for 275.00 Bighas of land will be Rs. 12, 43, 069/- (in words – Twelve lakh forty-three thousand and sixty-nine rupees only) per annum and will be payable for first two years from the date of allotment. The lease rent for the first year which is Rs.

1243069/- has been deposited in the treasury of the state through invoice no. GRN 3737627 dated 16-10-2014 in the first week of the beginning of the next year, the yearly lease rent (for the entire allotted land) will be deposited through Tehsil, Bap, in the treasury by the lease holder through invoice. After first two years, the lease rent with five percent increment on the previous year's lease rent will be deposited in the treasury. At the time of every reassessment, the lease rent will be increased as per the norms at that time.

8. Within 2 years from the date of allotment,/determined by RREC Ltd. The establishment work of the Solar PV Power Project must be completed and the concerned office must be informed in written, and the project will go on incessantly. If the land is not used as per the purpose described above, the land sans all charges will return to the favour of the state government.

9. The allottee, within 45 days from the date of allotment, will present the lease deed in the prescribed format which will incorporate all the conditions of the lease. If the lease deed is not executed within the given period, the allotment will be automatically cancelled.

10. The power producer will be able to start work on the allotted land only after the lease deed is executed.

11. Whenever the lease holder or the sub-lease holder will be found violating the terms of lease or will be found going against Rajasthan Land Revenue Act 1956 (Act 15 of 1956) or any provision mentioned in these norms or law related to power production, the lease will be terminated and the land will return to the state government. In such condition, the lease holder will remove all the construction at his/her own expenses and if he fails to do so, the district collector will be authorised to remove all the construction at the expenses of the developer or the applicant.

12. The allotment order having been issued, the district collector will be signing the lease deed only after the security amount and the premium are deposited with RREC Ltd.

13. If, during the auditing, any amount is payable as per the future norms, the lease holder, the sub-lease holder will ever be liable to deposit the payable amount.

14. The trees, shrubs, etc. present on the allotted ground would be removed only with the permission of a competent authority. It is mandatory for the company to plant three times more trees than the number of trees removed.

15. The power producer will have to act as per various conditions fixed by Rajasthan Pollution Prevention/Control Board.

16. The right to create a public thoroughfare through the above-said land will be secured. The land provided for this purpose will be free from any provision for compensation.

Accordingly, the depository, Bap, will hand over the right of the stated land allotted as per the rules to the representative of Ranji Solar Energy Pvt. Ltd. (Regn. No. S/944/2011) and enter the report of the execution in revenue record and also mark it in the revenue map

(Dr. Pritam B. Yashwant)
District Collector,
Jodhpur

Date: 17/10/2014

Letter No. P-12 (3-) Raj/Allotment/**ACME/14/4461-68**

The copy has been sent to the following for information and necessary proceedings:-

1. Principal Administrative Secretary, Revenue Department, Rajasthan, Jaipur.
2. Director (Technical) RREC Ltd. E-166, Yudhisthir Marg, C-Scheme, Jaipur.
3. Joint Administrative Secretary, Revenue (Group-3) Department, Rajasthan, Jaipur.
4. Officer In-charge, District Revenue Audit Branch office, Haja.
5. Sub-section Officer, Bap.
6. Depository, Bap.
7. Messrs Ranji Solar Energy Private Limited, 152, Sector-44, Gurgaon-122002
8. Guard Patravali

Signature
District Collector
Jodhpur

Annexure III: Questionnaire for Social Consultation

A. Location Related Information

1. Name of the Village:	2. Panchayat:	3. Tehsil:	4. District:
-------------------------	---------------	------------	--------------

B. Societal Set Up

1. Total Population:	2. Total Male Population:	3. Total Female Population:
4. Religion:		
5. Ethnic Group:		
6. Literate Population:	7. Male Literates:	8. Female Literates:
9. Main Occupation: (Main & Secondary)		
10. Crops Grown:		

C. Existing Public Amenities

1. Source of Drinking Water:	
2. Road Connectivity:	
3. Electricity Connection:	
4. Sanitation Facility:	
5. Transport Facilities Available:	
6. Health Facilities:	

7. Education Facilities:	
8. Government Schemes:	
9. NGO's in the area:	
10. Banking Facilities:	
11. Co-operatives (if any)	
12. Veterinary Facilities	
13. Fertilizer/Seed Shop:	
14. Fair Price Shop:	

D. Gender Profile

1. Pattern of employment among women?	
2. Do men migrate out of the village in search of employment?	
3. Government schemes in the area for women?	
4. Medical issues and facilities for women?	
5. At what age are girls married?	

6. Education level among women?	
7. Access to <ul style="list-style-type: none"> a. Family Planning Services b. Toilets c. Water for Personal Use 	
8. Any Mahila Sanghatans (women groups), if any?	

E Perception about the Project

1. Has any land from the village of Bari Seer and Nayagaon acquired for the project?	
2. Is the land for the proposed access road and transmission line private land?	
3. Any cultural heritage/ archaeological site near the project area?	
4. Has there been any change due to the coming of solar projects in the area? How has the change affected you?	
5. Has land prices increased because of the project?	
6. What is the Community's understanding of the Project?	
7. Concerns/ Issues relating to the project	
8. Benefit/ Expectation from the project	

F. Need Assessment (very important -5; somewhat important -4; neutral -3; not very important -2; not at all important -1)

Educational Institutions		Health Centres	
Infrastructure (roads, electricity etc.)		Employment	
Water Supply		Transport Facilities	

Skill Development		Women Empowerment (vocational centres, jobs, healthcare, education etc.)	
Agricultural Improvement		Recreational/ Community Hall etc.	
Others (specify) :		Remarks:	

Date:

Annexure IV: No Objection Certificate (NOC) from Bari Seer Panchayat

कार्यालय ग्राम पंचायत बड़ी पंचायत समिति बाप (जोधपुर)

क्रमांक : SPL-01 | G.P | प्रस्ताव-01

दिनांक : 20/09/14


अनापत्ति प्रमाण पत्र

यह प्रमाणित किया जाता है कि ग्राम बड़ीसिड के खसरा नम्बर 124 रकबा 275 बीघा राजकीय सिवायचक भूमि स्थित है। यदि उक्त भूमि सरकार द्वारा मैसर्स रणजी सोलर एनर्जी प्रा.लि., 104 मुनीष प्लाजा 20 अनसारी रोड, दरियागंज नई दिल्ली 110002 को आवंटित की जाती है तो इसमें ग्राम पंचायत बड़ीसिड को कोई आपत्ति या एतराज नहीं है।

यह प्रमाण पत्र ग्राम पंचायत के प्रस्ताव संख्या 01.....

दिनांक 20/09/2014 के अनुसरण में मेरे हस्ताक्षर से जारी किया गया


[Illegible text]


सरपंच
ग्राम पंचायत बड़ी सिड
प.स. बाप (जोधपुर)
ग्राम पंचायत, बड़ीसिड

Gram Panchayat Samiti Office Bap (Jodhpur)

S. No: - SPL-01/G.P/ Proposal 01

Date: - 20/09/2014

No Objection Certificate

This is certified that Khasra No 124 Rakba 275 Bigha of Village Badi Sid is situated on State Government Land. If Government allots above mentioned land in favor of Messrs Ranji Solar Energy Pvt. Ltd., 104 Mulish Plaza, 20 Ansari Road , Daryaganj, New Delhi-110002. Then the Village Panchayat does not have any Objection to it.

This is issued by my signature in accordance to the proposal no. 01 dated 20/09/2014 of Gram Panchayat.

Sarpanch

Gram Panchayat Badi Sid

Annexure V: List of Person's consulted

15th July 2011

Name

Signature

Village:
Beri Seer

① Bhagman Singh

भगवान सिंह

② Surender Singh

सुरेन्द्र सिंह

③ Hiralal

हिरालाल

④ Suresh

सुरेश

⑤ Anant Lal

अनंत

⑥ Chetan Singh

चेतन

⑦ Ughan Singh

उग्रमसिंह

⑧ Jai Odham Ji.

जैदयाल

⑨ Surjan

सुरज दास

⑩ Champa Devi

चम्पा देवी

⑪ Phusa Ram.

फुसा राम

⑫ Kheta Ram.

खेतराम

⑬ Bhanu Ram.



⑭ Bhuram Singh

भुरम सिंह

⑮ Sibbu Khan.

सिबु खान

⑯ Shaitan Singh.

शैतान सिंह

⑰ Prem Sutt Sharma.

प्रेमसुत देवी

⑱ Manphool Devi
Sharma.

मनफूल देवी

15th July
2014

Name

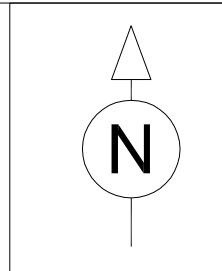
Signature

Village :

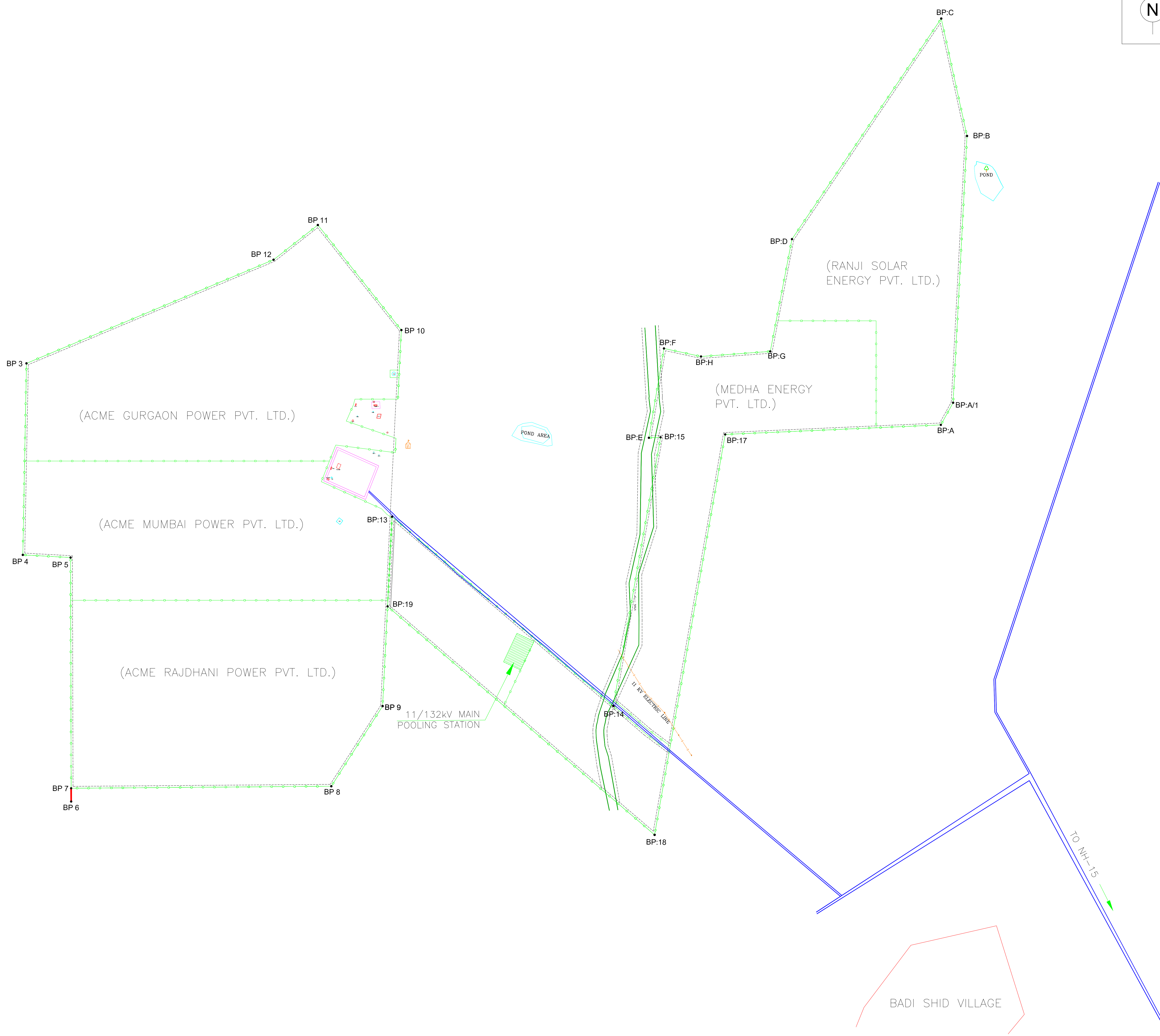
Navigan
Dhani

- | | | | |
|---|---------------|---|---------------|
| ① | Jethu Singh. | — | जेठू सिंह |
| ② | Sugam Kumar | — | सुगम कुमार |
| ③ | Bhanani Singh | — | Bhanani Singh |
| ④ | Nakash Singh. | — | नखत सिंह |
| ⑤ | Devi Singh. | — | देवी सिंह |
| ⑥ | Pappu Kumar. | — | पप्पू कुमार |
| ⑦ | Dulga Kumar. | — | दुगा राम |

Annexure VI: Location of the 100 M W solar projects as provided by ASEPL



NOTES:-
1. ALL DIMENSIONS & CO-ORDINATES ARE IN METERS.



BOUNDARY CO-ORDINATES

SR. NO.	EASTING	NORTHING	LATITUDE	LONGITUDE
BP-3	242539.8189	3044225.577	27°29'50.384"	72°23'38.354"
BP-4	242528.2953	3043619.293	27°29'30.692"	72°23'38.399"
BP-5	242679.4504	3043610.92	27°29'30.523"	72°23'43.908"
BP-7	242681.2939	3042880.447	27°29'6.808"	72°23'44.534"
BP-8	243505.1441	3042886.891	27°29'7.578"	72°24'14.521"
BP-9	243667.5939	3043140.607	27°29'15.926"	72°24'20.242"
BP-10	243727.0016	3044331.013	27°29'54.615"	72°24'21.498"
BP-11	243462.6674	3044663.596	27°30'5.234"	72°24'11.62"
BP-12	243322.3242	3044553.626	27°30'1.568"	72°24'6.594"
BP-13	243697.5131	3043740.125	27°29'35.411"	72°24'20.874"
BP-14	244397.9346	3043141.204	27°29'16.44"	72°24'46.83"
BP-15	244547.9408	3043991.602	27°29'44.152"	72°24'51.646"
BP-17	244752.6238	3044000.646	27°29'44.584"	72°24'59.091"
BP-18	244529.0286	3042733.066	27°29'3.278"	72°24'51.912"
BP-19	243683.3437	3043456.199	27°29'26.183"	72°24'20.575"
BP-A	245435.542	3044030.82	27°29'46.025"	72°25'23.933"
BP-A/1	245474.4066	3044101.081	27°29'48.333"	72°25'25.294"
BP-B	245518.4919	3044945.389	27°30'15.775"	72°25'26.261"
BP-C	245436.8121	3045317.288	27°30'27.795"	72°25'23.005"
BP-D	244964.0769	3044618.897	27°30'4.8"	72°25'6.321"
BP-E	244510.8724	3043989.965	27°29'44.074"	72°24'50.297"
BP-F	244558.6835	3044272.854	27°29'53.291"	72°24'51.823"
BP-G	244895.364	3044263.478	27°29'53.214"	72°25'4.089"
BP-H	244675.9524	3044247.398	27°29'52.544"	72°24'56.112"

PROJECT TITLE :
5x20MW SOLAR PV POWER PLANT

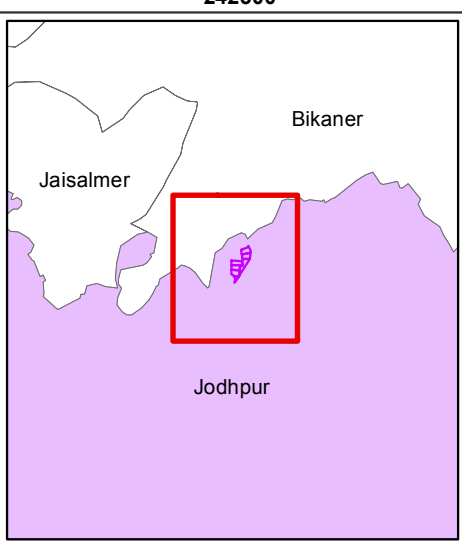
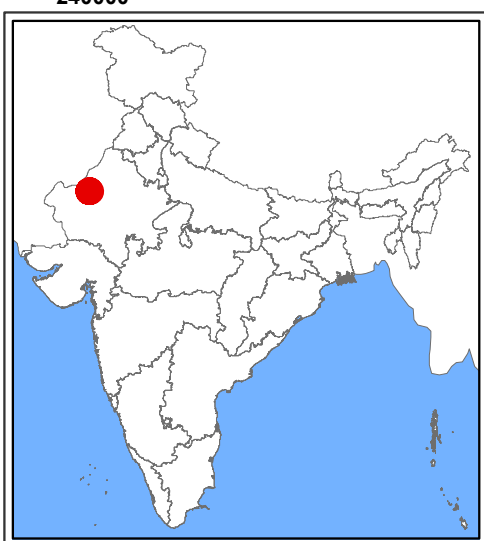
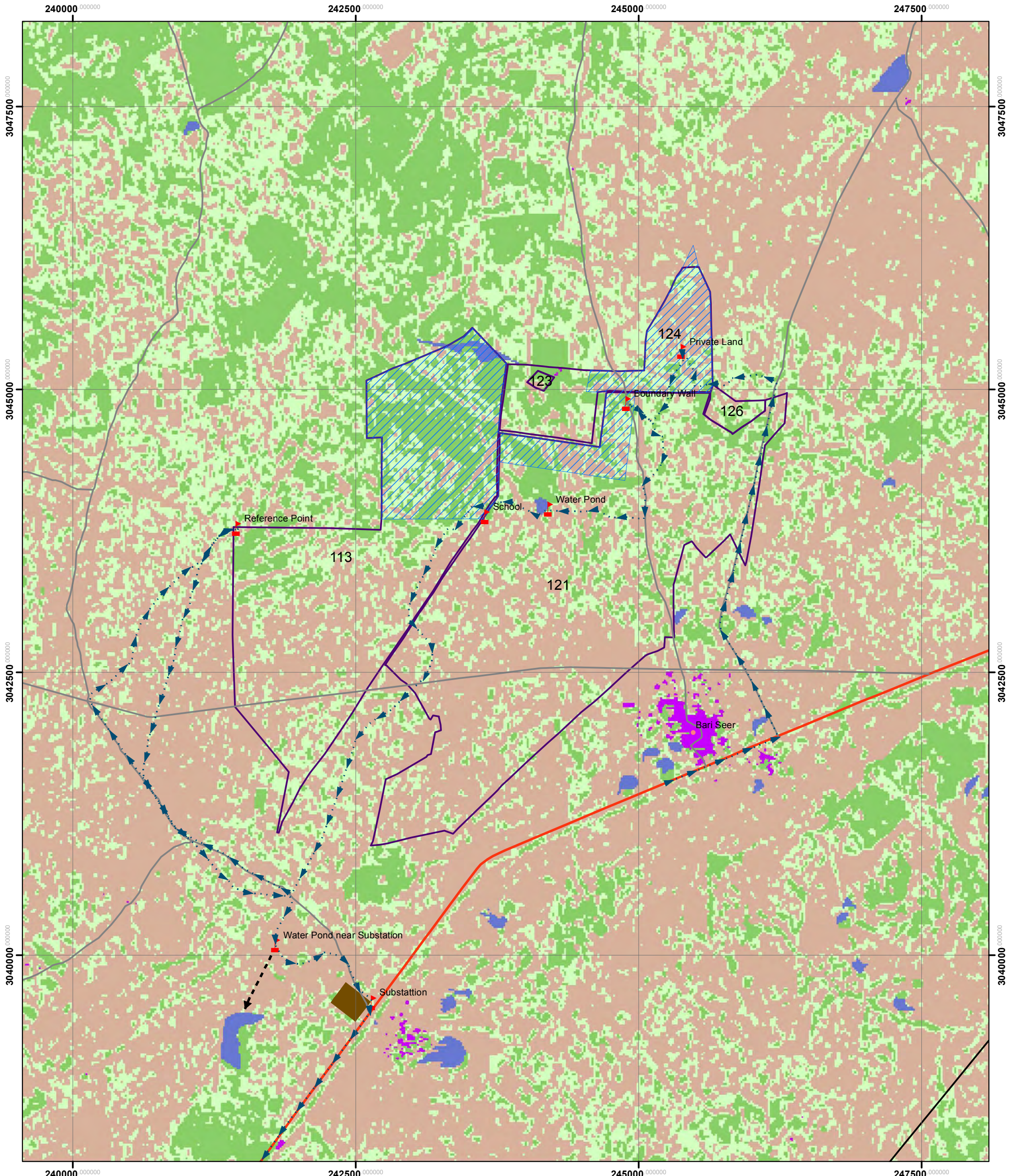
DWG. TITLE :
LAND/PLOT LAYOUT

 ACME SOLAR ENERGY PVT. LTD.
Leading Through Innovation

CONTRACTOR :

DRAWN : LC	CHECKED : KLS	SCALE : NTS
REVIEWED : KLS	DATE : 27.10.14	
APPROVED : PM	SHEETS : 01	
JOB NO. VGF	DRAWING NO. ACME-VGF-C-PLT-LAYOUT	REV. 03

Annexure VII: ASEPL Base Map showing GPS Tracking



Legend

- Villages
- Site Survey Tracking
- Observation Locations
- Roads
 - National Highway
 - Metal Roads
 - Non-Metal Roads
- ACME Identified Site Area
- Khasra Numbers provided by ACME
- Substation

Landuse

- Agriculture Land
- Fallow Land
- Sand Dunes / Barren Land
- Existing Solar Power Plant Land
- Waterbody
- Settlements

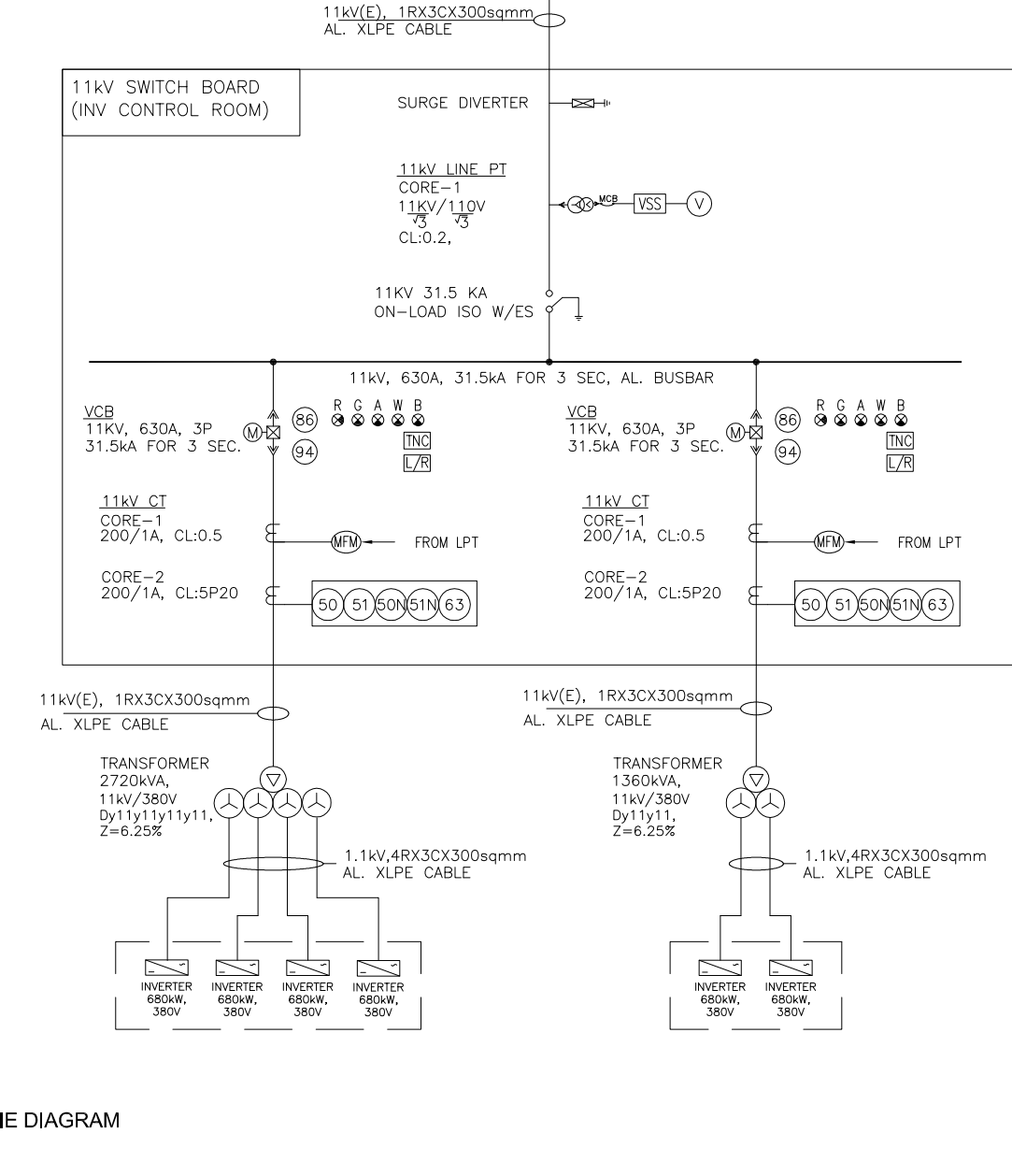
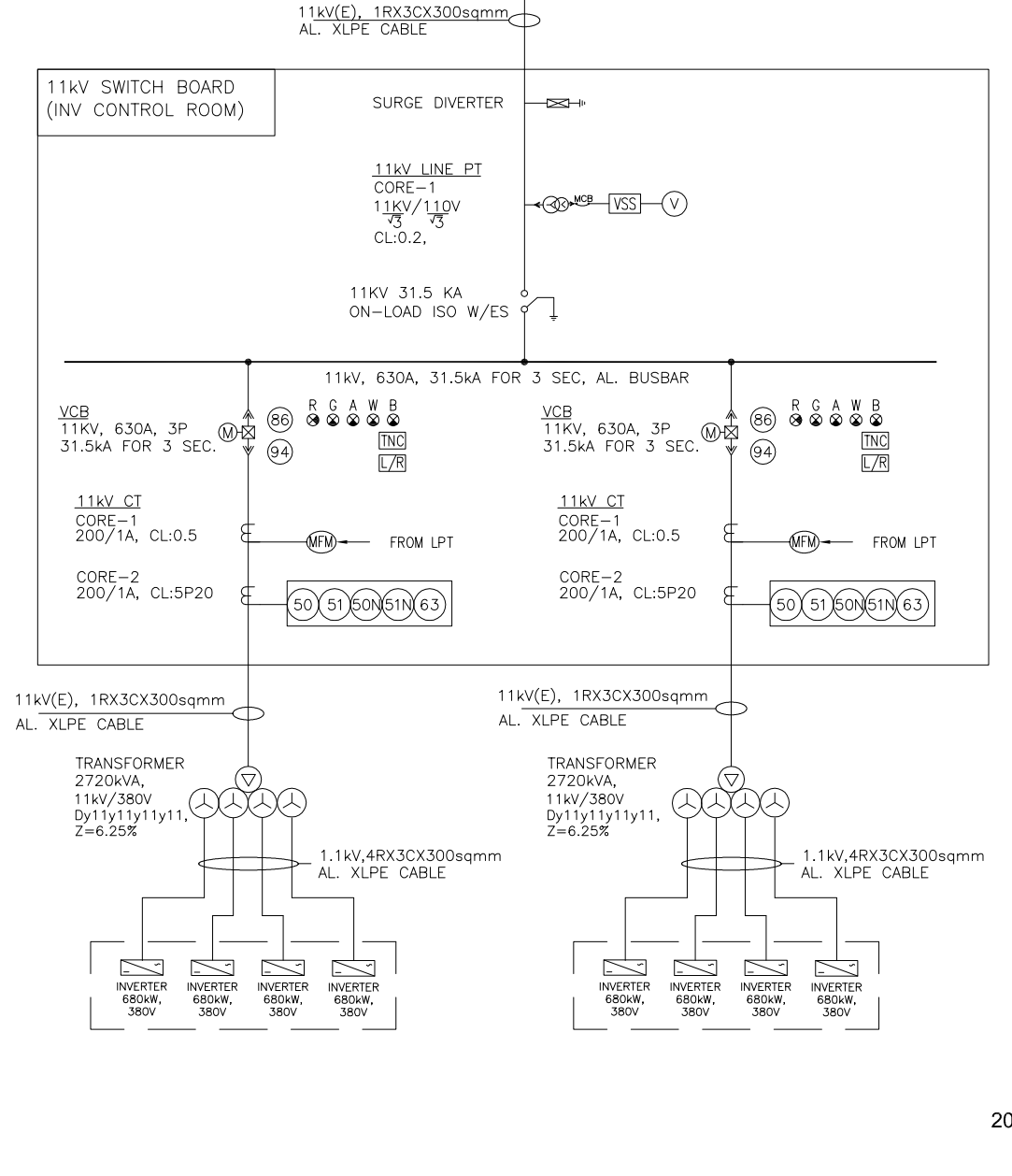
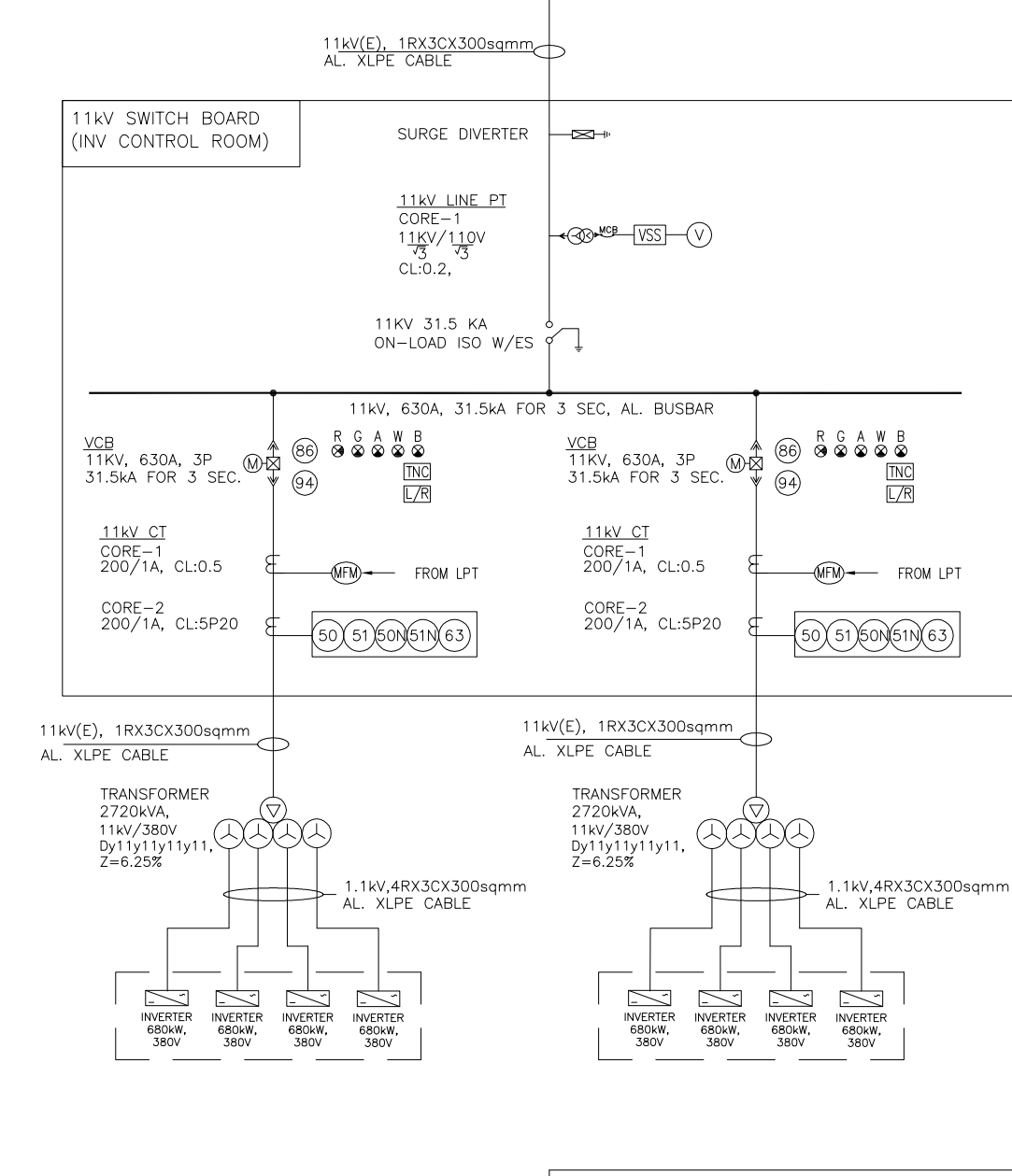
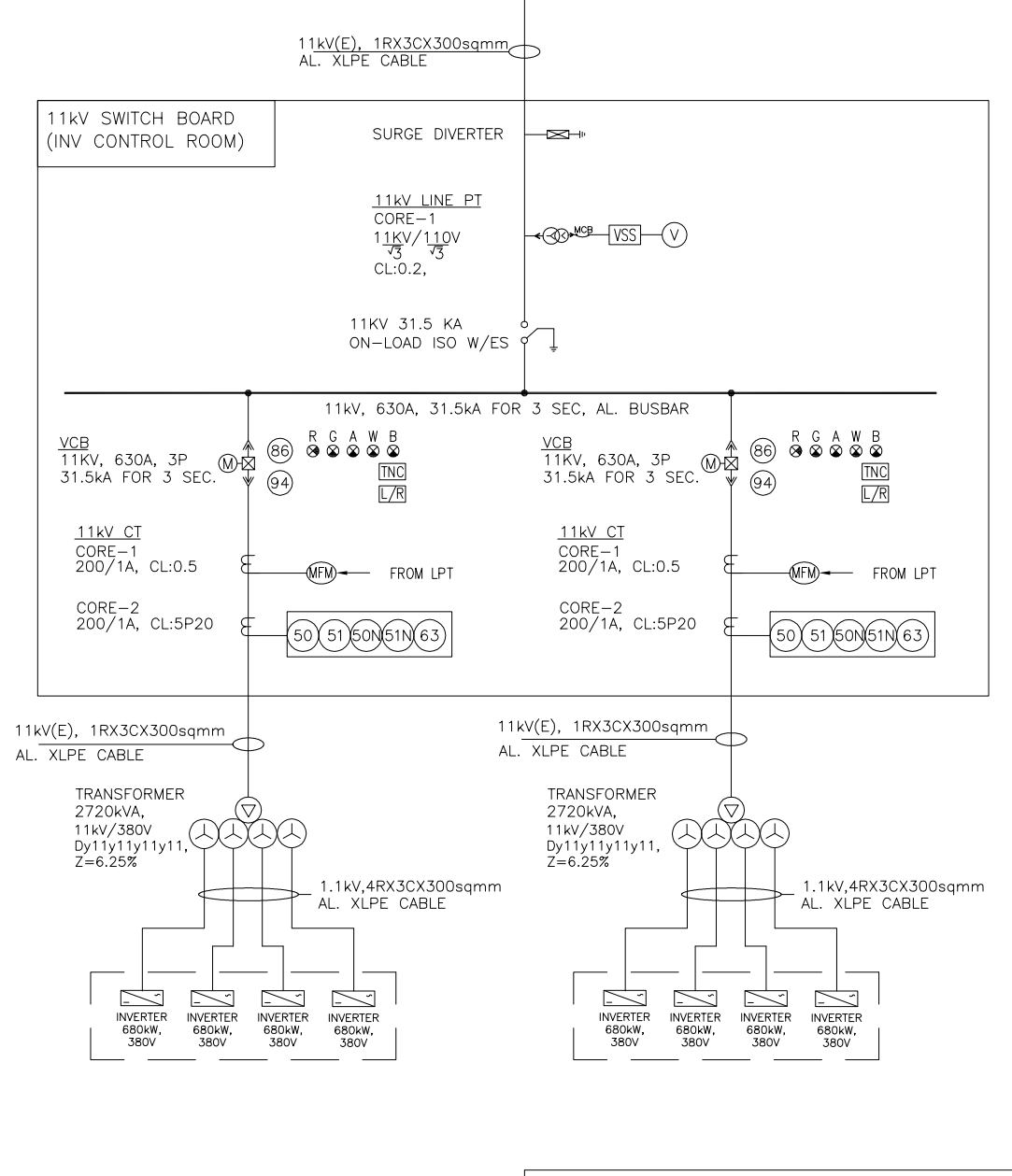
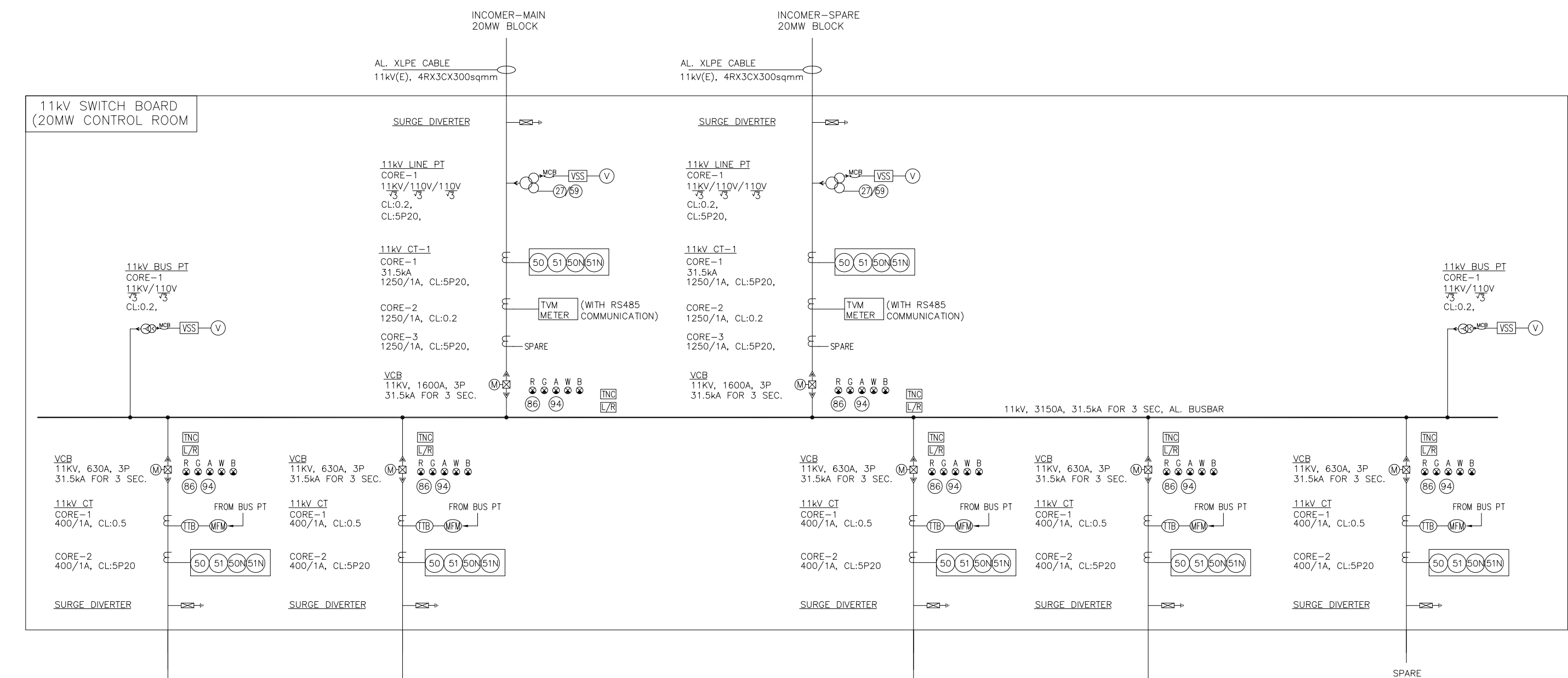
0 0.3 0.6 1.2 1.8 Km

Scale : 1:30,000

AECOM



Annexure VIII: Single Line Diagram (AC and DC Side)



20MW BLOCK SINGLE LINE DIAGRAM

- NOTES:-**
1. POWER DISTRIBUTION SCHEME IS INDICATIVE. SOME VALUE/RATING MAY CHANGE DURING DETAIL ENGINEERING.
 2. MAXIMUM POWER GENERATION WILL BE AT 1000W/M² GHI AND 25°C.
 3. EQUIPMENTS RATING ARE TENTATIVE-SHALL BE FINALIZED AFTER DETAILED ENGINEERING.

LEGENDS:-

SYMBOLS	DESCRIPTION
	SURGE DIVERTER
	CURRENT TRANSFORMER
	SF6 CIRCUIT BREAKER
	ISOLATOR WITHOUT EARTH SWITCH
	ISOLATOR WITH EARTH SWITCH
	POTENTIAL TRANSFORMER

RELAY DETAILS

RELAY DFV/CF NO	DESCRIPTION
(21)	DISTANCE PROTECTION
(55)	UNDER/OVER VOLTAGE RELAY
(50)(50N)(51)(51N)	OVER CURRENT & EARTH FAULT RELAY
(67)(67N)	DIRECTIONAL OVER CURRENT & EARTH FAULT RELAY
(87)	TRANSFORMER DIFFERENTIAL PROTECTION RELAY
(4R)	RESTRICTED EARTH FAULT RELAY
(51N)	SINGLE POLE STAND BY EARTH FAULT RELAY
(78)	VECTOR SURGE RELAY
(86)	HIGH SPEED TRIPPING RELAY (MASTER TRIP RELAY)
(95)	TRIP CIRCUIT SUPERVISION RELAY
(63A)(63B)(63C)	TRANSFORMER AUXILIARY RELAY
(80)	DC SUPERVISION RELAY
(30)	ANNUNCIATION
(50R)	CIRCUIT BREAKER FAIL

METERING DETAILS

SYMBOL	DESCRIPTION
V	VOLTMETER
A	AMMETER
F	FREQUENCY METER
ASS	AMMETER SELECTOR SWITCH
VSS	VOLTMETER SELECTOR SWITCH
OTI	TRAF0. OIL TEMP. INDICATOR.
PRV	PRESSURE RELIEF VALVE
WTI	TRAF0. WINDING TEMP. INDICATOR
MOG	MAGNETIC OIL GUAGE (TRAF0.)
MFM	MULTI FUNCTION METER

FOR PROPOSAL PURPOSE ONLY

PROJECT TITLE :
20MW SOLAR PV POWER PLANT-VGF
BADI SID,BAP, (RAJASTHAN)

DWG. TITLE :
20MW BLOCK SINGLE LINE DIAGRAM

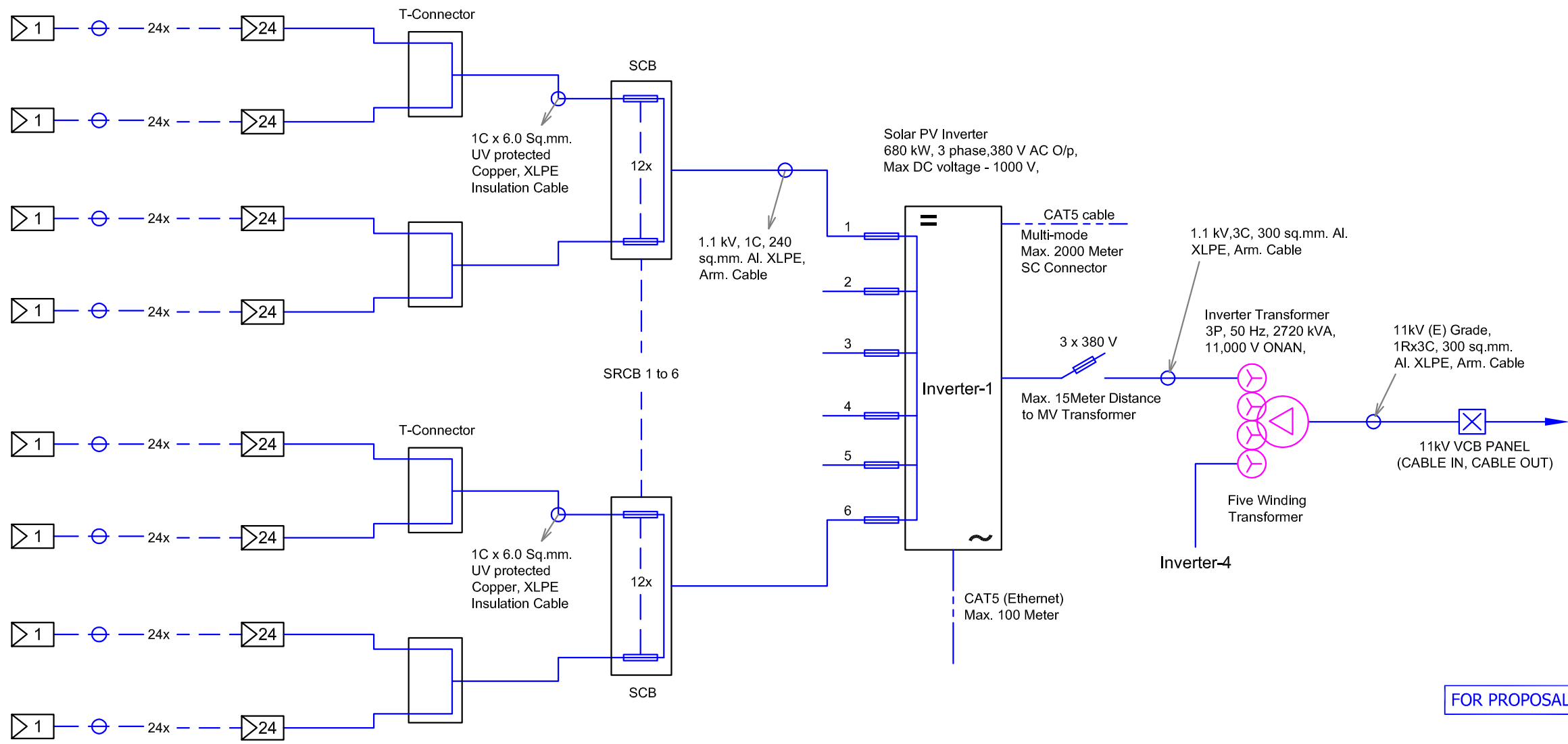
RANJI SOLAR ENERGY PVT. LTD.

NO.	REVISION	DATE	BY	CHKD.	APPD.
1	REVISED WITH 680kW INVERTER & 2720kVA INVERTER TRANSFORMER	29.10.14	LC	RS	
2	FIRST ISSUED	05.09.14	LC	RS	
3	NATURE OF REVISION & DESCRIPTION				

DRAWN : LC	CHECKED : RS	SCALE : NTS
REVIEWED : BKS	DATE : 05.09.14	
APPROVED : PM	SHEETS : 1 OF 1	
JOB NO. VGF-RANJI	DRAWING NO. ACME-VGF-RANJI-E-20MW-AC-SLD	REV. 01

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NOTES:-
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PV MODULES >TATA POWER (240/245/250 Wp)
SRCB > 12 IN / 1 OUT

FOR PROPOSAL PURPOSE ONLY

PROJECT TITLE :		20MW SOLAR PV POWER PLANT	
DWG. TITLE :		DC SIDE SINGLE LINE DIAGRAM	
		ACME SOLAR ENERGY PVT. LTD.	
CONTRACTOR :			

NATURE OF REVISION & DESCRIPTION	CHECKED	DRAWN	REV.	DATE
REVISED WITH 680kW INVERTER	NK	LC	01	28.10.14
FIRST ISSUED FOR DPR PURPOSE ONLY	NK	LC	00	29.09.14

DRAWN : LC	CHECKED: RS	SCALE : NTS
REVIEWED : NK	DATE : 29.09.14	
APPROVED : PM	SHEETS : 03_OF_03	
PROJECT NO. VGF	DRAWING NO. ACME-VGF-E-DC-SLD-03	REV. 01